ACCOUNT OF THE OPERATIONS OF

THE GREAT TRIGONOMETRICAL SURVEY OF INDIA

VOLUME IX.

ELECTRO-TELEGRAPHIC LONGITUDE OPERATIONS

EXECUTED DURING THE YEARS 1875-77 AND 1880-81

BY

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AND

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SURVEYOR GENERAL OF INDIA, AND SUPERINTENDENT OF THE TRIGONOMETRICAL SURVEY.

Dehra Dun:
PRINTED AT THE OFFICE OF THE TRIGONOMETRICAL BRANCH, SURVEY OF INDIA.
B. V. HUGHES.
1883.

Eighth Edition

COMPILED UNDER THE ORDERS OF COL. J. T. WALKER, R.E., F.R.S. &c. SUPERINTENDENT GREAT TRIGONOMETRICAL SURVEY OF INDIA AT DEHRA DOON, AUGUST 1870.

Printed from a transfer to Zinc in the Photo: Branch of the Surveyor General's Office

Outline by H. James. Writing by J. M. Dalziel
Engraved under the Superintendence of C. W. Coard

Engraved at the Surveyor General's Office.
Calcutta Novr. 1870.
Corrected up to October 1882.

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PREFACE.

The present volume—the ninth—of the *Account of the Operations of the Great Trigonometrical Survey of India,* describes the Electro-Telegraphic Operations for the determination of Differential-Longitudes which have been completed by this Survey, up to the end of the field season of 1880-81, in various parts of India, and on the lines of sub-marine cable which connect India telegraphically with Europe, *viâ* Aden and Suez.

The Government of India—under the ruling Viceroy and Governor General, the Court of Directors of the Hon'ble East India Company, and the Secretary of State for India—have always taken a very liberal view of the relation of the Great Trigonometrical Survey to purely scientific ends, as well as to the geographical ends for which the Survey was primarily constituted. Operating within parallels of latitude which are situated much nearer the equator than those within which any geodetic operations of importance have as yet been undertaken in other parts of the globe, this Survey has, almost from its commencement by Major Lambton in 1800, furnished data which have been of very great value in all investigations of the Figure of the Earth. Its earliest contributions to the Science of Geodesy were determinations of the lengths and amplitudes of Meridional Arcs—the lengths being deduced from the triangulation and base-lines, the amplitudes from astronomical observations of the latitude at the stations at the extremities of the arcs—as described in Colonel Everest's *Accounts of the Measurement of Sections of the Meridional Arcs of India,* published in 1830 and 1847. Then came the series of Pendulum Operations for the purpose of determining the variations of the force of gravity at sundry stations of the Survey—situated on mountains, table-lands, the interior of the continent and the coast lines—which was commenced in the year 1865, and is described in the fifth of the present series of volumes. Also when the electric telegraph had been introduced into India, and all the principal cities and towns had become or were being connected by lines of wires, advantage was taken thereof to commence the measurement of differential longitudes between certain stations of the Survey, co-ordinating with the differential latitude measurements, and thus to contribute to the science of geodesy determinations of a number of Longitudinal Arcs, which were to supplement and be combined with the time-honoured Meridional Arcs. The present volume gives full details of this work, so far as completed up to 1880-81. A few prefatory remarks are however necessary in this place.

In 1862, shortly after I succeeded to the superintendence of the Great Trigonometrical Survey, I moved the Secretary of State for India to sanction the necessary expenditure for procuring a complete apparatus—including astronomical clocks, transit instruments, chronographs and electric appliances—for the determination of differential longitudes in India with the aid of the system of electro-telegraphic lines. My proposals were duly sanctioned. Colonel Strange, an officer of the Great Trigonometrical Survey who had recently retired and was then residing in London, was entrusted with the, to him, congenial task of designing and superintending the construction of the several instruments; because he had already acquired in India a high reputation for skill in mechanism generally, and more particularly as regards the great theodolites and all the more delicate instruments which are employed in geodetic operations. He was given *carte blanche* as to expenses and the selection of instrument makers; and he eventually employed Messrs. Frodsham of London for the clocks, Messrs. Cooke and Sons of York for the transit instruments, and Messrs. Eichens and Hardy of Paris for the chronographs and the electric apparatus. Before being sent out to this country the instruments were examined at the observatory attached to the India Office Stores Department at Lambeth, by Colonel Strange, assisted by Captain—now

Lieut.-Colonel—W. M. Campbell, R.E., who subsequently took a prominent share in the operations carried out with the same instruments, and by whom the descriptive chapters in the present volume have been written, and the subsequent numerical details arranged for publication.

The general procedure of operation for the determination of differences of longitude by the electric telegraph, may be briefly stated as follows. Two observers are employed, one for each of two stations connected by the telegraph lines. Each observer, furnished with a complete set of instruments, takes up his position and makes the most accurate determination possible of the error of his own clock; and at certain times, both observers working in concert determine, by means of electric signals transmitted between the stations, the absolute difference between the clocks at a given instant; with these data the difference of longitude between the stations—or as it is here generally termed the "arc of longitude"—becomes known. There are other methods of procedure; for instance, the one which was commonly practised in these operations, whereby dependency on stars' places is avoided in determining the difference of local times. Modifications of system had to be introduced for varying circumstances. Full explanations of the precise methods followed from time to time will be found in the present volume, where it will be seen with what constant care and attention, and incessant vigilance in guarding against all sources of even minute error, the operations were conducted.

The instruments were received in India in 1872 and were immediately placed in the hands of Captain J. Herschel, R.E., and Captain W. M. Campbell, R.E., with a view to the early commencement of the longitude operations. These Officers were then residing at Bangalore, which place being connected both by railway and telegraphically with Madras, was a convenient locality for commencing operations by a series of experiments to ascertain the most suitable procedure for adoption, which would be followed by practical application in the measurement of Madras–Bangalore as the first arc. This arc, which connects the east coast with the centre of the Peninsula, having been completed, the sister arc connecting Bangalore with Mangalore, on the west coast—also easily accessible by rail and steamer—was measured. The operations were carried on under the immediate charge of Captain Herschel, the senior Officer. The observations were reduced in the summer of 1873.

Here it may be observed that the arc of parallel which was selected, because most convenient, as the first for measurement by the electro-telegraphic method, was also of peculiar interest, in that it was situated much nearer to the equator than any similar arc which had yet been measured in any part of the globe, or was likely to be measured for many years to come; for such operations, when executed for geodesy, must necessarily be restricted to regions which have been or are about to be covered with a first class triangulation. The arc was a short one, and, terminating at both ends on the ocean, it was obviously incapable of extension; yet its length—5° 24′ 12″ in amplitude and lineally about 364 miles—was by no means insignificant, though small in comparison with the arcs to be subsequently measured higher up across the Peninsula, and in Northern India, such as the arc of over 21° in amplitude and 1350 miles in length which will shortly connect Kurrachee with Calcutta. Moreover it was on this very arc of parallel that Colonel Lambton had endeavoured, in the years 1802-5, to determine the length of a 'degree of longitude', by the method of observing the astronomical latitudes and azimuths at a series of mutually visible and reciprocating stations of the principal triangulation, stretching across from coast to coast. Thus circumstances led to the selection of the same parallel of latitude for the commencement of longitudinal determinations by modern methods as had been chosen by Colonel Lambton for determinations by ancient methods.

The results of the first field season's operations were far from satisfactory; one of the transit instruments, No. 2, showed discordances in the determination of the 'constant for collimation' which were very perplexing at the time, and after long and anxious scrutiny were eventually traced to a fault at the joint of the object end tube of the telescope with the flange for attachment to the cube of the transit axis. The joint had been originally effected by soldering alone and had become infirm and shaky. This fault has so greatly detracted from the worth of the two arcs which were measured with the aid of the defective instrument, that they must be rejected, and the measurements repeated hereafter.

Operations were resumed during the field season of 1875-76, Captain Campbell being placed in charge as senior Officer, with Captain W. J. Heaviside, R.E., as his colleague. The fault in transit instrument No. 2 had meanwhile been remedied by Mr. Doderet, Mathematical Instrument Maker to the Madras Government; and from that time forwards, during the entire period embracing the observations which are contained in the present volume, both this and the sister instrument were in a very efficient condition.

The experience already gained showed that it was essentially necessary to introduce a system of check and control over the results, in order to guard against the influence of any defects—either in the instruments, the telegraph lines, or the electric connections—which might introduce errors entering as constants throughout the whole of the observations for determining an arc, thus escaping detection while vitiating the work, and causing the results to show only small errors while larger ones remained latent and undetected. There are various methods of check by independent processes of operation; as for instance repetition after a reversal of the positions of the observers and the instruments; or measuring a double arc, the sum of two single arcs, as Madras–Mangalore = Madras–Bangalore + Bangalore–Mangalore. But the method which I decided on adopting, as most suitable for combination with the great triangulation of India, and also as advantageous in that it furnishes the greatest number of arcs from the same number of operations, was to select three trigonometrical stations, as *A, B* and *C,* situated—near the telegraph lines—at such distances apart as to form a fairly symmetrical triangle; and, after having measured the longitudinal arcs corresponding to *A B* and *B C,* to measure *A C* independently as a check on the two first arcs; and so on. This is the principle which has governed the selections of the longitude stations in India, up to the present time; stations have been chosen in such a manner as to throw a net-work of fairly symmetrical longitude-triangles over the face of the country. Whenever practicable the stations are selected on telegraph lines forming a circuit, as then the operations on the three arcs are in all respects independent; the disposition of the lines however does not always permit of this being done. Thus there may be no direct telegraphic connection between *A* and *C,* but only the connection *viâ B;* but even here the triangular arrangement is advantageous; for while it furnishes the greatest number of localities with longitude stations, it gives as much independency of local time observation as any other method, and this is of much more importance than independency of telegraph line.

For some time I felt much misgiving as to whether the errors to which operations of this kind were liable were due in greater measure to the astronomical observations or to the electrical connections. At first there was a natural feeling of incertitude as to what might be happening on telegraph lines, possibly several hundred miles in length, passing through a number of offices, in which the wires had to be joined up, and where the electric currents might be transmitted through relays, owing to mistakes being made in the connections. But experience has shown that the aggregate of the errors in the telegraphic signalling between the stations is immaterial and insignificant as compared with the aggregate of the errors in the local time observations. If any mistake is made at a telegraph station, it usually has the effect of stopping the interchange of signals altogether, rather than of introducing error. Thus the large errors in the two arcs first measured were traced eventually to a fault in one of the transit telescopes and not to any faults in the telegraph lines; and I may here state that in the field season of 1881-82—the first after the completion of the operations which are exhibited with full numerical detail in the present volume—it so happened that large errors were again met with, and again the errors were traced to the same source, namely to a recurrence of the fault in the originally defective transit telescope.

During the field season of 1875-76 the following arcs were measured by Captains Campbell and Heaviside :—

Hyderabad (Bolarum)–Bombay.
Bellary–Bombay.
Hyderabad (Bolarum)–Bellary.
Madras–Hyderabad (Bolarum).
Madras–Bellary.
Bangalore–Bellary.

In the next field season the following arcs were measured by the same Officers :—

Vizagapatam–Madras.
Vizagapatam–Bellary.
Mangalore–Bombay.

While the preceding operations were in progress I was asked by Sir G. B. Airy, K.C.B., Astronomer Royal, to move the Government of India to sanction the determination of the differences of longitude between Bombay, Aden and Suez, with the aid of the ocean telegraphic cables connecting these places; this determination was required in order to complete the connection between England and India, of which the section between Greenwich and Suez had already been executed—on the occasion of the Transit of Venus in 1874—under the superintendence of the Astronomer Royal. Sanction was duly obtained. And now it became necessary to modify very materially the procedure which had hitherto been adopted, in order to meet the transition from the land-lines of telegraph and their signalling apparatus to the sub-marine cables and the syphon recorders of Sir William Thomson which were then used in the offices of the Eastern Telegraph Company at Bombay, Aden and Suez. Captain Campbell devised a method of comparing the clocks through the cables which may be called automatic, inasmuch as no personal errors of observing or repeating signals could enter; it is believed that this is the first instance of such perfection of method having been attained in signalling through cables, as the method would not have been practicable in signalling before the introduction of the syphon recorder. The operations were carried out with complete success, and thus the Observatories at Greenwich and Bombay were telegraphically connected for the first time; moreover the Madras Observatory—the primary origin of longitudes for the Survey of India—became connected at the same time, with the aid of the arc measures already accomplished on the land lines.

The longitude operations remained in abeyance during the years 1877-80, at first because Captains Campbell and Heaviside obtained leave of absence on furlough, and secondly because on the return of those officers to duty their presence was required for some time with the British Armies in Afghanistan. It was not until the year 1880 that their services became again available for departmental employment.

In the field season of 1880-81 the operations were resumed by Lieutenant-Colonel Campbell and Major Heaviside—both officers having meanwhile obtained brevet promotion for their services in Afghanistan—and the following arcs were measured.

Bombay–Deesa.
Deesa–Kurrachee.
Bombay–Kurrachee.
Jubbulpore–Bombay.
Jubbulpore–Hyderabad (Bolarum).
Jubbulpore–Agra.
Jubbulpore–Deesa.
Agra–Deesa.

The present volume gives, in Part I, an account of the instrumental equipment as originally received from England, and as subsequently modified for adaptation to actual requirements in India; a description of the observatory arrangements and preparations at each station; an account of the several operations carried out in the course of the measurement of the six arcs of 1875-76, the three arcs of 1876-77, and the eight arcs of 1880-81; a separate chapter on the determination of personal equation, with a description of an Idiometer specially designed by Lieutenant-Colonel Campbell in order to facilitate and control the investigations of personal equation; a detailed description of the methods of observation and reduction, with full explanations of the tables in which the observations and their reductions have been arranged for publication; and finally the corresponding tabular matter in full detail. The details of the operations during 1872-73, when one of the transit telescopes was in an unsound condition, have been purposely omitted, as the results must be rejected altogether and revised hereafter.

An appendix to Part I contains the details of the subsidiary triangulation executed wherever necessary to connect the longitude stations with the principal stations of the great triangulation. With the aid of these data the geodetic values of the latitude and longitude of the longitude stations were computed, by the formulæ and tables of constants which are employed in all calculations of geodetic elements in the Survey of India; the results are given in *Table C.* A comparison between the geodetic and the electro-telegraphic values of the several arcs of longitude is given in *Table D.* This is followed by a table of the values of the errors exhibited at the close of the several triangular circuits formed by the electro-telegraphic determinations. Another table gives the several values of the personal equations, obtained both from star observations and from observations taken with the Idiometer.

Part II gives the details of the operations for determining the differences of longitude between Bombay, Aden and Suez by means of the sub-marine cables. It is followed by an appendix containing the details of the triangulation which was executed at Aden, with a view to connecting the Longitude station with Captain Heaviside's Pendulum station, Lord Lindsay's chronometric-longitude station, the light-house and the most prominent surrounding land-marks. It ends with a table of the right ascensions of the clock stars which were used in the Bombay–Suez–Aden observations.

No attempt has yet been made in this Survey to solve the equations of condition presented by the several arcs of longitude, with a view to obtaining the most probable value of each arc, because this cannot be done finally until the arcs remaining for determination are completed. A primary combination of the eleven arcs first measured has however been made by Colonel Clarke, C.B., late of the Ordnance Survey of Great Britain, who when preparing the valuable work on Geodesy which he published in 1880, applied to me for as much as I could furnish him with of the recent, or as yet unpublished, data of the meridional and longitudinal arcs of the Indian Survey, with a view to employing those data in a new determination of the figure of the earth. The method which he adopted for the treatment of the longitudinal arcs is given in Chapter VIII of his Geodesy (*Clarendon Press Series, Oxford 1880*); and when all the arcs in India are completed they must be subjected simultaneously to somewhat similar treatment.

Up to the present time, the number of instances in which the geodetic value of a longitudinal arc is in excess of the electro-telegraphic value greatly preponderates over the number of instances in which the geodetic value is in defect. This tends to show that the values of the elements of the earth's figure which are employed as constants in all the geodetic calculations of this Survey—and which were calculated by Colonel Everest, who published them in 1830—will probably have to give place eventually to values closely approximating to those subsequently deduced by Colonel Clarke; for on substituting Colonel Clarke's constants, the geodetic values of the arcs are brought into much closer accordance with the electro-telegraphic values. Still, after this is done, the geodetic values of the arcs stretching from coast to coast of the Peninsula continue to be materially in excess of the electro-telegraphic values, the average excess, which is about 10″ with Colonel Everest's constants, being still as much as 6″ with Colonel Clarke's constants.* This is believed to be due to deflections of the plumb line, towards the sea and away from the continent, at the stations on the coasts; and it is in accordance with the results of the pendulum observations by the late Captain Basevi, which indicate a probably greater density in the strata of the earth's crust under oceans than in the strata under continents,† for that would diminish the amplitudes of all astronomically determined arcs between stations on the coast and in the interior, and still more diminish the amplitudes of arcs between stations situated on opposite coasts.

* The values in feet of Everest's, Clarke's, Airy's and Bessel's constants are as follows, the earth being assumed to be spheroidal.

Investigation.	Major axis a	Minor axis b	$a-b$	$\frac{a-b}{a}$
Everest 1830	20,922,932	20,853,375	69,557	$\frac{1}{300 \cdot 80}$
Airy	20,923,713	20,853,810	69,903	$\frac{1}{299 \cdot 33}$
Bessel	20,923,600	20,853,656	69,944	$\frac{1}{299 \cdot 15}$
Clarke 1866	20,926,062	20,855,121	70,941	$\frac{1}{294 \cdot 98}$
" 1880	20,926,202	20,854,895	71,307	$\frac{1}{292 \cdot 96}$

Formulæ for the calculation of changes in the geodetic latitudes and longitudes of the Survey arising from changes in the elements of the earth's figure are given at page 131 of Volume II; and on the following page a table of the numerical changes in arcs of 1° in length is given for the change to Clarke's constants of 1866.

† See pages xxviii to xxxiv of preface to Volume V.

The present determinations of the differences in longitude between Bombay, Aden and Suez combine with those of the differences between Suez, Mokattam and Greenwich which were derived from the observations taken in connection with the Transit of Venus in 1874, to give the following results;—

Longitudes, East of Royal Observatory, Greenwich.

	h	m	s		°	′	″
Mokattam	2	5	6·24	=	31	16	33·60
Suez	2	10	13·17	=	32	33	17·55
Aden	2	59	55·832	=	44	58	57·48
Bombay	4	51	15·805	=	72	48	57·08
Madras Observatory	5	20	59·335	=	80	14	50·03

The last value is subject to slight modification hereafter, when the whole of the longitudinal arcs in India have been measured and finally adjusted, which may cause a small alteration in the difference of longitude between Bombay and Madras.

Here it may be observed that whereas the difference between the longitude stations at Madras and Bombay is 7° 25′ 52″·95, as determined electro-telegraphically, the geodetic difference resulting from the principal triangulation, now finally reduced, is 7° 26′ 5″·24; the excess of 12″·29 in the latter value is probably due, partly to the values of the constants for the figure of the earth which were employed in the calculations tending to make the geodetic arcs too long, and partly to local attractions on the coast lines tending to diminish the astronomical amplitudes.

A few remarks are here desirable regarding the adopted value of the Origin of Longitudes of the Great Trigonometrical Survey, and the effect thereon of the recent connection with Greenwich, by the electro-telegraphic operations between Bombay and Suez, which are described in Part II of the present volume, and those between Suez and Greenwich which were performed in connection with the observations of the Transit of Venus in 1874.

The primary station of origin was the Astronomical Observatory at Madras, the meridian circle of which was assumed to be in long. 80° 17′ 21″ east of Greenwich, as determined by observations taken in the year 1815. But about the year 1840, Colonel Everest adopted a point in his Observatory at Kaliánpur in Central India as a second origin of longitudes, placing it in long. 77° 41′ 44″·75, by calculation through the then existing triangulation from Madras westwards to Bangalore, and from Bangalore northwards along the Great Arc to Kaliánpur. Much of the triangulation employed had been executed with inferior instruments and was based on the primary chain-measured base-lines of this Survey; all this has now been revised, and also computed in terms of the modern base-lines which were measured with the Colby apparatus of compensation bars and microscopes. And now the whole of the triangulation between Madras and Kaliánpur has been finally disposed of, in the course of the final reductions of the South-East Quadrilateral and the Southern Trigon, two of the great sections into which the general triangulation of India was divided with a view to the execution of the successive simultaneous reductions of the chains of triangles included in each section, as set forth in Section 7 of Chapter I of Volume II. This has led to the retention of Colonel Everest's adopted origin at Kaliánpur as the origin of longitudes; for the final reductions were necessarily commenced with the triangulations emanating from Kaliánpur, because the longitudinal series to Madras and the southern sections of the Great Arc had not then been revised. The final reductions for the Southern Trigon are complete in all respects, though they have not yet been published; they place the Madras Observatory in longitude 80° 17′ 21″·51 relatively to the value which was adopted by Colonel Everest and has hitherto been maintained for Kaliánpur; *vide* pages 135 and 136 of Volume II. Subtracting from this the value, 80° 14′ 50″·03, furnished by the electro-telegraphic operations, we obtain −2′ 31″·48 as the value of the constant correction to reduce all the longitudes of the Great Trigonometrical Survey to Greenwich. The value actually employed at the present time, pending the completion and final reduction of the longitudinal arcs for all India, is −2′ 30″.

It would have been impossible to carry out electro-telegraphic longitude operations in India without the hearty co-operation and assistance of the Government Telegraph Department. The late Director General of Telegraphs, Colonel D. Robinson, R.E., and his successor Colonel Murray, have always responded most cordially to my applications for the use of the lines when required for observation, and Lieut.-Colonel Campbell records, in the body of this volume, his appreciation of the unvarying courtesy and attention which he always met with from the numerous officers of the Telegraph Department with whom he had any business relations. Similarly, when the operations between Bombay, Aden and Suez were undertaken, application was made to the Director of the Eastern Telegraph Company for the use of the cables; and the application was most liberally responded to by the loan of the cables without any charge. This was a most valuable concession; for on these cables the night hours—during which they were required for our observations—were always the busiest of the twenty-four; and at the commencement of the operations—while the method of exchanging longitude signals was comparatively experimental—the cables were employed for considerable periods. Here again Colonel Campbell expresses his gratitude to all the officials of the Company with whom he came in contact.

It only remains for me to repeat that the whole of the observations recorded in this volume were taken conjointly by Lieut.-Colonel Campbell, and Major Heaviside; and to add that the reductions of the observations, and the determinations of the several arcs of longitude were also effected conjointly by those officers. The descriptive chapters in the present volume, and the tabular arrangement of the numerical details of the observations and reductions, are due to Lieut.-Colonel Campbell. The volume was printed at the office of the Great Trigonometrical Survey in Dehra Dún, under the supervision of J. B. N. Hennessey, Esq., M.A., F.R.S., who has rendered material and valuable assistance to Lieut.-Colonel Campbell in preparing the volume for publication and passing it through the press.

CALCUTTA,
January 1883.

J. T. WALKER, LIEUT.-GENERAL, R.E.,
Surveyor General of India, and
Superintendent of the Trigonometrical Survey.

ERRATA ET ADDENDA.

PART I.

Page			
6	line 14 from bottom	*for* *Y*	*read* *Z*
29	„ 9 from top	„ The line wire is attached to *L*	„ The line wire is attached to the binding screw marked *l* on the talking key *D D*, whence connection is made with the plate *L* of the commutator through the relay *F*, and the switch *M*, by means of the pegs numbered 22 and 23, or with the sounder *S S* by pegs 23 and 24.
54	line 17 from top. The formulæ for the calculation of collimation, level and azimuth corrections are given at page 43; for convenience of reference they are also given in another form at the end of the addenda.		
6 to 16	in heading of *Table II*	*for* ERROR	*read* CORRECTION
7	col. 2, latitude of Bellary	„ 17° 30′	„ 15° 9′
9	„ 18, line 8 from bottom	„ + 15·4	„ − 15·4
11	„ 10 „ 10 „	„ (13 28 20·41) 13 41 59·21	„ (13 28 20·41)* 13 41 59·21, and *add* footnote to page as follows:—* The observed time for η Ursæ Majoris, which is entered in brackets, is the time by W Clock, and the quantity below it is the corresponding time by E Clock.
15	col. 10, line 5 from bottom	*for* 7 46 53·86	*read* 7 46 55·86
„	„ 15 „ 5 „	„ 54·71	„ 56·71
„	„ 17 „ 5 „	„ 37·43	„ 35·43
22	„ 17 „ 13 „	„ + 6·4	„ − 6·4
24 to 26	in headings of *Table IV*	„ ERROR	„ CORRECTION
50	col. 7, line 12 from bottom	„ 22 31·697	„ 23 31·697
„	„ 7 „ 8 „	„ 22 31·728	„ 23 31·728
„	„ 7 „ 4 „	„ 22 31·750	„ 23 31·750
58	„ 6 „ 10 from top	„ 24 60·65	„ 25 60·65
„	„ 11 „ 8 „	„ 21 61·08	„ 22 61·08
60	„ 6 „ 12 from bottom	„ 8 1 20·74	„ 8 2 20·74

PART I.—(*Continued*).

Page			
61	col. 10, line 5 from top	*for* $\dot{Q} + 1{\cdot}67$	*read* $\dot{Q} - 1{\cdot}67$
78	in heading of table, line 1	„ BELLARY *Lat.* (W) *15° 9′*	„ BELLARY (W), *Lat. 15° 9′*
104	col. 7, line 2 from top	„ $-1{\cdot}89$	„ $-0{\cdot}89$
199	„ 18, in heading of column	„ $\delta L_N + \rho$	„ $\delta L_N - \rho$

PART II.

(20)	line 5 from top	*for* From ΔL_N	*read* From δL_N
(3) to (8)	in headings of *Tables II* to *IV* and in note to *Table III*	„ ERROR	„ CORRECTION
(4)	col. 10, line 4 from bottom	„ 16 21 55·31	„ 16 20 55·31
(52)	last line in table	„ Mean 16 41 26 = t_E	„ Mean 16 41 29 = t_E
(69)	col. 11, line 1 from top	„ D = 1 51 56·988	„ D = 1 51 55·988
(70)	„ 11 „ 6 „	„ T_E = 15 53 25	„ T_E = 15 53 40
(84)	„ 7 „ 2 „	„ 16 8 12·67	„ 16 7 72·67
„	„ 9 „ 2 „	„ 14·22	„ 74·22
„	„ 7 „ 7 „	„ 52 12·86	„ 51 72·86
„	„ 9 „ 7 „	„ 10·82	„ 70·82
„	„ 9 „ 8 from bottom	„ 1·16	„ 61·16
(85)	„ 5, May 2	„ for first three stars	„ for first two stars
„	„ 5, May 3	„ for first four stars	„ for first three stars
„	„ 7, line 3 from top	„ 16 8 17·59	„ 16 7 77·59
„	„ 9 „ 3 „	„ 15·52	„ 75·52
(86)	„ 5, May 4	„ for first three stars	„ for first two stars
(89) to (92)	„ 6, throughout table	„ Mean, t_E	„ Mean, t_W
(91)	„ 10, line 12 from bottom	„ 21·38	„ 81·38
„	„ 10 „ 7 „	„ 21·37	„ 81·37
(92)	„ 10 „ 4 from top	„ 21·37	„ 81·37
„	„ 10 „ 8 from bottom	„ 21·37	„ 81·37
(93)	„ 7 „ 8 „	„ 15 5·52	„ 14 65·52
„	„ 9 „ 8 „	„ 4·09	„ 64·09
(94)	„ 7 „ 1 from top	„ 16 8 0·75	„ 16 7 60·75

PART II.—(*Continued*).

Page		for	read
(94)	col. 9, line 1 from top	*for* 2·53	*read* 62·53
„	„ 7 „ 9 from bottom	„ 15 6·74	„ 14 66·74
„	„ 9 „ 8 „	„ 5·14	„ 65·14
„	„ 7 „ 2 „	„ 19 3 1·21	„ 19 2 61·21
„	„ 9 „ 1 „	„ 2·70	„ 62·70
(99) to (101)	„ 6, throughout table	„ Mean, t_E	„ Mean, t_W

Formulæ for the Calculation of Collimation, Level and Azimuth Corrections, in time, to Star Transits.

$$\text{Collimation correction} = \frac{1}{15} c' \sec \delta$$

$$\text{Level} \quad „ \quad = \frac{1}{15} b' \sec \delta \cos \zeta$$

$$\text{Azimuth} \quad „ \quad = \frac{1}{15} a' \sec \delta \sin \zeta$$

in which δ is the declination, + when north, and − when south;

ζ is the zenith distance, − when north, and + when south;

and c′, b′, a' are the instrumental constants—expressed in seconds of arc—for collimation, level and azimuth. In the present volume the instrumental constants are c, b and a, expressed in divisions of the micrometer; thus the several corrections, in time, have been obtained throughout by employing the numerical factor 0·0225 instead of $\frac{1}{15}$ for all observations, the value of the micrometer divisions being the same for both instruments.

INDEX CHART.

Of the Longitude Arcs shown on the Index Chart facing the Title page, those to the east of the arc Jubbulpore–Agra, seven in number — *viz*: Fyzabad–Jubbulpore, Fyzabad–Agra, Hazáribágh–Jubbulpore, Hazáribágh–Fyzabad, Calcutta–Hazáribágh, Calcutta–Jalpáiguri, and Jalpáiguri–Hazáribágh—were observed subsequently to the operations included in this volume.

ELECTRO-TELEGRAPHIC LONGITUDES

PART I.

INDIAN ARCS

DESCRIPTION OF THE INSTRUMENTAL EQUIPMENT

AND OF

THE OPERATIONS GENERALLY

WITH

DETAILS OF THE SYSTEM OF OBSERVING

AND OF

REDUCING THE OBSERVATIONS

DURING

1875-76, 1876-77 AND 1880-81.

CHAPTER I.

DESCRIPTION OF THE INSTRUMENTAL EQUIPMENT.

1.

Equipment.

The Instrumental Equipment will now be described, as originally received from England. It consists of two complete sets of instruments, each set comprising; a Transit Telescope, a Chronograph with accompanying Electrical Apparatus, and an Astronomical Clock.

2.

The Transit Telescopes.

The Transit Telescopes are by Messrs. T. Cooke and Sons, of York, sister instruments of nearly identical dimensions; they are marked No. 1, and No. 2. One of these is shown in Plate I, in position for the observation of the reflection of the wires in the mercury trough. The focal length is slightly over 5 feet, and diameter of object glass 5 inches, the whole of which is effective. There are two wire diaphragms, one of which carries a single vertical, and a pair of horizontal wires—about 1′ apart—crossing the centre of the field; and the other a set of 25 vertical wires, arranged in groups of 5 each, for the observation of transits. The latter diaphragm is worked by a micrometer screw, and the former may be called fixed although there is provision for adjusting its position as required. The 25 vertical wires were conveniently named *A*, *B*, &c. to *Y*, the central one being *M*; their mean distance apart is about $36''\cdot 6 = 2\cdot 44$ equatorial seconds, and the groups are separated by double intervals. The micrometer head (which is hidden in Plate I by the lamp stand) is comprised of two plates, one graduated to show revolutions, and the other to indicate divisions, of which there are one hundred in the revolution; the two plates are connected by a set of toothed wheels. The value of a revolution was found to be almost identical in the two instruments, *viz*: $1^R = 33''{\cdot}75$. The micrometer head is protected by a cap, which, being screwed on after setting to a particular reading, insures it against being accidentally moved, and there is a small window of talc through which the setting can be inspected, lest it should have been disturbed in applying the cap, which is not an unlikely contingency. This setting is of great importance, as upon it the collimation of the telescope depends. A screw (which is also hidden in Plate I) is provided for moving the eye-piece rapidly across the vertical wires during observations, so that the star may be kept close to the centre of the field. The set of eye-pieces comprises direct eye-pieces of various powers, with prisms for oblique use, and a Bohnenberger eye-piece, *A*, Plate I, for use with the mercury trough. The latter eye-piece has been invariably used for all work, including star transits, its shape being convenient for the observation, in a sitting posture, of stars close to the zenith. An unfortunate difference originally existed between the two instruments with regard to these Bohnenberger eye-pieces, that of No. 1 instrument being much superior to that of No. 2, both in construction and magnifying power, which was about 160 in the one, and not more than 80 in the other.

Two kinds of wire illumination are provided:—*1st*, the ordinary dark wires in a bright field; and *2nd*, bright wires in a dark field; the arrangement being as follows. A lamp is placed opposite one end of the transit axis, which is perforated, and fitted with a lens, whence that end is designated the "Illuminated Pivot", a term constantly used to define the position of the instrument. When observing, a second lamp, though not required, is always placed opposite the other end of the axis to neutralise any effects of heating on the instrumental adjustment, see Plate I. In the centre of the axis there is a light plate, revolving on an axis at right angles to both telescopic (optical) and transit axes, (cut out in the centre so as not to interfere with rays from the object glass) and capable of being moved through an angle of 45°, by a rod passing along inside the tube of the telescope, with a handle projecting close to the eye-piece. In the centre of the opening in this plate, and therefore at the intersection of the optical and transit axes of the telescope, a small black glass reflector is placed at the end of a fine supporting arm. When the plate is inclined at 45° to the transit axis, the light from the illuminating lamp is reflected directly on to the wires by this small reflector, and the result is a bright field with dark wires. When the plate is turned so that its plane coincides with the transit axis, the light of the illuminating lamp is intercepted by a set of four prisms which are attached to the plate, and reflected towards the eye-piece, between the telescope tube and an inner tube provided for the purpose; these four sets of rays converge slightly, so as to strike upon four prisms, which are attached to the frame carrying the wire diaphragm, two on each side of the telescope, slightly above the plane of the wires. The latter prisms again reflect the light at right angles, so that the rays are brought nearly into the plane of the wires, which thus become illuminated by the light from the prisms on each side, the field remaining dark. Both kinds of illumination are fairly satisfactory.

There are two setting circles, *B*, *B*, attached to the tube of the telescope, one on each side near the eye-end, each $7\frac{1}{2}$ inches in diameter; they are graduated to 20 minutes, with verniers reading to 1 minute, and each is provided with a coarse level. These circles are not permanently fixed to the telescope tube but can be turned round and clamped in any position, which admits of a change of adjustment for setting by declinations direct, or by zenith distances, &c., when the instrument is set up for use at a new station. There is no provision for clamping the telescope when set.

The object glass is fixed in its cell, so as to be pinched at three points only; and the cell, instead of being screwed into the telescope tube, has close contact with it only at three equidistant points where it is attached by screws, an arrangement which admits of the object glass (complete in its cell) being put on in three different positions.

The frame of the telescope consists of three principal pieces, *viz.*; the axis, *C*, the object-half, *D*, and the eye-half, *E*, which pack separately for travelling. The shape of the axis is a central cube of $9\frac{1}{2}$ inches side, supported by conic frusta of $9\frac{3}{4}$ inches axial length, and $9\frac{1}{4}$ inches in diameter at their junction with the cube, tapering to 3 inches diameter, and terminated by enlarged cylindrical shoulders, $3\frac{3}{4}$ inches diameter and $2\frac{1}{4}$ inches wide, into which the steel pivots are fixed, the axis having been shrunk on to them. The pivots are 1·9 inches diameter, perforated by an opening 0·9 inch diameter, and they project 1·9 inches from the axis shoulders. The total length of axis is thus 37·3 inches, while its length between the shoulders is 33·5 inches; the thickness of the metal is about 0·37 inch throughout the cube and cones, which were cast in one piece, the cube being strengthened by internal ribs. The conical parts were turned both inside and out to ensure as perfect symmetry as possible. The weight of the axis is about 65 lbs. Of the four faces of the cube parallel to the axis, one pair are perforated by openings of $3\frac{1}{4}$ inches diameter, to allow of inter-collimator observations while the transit telescope is in position. These openings can be closed with caps, *F*, Plate I, and they are crossed by spokes which support the illuminating plate already described. In the other pair of faces openings of 6·8 inches diameter are cut for the attachment of the telescope half tubes.

The two halves of the telescope are each attached to the axis by 12 powerful steel bolts, which pass through a flange at the base of each tube, $\frac{1}{4}$ inch thick and projecting 0·7 inch, *G*, *G*, Plate I, and screw into the metal of the cube. Each tube is further steadied by its flange fitting into a sunken annulus cut in the face of the cube. The two half tubes are quite plain, except that about $1\frac{1}{2}$ inches from the base of each, brackets, *H*, *H*, Plate I, are cast upon them to support levels, which will be described below. The object-half is about 2 feet $8\frac{1}{2}$ inches long from its base to the outer surface of the object glass, and weighs (with dew cap but without levels) 32 lbs. The dew cap, *K*, is 6 inches long, increasing the length of the object-half of the telescope to 3 feet $2\frac{1}{2}$ inches, or 3 feet $7\frac{1}{4}$ inches from the (transit) axis of rotation to the end of the dew cap.

The eye-half tube is only 1 foot $10\frac{3}{4}$ inches long from its base to where it is cut off for the attachment of the "eye-end", *L*, by four brass screws. The eye-end is composed of two concentric tubes to allow of the focussing adjustment, which is performed by two opposing screws acting on a stud, *M*; it is 6 inches long, measured to the plane of the wires, $3\frac{3}{4}$ inches diameter, and weighs 6 lbs. The weight of the eye-half altogether (without levels) is 40 lbs. The total weight of the telescope proper is thus $65+32+40=137$ lbs.

The pivots rest on nearly semi-cylindrical bearings, *N*, of gun-metal, of the same length and diameter as themselves, but cut away in the lower part so that there is contact only on two arcs of about 60° each. The under surface of these bearings is spherical, fitting exactly the upper surface of the beds, *P*, *P′*, on which they rest, and to which they are loosely attached by a bolt passing through a slotted hole, so that the whole forms a universal joint, which allows the bearings to adjust themselves under the weight of the telescope, and insures the equal bearing of the pivots throughout their length. Again, each of these beds rests on a lower or foundation plate of iron, *Q*, *Q*, which lastly are placed on the masonry piers, *R*, *R*. Each foundation plate, *Q*, rests on three feet, projecting very slightly below its lower surface. One pivot bed, *P*, has three foot-screws by which the level of the transit axis is adjusted, and the other, *P′*, has a provision, *S*, for the adjustment in azimuth. The pivots are protected from dust by well fitting caps, *T*, *T*. The weight of each pivot bed with foundation plate is about 40 lbs., thus bringing up the total weight of the telescope complete, to $137+80=217$ lbs.

Each telescope was intended to have a set of four hanging levels, but No. 2 was sent out to India before they were ready, and the level bubbles provided with No. 1 were of very inferior quality. When horizontal* collimators, and the mercury trough (or vertical collimator) are used together, levels are not necessary, and thus it happens that these levels have never been required during the observations with either instrument. No detailed description of them therefore seems called for, but as the system, though not quite novel, is certainly very uncommon, a few particulars will not be out of place. Each pair of brackets, *H*, *H*, carry four arms at right angles to the optical axis of the telescope, and in planes parallel to that of its rotation, to which the levels are suspended on spindles, the arms being long enough to allow the levels to revolve freely on their spindles as the telescope is rotated, always maintaining a position, if in adjustment, at right angles to the plane of revolution of the telescope. The arms are not

* This is merely a term of distinction, for these collimators are not necessarily horizontal, although always nearly so.

shown in Plate I, because, as they were never used and offered inconvenient projections, they were removed, but the apertures from which they would project are seen at *h, h, h, h*. The system has certainly advantages over the usual hanging or striding level: 1*st*, there are four levels in place of one; 2*nd*, they can be read in all positions of the telescope; and 3*rd*, they are affected in the same degree as the telescope by its axial flexure, and by irregularities of its pivots. But on the other hand they have objectionable features, the principal of which are: 1*st*, irregularities of figure of the spindle bearings, on which the levels hang, will affect the levels in the same way as similar irregularities of the telescope pivots, but in a much greater degree, because these spindles are only 10½ inches long, whereas the length of the axis is above 33 inches; 2*nd*, the adjustments are very numerous and troublesome, and the effects of residual errors on the level readings vary with the position of the instrument; for these adjustments are of two kinds, in planes at right angles to each other, and their effects vary respectively as the sine and cosine of the altitude at which the instrument is set. Considerable experience of the system (furnished with better level bubbles than those supplied) is required, before an opinion of its value can be arrived at.

3.

Adjusting Telescope and Collimators.

Each transit telescope is provided with a small, light telescope of 9 or 10 inches focal length, supported by an axis of the same length as that of the large telescope, the object of which is to facilitate the adjustment of the collimators to their proper places, before the transit telescope is put in position. This small telescope has a level attached, so that the bearings of the transit telescope can also be approximately levelled before placing the large telescope upon them.

With each transit telescope is an excellent pair of collimators, each having an object glass of 2½ inches diameter, and 24 inches focal length. One of each pair is furnished with a powerful micrometer in the eye-piece for measuring horizontal displacements; the other rests on circular bearings on which it can be turned round its optical axis, and it has a good striding level, by applying which during such rotation, the line of collimation can be levelled, and thus the exact horizon of the transit telescope may be determined. This is a matter of some convenience, as it allows of the setting circles being exactly adjusted for the latitude of a new station without delay. A peculiar feature about the collimators is the following arrangement, designed to prevent lateral disturbance owing to change of temperature. The instrument is really supported on only two legs under its axis, while it is merely steadied by a third leg projecting to one side, and attached to the instrument by a hinge allowing of motion in a horizontal plane. Of the two legs under the axis, one rests on its bed in a fixed position, while the other is allowed to move freely in the line of the axis; the foot of the third leg is allowed play on its bed in any direction. Thus when a movement of the feet is rendered necessary, by a change of the dimensions of the instrument relatively to its supporting pillar, owing to a change of temperature, it is assumed that it will take place in the line of the axis. If the instrument rested as usual on three feet equally, the direction of such a movement would altogether depend on the friction between the feet and the pillar. The idea is an ingenious one, but a large amount of observation would be required to determine certainly, whether the desired object is sufficiently effected to render the collimators trustworthy meridional referring marks, so far as regards the effects of temperature variations.

4.

The Chronographs.

The chronographs were made by Messrs. Eichens and Hardy of Paris, the latter taking charge of the electrical arrangements; they are exactly alike, (marked by the makers *A* and *B*), and one is shown in perspective in Plate II, to which all the references in the following description apply.

The instrument may be said to consist of three parts, all supported by a rectangular foundation plate of iron, furnished with three foot screws for levelling :—

1st. The clock work, A, for driving and regulating.

2nd. The revolving drum, B, carrying the paper on which the record is impressed.

3rd. The table, and carriage, C, carrying the recording styles.

The regulator is of a novel construction designed by M. Foucault. It consists of a pair of governor balls, *D, D*, connected by a train of toothed wheels with a small fan revolving on a vertical spindle (at the rate of about 30 revolutions per second) inside a fixed cylinder, in the circumference of which little windows are cut for the passage of air. An outer cylinder, *E*, with a corresponding set of windows, fits closely over the fixed one, and is connected with the governor balls in such a way by a rod, *F F*, that, as the latter rise owing to an increase of speed, the outer windows come into coincidence with the inner and allow the air to pass through, whereby the resistance offered to the fan is increased, and the rate of the machine checked. The two instruments present a curious difference in the action of this regulator which has always existed, nor could its cause be traced by the maker himself. In one (*B*) the outer fan-cylinder never rests for an instant, but maintains a constant state of oscillation, while in the other (*A*) it preserves one position pretty steadily for a while, and then shifts to another.

The governor balls revolve on a vertical spindle which rests on a lower cup-bearing just below *Q*—hidden in Plate II by the driving wheels—and works in an upper bearing in the bar *W*, where a cup, with covering cap, is provided for oil. The bar *W* screws on to the upright pillars *X, X*.

The connection of the governor with the outer fan-cylinder is effected by the light rod *F* in the following manner. An upright arm, *G*, is mounted on pivots, which are hidden in Plate II by the drum of the driving weight, and carries counterpoises—also hidden—which press its upper end towards the governor. The upper end is forked, and between the members of the fork the rod *F* is pivoted. Another rod, *H*, is similarly pivoted, and extends to the upright spindle of the governor, where it carries a round headed adjustable pin *I*, which works in a collar fitting round the spindle, and attached to the governor balls so that it revolves with them, and moves up or down the spindle according as the balls rise or fall, owing to increase or decrease of speed. In the middle of *H*, at *J*, there is an adjustable pin, which fits into a hole in the end of a yoke, *K*, thus affording a movable joint at *J*. *K* is itself pivoted on the fixed frame-work *M* at its other end, and affords a tie to the rod *H*, of such a nature, that so long as the joint at *J* does not rise or fall, the arm *G* must maintain a constant position.

The outer fan-cylinder *E* is hung on a bearing above it—exactly over the vertical spindle of the fan—by an open frame-work, attached to which is a small projecting horizontal tongue, *L*, the position of which is adjustable. The rod *F* rests on *L*, and has a small pin which fits loosely in a hole in *L*, and thus provides a movable joint between the two. Now if the governor balls fly out, owing to increase of speed, the collar with the pin *I*, and consequently also the pin at *J*, must rise, and the upper end of *G* will be brought forward towards the fan-cylinder, carrying with it the rod *F*, which thus by its action on *L* causes the cylinder to revolve. *L* can be adjusted until the best position of the windows in the outer cylinder, relatively to those in the internal fixed cylinder, has been secured.

The rod *H* is continued beyond *G*, and carries at its extremity a counterpoise, *N*, which can be screwed along *H*—through a small range—and clamped wherever desired, thus affording a means of regulating the rate of the instrument; that is to say, its mean rate as distinguished from the uniformity of rate, the regulation of which is effected by the governor and fan. The mean rate will increase as the position of *N* is shifted towards the governor, and *vice versâ*, for the nearer *N* is to the pin *I*, the less will be the pressure of the latter upwards against the collar, and therefore the greater will be the rate of revolution of the governor, which is necessary to cause the balls to rise. The collar is fixed to the lower end of a cylinder, which fits round the spindle and runs over it on two sets of friction rollers, *O, O*, between which the jointed arms, *Y, Y*, are attached which connect the cylinder with the balls *D*. On the spindle are clamped two stops, *P, P*, which limit the range of the cylinder—and therefore of the balls and collar—and when the instrument is going properly, the cylinder must always oscillate between these stops without touching either. This condition is ensured by varying the amount of the driving weight—which is composed of separate discs of lead—while the consequent rate of revolution is regulated by the counterpoise *N*.

The motion of the governor is communicated to the fan by a chain of toothed wheels as follows. At *Q* there is an enlarged toothed surface on the spindle, which gears on one side with the last driving wheel, *R*, and on the other with a small toothed wheel, *S*, revolving in a horizontal plane. Just below *S*, on the same axis—to which it is firmly but not rigidly connected—is an exact duplicate of *S* (hidden in Plate II) which runs free of *Q* owing to its lower level, and gears on the other side with *T*, a set of teeth on the spindle of the next toothed wheel *U*. The teeth *T* are on a lower level than the upper wheel *S*. Lastly the wheel *U* gears with a set of teeth on the spindle of the fan, the lower bearing of which is at *V*. The object of the duplicate wheel *S*, is to save the machinery from a dangerous jar in case of sudden stoppage, such as would occur if the cord of the driving weight were to break. As has been stated, a slight relative movement of the two members of *S* round their common axis is allowed for, which is regulated by a stiff spring, so as to break the jerk.

The lower bearing *V* of the fan-spindle requires careful adjustment, which, however, when once obtained may be looked upon as permanent, unless intentionally disturbed. It consists of a conical cup-bearing, with a relieving capstan-headed screw under the point of the spindle, which can be raised or lowered with reference to *V*, while the whole bearing can also be raised, or lowered, and clamped by screw nuts. Its position should be such, that vertical shake of the spindle is just perceptible to the touch; the least jam, preventing such shake, will stop the instrument instantly. When proper adjustment of all the parts has been secured, the great secret to ensure a good rate is oil—plenty of oil on all the bearing surfaces where there is friction under rapid motion. The lower bearings of all the vertical spindles should be plentifully supplied, and as they are all cup-shaped, the supply remains pretty constant. Their upper bearings also require occasional touching. But the most important point is the contact between the pin *I* and its collar, where from its situation the oil will not remain long. In nineteen cases out of twenty, when the rate of the instrument decreases, a drop of oil between the pin and the collar is sufficient to set it right again. Occasionally the fan makes a screeching noise, when the rate will at once fall off; this is a sign that a touch of oil is wanted on the *upper* bearing of the fan-spindle.

When packing the instrument for travelling, the system of arms *F*, *G*, *H*, are removed in one piece, by loosening one of the pivots on which *G* works; the yoke *K*, and the fan-cylinder *E*, are also taken off. The bar *W* is then taken off the upright pillars *X*, *X*, which allows of the removal of the governor in one piece, after which *W* is replaced. The driving weight is of course taken off and the cord wound up. The whole of the clock-work is enclosed, when the instrument is at work, in a light iron-framed cover to keep out dust, which is not shown in Plate II. It is fitted with a glass roof, and glass windows at the sides, which latter draw out and allow the hands to be inserted for putting the clock-work together, or taking it to pieces, or for necessary adjustments, and thus the removal of the cover is never necessary. The winding arbor *Y* protrudes through a hole in the cover to admit of the weight being wound up. On the other side—not visible in Plate II—a handle also passes through the cover, and acts by a screw on a clamp fitted round the axis of the wheel *R*, by which the instrument can be stopped. When supported on its usual wooden stand, without any hole in the ground for the descent of the driving weight, the instrument will go for about 50 minutes without being wound up; but the cord is long enough to admit of continuous motion for about 3 hours, if the weight is allowed to descend.

The drum is $11\frac{3}{4}$ inches wide, 3 feet 1·6 inches in circumference, and weighs about 45 lbs. Each instrument has three spare drums. The paper used is $11\frac{3}{4}$ inches wide, and about 3 feet $2\frac{1}{4}$ inches long; it is put on with common paste. The direction of revolution is shown by an arrow.

The connection of the drum with the driving clock-work is carried out as follows. The axis of the last driving wheel *R* which gears with the governor at *Q*, and is therefore directly controlled by it—is prolonged (through the protecting cover) at α, to an outer bearing which is not seen in Plate II, being hidden by the supports of the drum. On α there is an enlarged fixed nut, β, with teeth along the edge of its vertical surface, and there is also a movable nut, γ, with similar teeth, which can be made to gear with β, or not, at pleasure, by means of a lever (invisible in Plate II) which works on the pin δ. Rigidly attached to γ is a toothed wheel which gears with the teeth round the edge ϵ, ϵ, of the drum. When β and γ are disconnected by the lever the drum is cut off from the clock-work, and can be turned as desired by hand. The clamp to stop the clock-work, which was referred to above, acts on the axis α.

The axis, ζ, of the drum is very strongly attached to the cylindrical portion by an interior diaphragm, and is supported on bearings carried by stout uprights, one of which is seen in Plate II at η. The other end of the axis ζ terminates in a toothed wheel (invisible in Plate II) exactly similar to the toothed wheel θ, with which it is connected by a third similar wheel, κ, so that the drum and θ revolve in the same period. The wheel κ can be drawn out on its axis to disconnect θ at pleasure from the drum. θ is fixed on the end of a long screw-spindle which runs through the table, λ, λ, and is seen projecting at μ.

The carriage C rests on the table λ, λ, and is furnished with a clip projecting downwards, and grasping the screw-spindle μ, so that as θ and μ revolve, the carriage travels along the table from left to right. The clip can be released by the handle ν, when the carriage may be moved by hand, and placed where desired. The carriage rests on three wheels, π, ρ, ρ, and is steadied by three others acting upwards against the sloped under surfaces of the table λ; only one of the latter is visible at σ, the other two being behind the table. Of these wheels the position of π only is adjustable, its axis being carried by an arm with a hinge at one end, and a raising or lowering screw at the other, by means of which π can be pressed down with more or less force against the table. Such pressure should be employed as to bring the lower wheels, σ, into close contact with the table, so that there may be no perceptible shake of the carriage when tested by hand. All these wheels have adjustable bearings for their own axes, and if ever the carriage is taken to pieces for cleaning, it is particularly necessary to put it together again carefully, without changing the position of similar pieces, or a proper fit will not be obtained.

The carriage carries the recording apparatus, which has been altered since the instruments were sent to India, and Plate II shows the new arrangement, which will be described hereafter. In the original design two styles were carried by arms which projected over the drum, so that the styles rested upon the paper, and traced a spiral thereon, progressing (in the direction parallel to the axis of the drum) at the rate of slightly more than $\frac{1}{8}$ inch per revolution. The drum is intended to revolve once in 2 minutes; hence the whole of it was traversed by the styles in about 3 hours, and a second of time corresponded to 0·313 inch linear space. There was a third arm which could also be furnished with a style if required, but it usually carried a small sharp-edged roller, pressing on the paper and tracing a line thereon useful as a guide to the eye. The styles terminated in rounded platinum points which were made to rest as lightly as possible on the paper, and they were insulated from the metal of the carriage by a block of ebonite. The points of the styles could not be brought nearer to one another than about $\frac{1}{6}$ inch, but they were adjustable at a convenient distance apart, to trace parallel lines just so far separated as to prevent possible coincidence of the marks electrically recorded through each, as will be presently explained. A screw was supplied for raising the styles off the paper when desired.

The details of these chronographs are beautifully worked out, a degree of care and attention, which is not often met with in like matters, having been given to the most insignificant parts. The behaviour of both may be considered nearly perfect, the one called *B* being perhaps a little superior to *A*.

5.

The Clocks.

The clocks are ordinary astronomical eight-day clocks by Frodsham with mercurial pendulums, almost exactly alike. They are furnished with the usual arrangement for breaking an electric circuit every second, *viz.*, by a 60-toothed wheel revolving once in a minute. One tooth is cut off so that one second signal is missed, which is made to agree with 0^s on the dial, and thus the commencement of each minute can be traced.

6.

The Electrical Arrangements of the Chronographs.

The record on the chronograph was originally obtained by electricity in the following manner. One style was always in connection with the clock, and the other generally at the disposal of the observer, hence they will be spoken of as the "Clock Style" and "Observatory Style." Each had an electrical apparatus composed as under. *1st.* A metallic circuit, including a voltaic battery of any sort, passed through the circuit-breaker of the clock, and the coils of a relay, the armature of which was acted upon by a spring, so as to be drawn away from the "contact stud" whenever the current was broken. This circuit was called the "relay circuit". *2nd.* A Bunsen battery was placed in a metallic circuit which passing through the primary wire of a Ruhmkorff, or induction, coil, was complete while the armature of the relay touched the contact stud. The outer, or small, wire of the Ruhmkorff coil was carried to the chronograph, one end being attached to the foundation plate and the other to a style, so that this metallic circuit was only interrupted by the paper, which intervened between the point of the style and the metal of the barrel.

The relay circuit being broken by the clock, the relay coils became demagnetized, and the armature was drawn away from the contact stud by the spring, thereby breaking the Bunsen circuit, and causing the demagnetization of the core of the Ruhmkorff coil. The consequence of the last effect was, that the induced electricity in the outer wire of the coil, of considerable tension owing to the length and fineness of that wire, was discharged through the paper, leaving thereon an indelible mark always spoken of as a "dot". This process was gone through at each beat of the clock, and second dots were recorded on the paper, only omitting the first of each minute.

An exactly similar arrangement was provided for the observatory style, the relay circuit in this case being broken by the observer at pleasure, by means of a key, or tappet, which he held in his hand. It should be noted that all signals were made by break of circuit, a method undoubtedly superior, as regards instantaneity, to the opposite plan of signals by making circuit.

7.

The Chronograph Paper.

The chronograph paper was prepared by dipping, first in a solution of ferro-cyanide of potassium, and then in one of chloride of calcium. The latter was intended to keep the paper at such a degree of dampness, that it should not offer too great a resistance to the electric current, which then passed through it in the form of a spark. The presence of the ferro-cyanide of potassium caused the spark to discolour the paper, thereby leaving a visible permanent record of its passage. If the paper were too damp the direction of the spark was liable to be uncertain, and as the dampness increased the resistance to the current became so slight that it passed through the paper in a diffused form, leaving no definite record.

CHAPTER II.

DEFECTS FOUND IN THE INSTRUMENTAL EQUIPMENT AND CONSEQUENT ALTERATIONS.

1.

The Transit Telescopes.

The first season's work in 1872-73, with the equipment in its original condition as described in Chapter I, thoroughly tested its efficiency, and brought to light many faults, which will now be described.

Of the Transit Telescopes, No. 1 gave great satisfaction, while the behaviour of No. 2 caused quite the reverse, as already mentioned. The readings of a collimator by No. 1 were remarkably steady, and not appreciably affected by any alteration in the manner of taking them, while those by No. 2 varied to an extraordinary degree, according to the last motion of the telescope. This fault in No. 2 gave extreme trouble and anxiety throughout the season of 1872-73, and the observations then taken must be considered to a great extent vitiated by the uncertainty of the telescope's performance. In 1875, while preparations were being made for a renewal of the operations during the ensuing cold season, No. 2 Telescope was thoroughly examined with the light of former experience, and the cause of its faulty behaviour was found in a badly executed splice near the base of the object-end tube. The instrument was placed in the hands of Mr. Doderet, Mathematical Instrument Maker to the Madras Government, by whom the splice was made thoroughly good, with most satisfactory results, for all eccentricities in its performance disappeared, and it became as trustworthy as the sister instrument.

2.

Difficulties in securing the Chronographic Record.

Both the Officers, Captains Herschel, R.E., and Campbell, R.E., who used the apparatus in its original state in 1872-73, complained bitterly of the electrical arrangements in connection with the chronographs. The preparation of the paper was troublesome, and one of the ingredients used, *viz.*, chloride of calcium, was difficult to obtain in India; and the state of the prepared paper was terribly at the mercy of hygrometric changes of the atmosphere, varying from hour to hour in a way that defied prevision, and frequently made a successful record an impossibility. Again, the Bunsen batteries employed to generate electricity of sufficient tension, were found to be exceedingly troublesome. They are known to be very inconstant at best, and there are numerous points requiring close attention, a fault in any one of which impairs, or may altogether stop, their action. The uncertainties of these batteries, and of the prepared paper combined—to say nothing of possible faults in the intermediate chain of relays and induction coils—made it impossible to reckon safely on procuring a good record of any observations made, and when a fault did occur, an hour might easily be wasted in searching for its cause. The apparatus had numerous other inconveniences; for instance it was exceedingly cumbersome and heavy; the materials for the Bunsen batteries, nitric and sulphuric acids, are expensive, unpleasant or even dangerous to handle, and procurable in India only at a few places, while they cannot be carried about (by rail or steamboat) except under restrictions which cause serious inconveniences. It is to be noted that when the success of observations, as in this case, depends on the combined action of two independent observers, both labouring under similar causes leading to uncertainty of results, the chances of failure in the combined results will be nearly as 3 : 2, in comparison with those affecting each individual; hence any uncertainty of action must be even more anxiously avoided, than in the case of observations by a single observer.

To obviate the faults and inconveniences above enumerated it was decided to substitute a simpler method of recording, which was designed by Captain Campbell in 1875, and carried out under his supervision by Mr. Doderet.

3.

New Arrangements.

There was no special novelty in the new system introduced, which was on the well known plan of causing a pen to trace an ink line on common (unprepared) paper, the signals being recorded by jerks conveyed to the pen by electricity. Two pens simply took the place of the original styles; the Bunsen batteries, relays, induction coils, and prepared paper were altogether dispensed with, and the pens were worked by small electro-magnets with ordinary Menotti batteries (such as had before been used for the relays), which is the form of battery universally used by the Telegraph Department throughout India, and therefore always procurable at short notice.

The new recorder is seen on Plate II. A slab of wood, *a*, is attached to the metal plate, *b*, which originally carried the styles, and is connected with the carriage by hinges at *c*, *c*. A screw (invisible in Plate II) below *a* provides a raising or lowering adjustment, to regulate the pressure of the pens on the paper. On *a* are mounted two pairs of electro-magnets, *d*, *d*; *e*, *e*, with adjustments for changing their position, and each pair has an armature, *f*, *f*, carried by arms, *g*, *g*, the ranges of which are regulated by suitable screw-studs on the upright bar *h*. A spring acts against each armature, pressing it away from the core of its magnet. The armature arms are pivoted on an upright arm similar to *h*, (which cannot be seen in Plate II, being hidden by the coils *d*, *d*) beyond which they extend over the drum, carrying the two pens, *i*, *j*, at their extremities. The arms are jointed, and have other means for adjusting the pens as desired. The pens themselves are specially made for chronographic recorders, so as to carry a large supply of ink.

From the ends of the coils of each electro-magnet two silk covered spiral wires, *k*, *k*, *k*, *k*, are carried down to binding screws on the stand of the chronograph at *l*, whence other wires *m*, *m*, *n*, *n*, are led away to the batteries, &c.; so that one pair, *m*, *m*, completes the clock circuit, and the other, *n*, *n*, that in which the observer's key is placed. The effect of a signal, by break of either circuit, is therefore to demagnetize the coils in that circuit, and release the armature, which is then jerked away by the spring provided for that purpose, causing the pen to make an outward jerk, *i.e.*, away from the other pen.

The pens can be adjusted to trace parallel lines as near together as desired, or actually coincident—the latter being generally the best—the signal jerks being made outwards; but they cannot follow each other at a much less distance than half an inch, representing about 1½ seconds of time. This difference—which also obtained when the original styles were employed—is called the "Pen Equation", and is always used as a correction in the reductions. When the alteration was effected it was necessary to utilize the electro-magnets of the old relays for the new pen magnets, though they were not well adapted for that purpose, being of a much higher resistance than advisable for short-circuit work*, but nevertheless the results of the alterations proved most satisfactory, as all uncertainty of recording was removed, and the observers were relieved of an immense amount of labor, care, and anxiety.

4.

The Commutator and Electrical Adjuncts.

The electrical apparatus under the new system was collected on a board, generally called the "commutator board", and consisted of: (1) a commutator, by means of which the various changes in the connections were made as required from time to time; (2) a translating relay, which is used for the transmission of clock, or other signals through the line to the far station; (3) a receiving relay, required for receiving the signals from the distant station, and passing them on, to the chronograph if for record thereon, or to the sounder if for conversation; (4) a talking key, and (5) a sounder for purposes of conversation, and conventional signals in connection with the work. The commutator board is conveniently placed close alongside of the chronograph on the same stand, and the local batteries are arranged on shelves below it. The exact way in which these instruments are used will be more fully explained in Chapter IV.

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* This was remedied in 1877-78, when more appropriate coils, made in the Calcutta Telegraph Workshops, were substituted.

CHAPTER III.

OBSERVATORY ARRANGEMENTS, AND PREPARATIONS FOR OBSERVING AT A STATION.

1.

Observatory Accommodation.

The observers always carry about with them portable observatories, consisting of canvas roof and walls on a wooden frame-work, with shutters and curtains to admit of a meridional aperture from the ground upwards. These observatories are sufficiently large to hold the transit telescope only; the chronograph, clock, &c., are otherwise provided for, by building proper shelter if suitable accommodation in existing buildings is not available, as it generally is. A small room of about 8 × 10 feet is all that is absolutely required for this purpose, though more space is convenient. This room should be as close as possible to the observatory tent—say within 10 yards—because the observer is constantly called on to visit one from the other. For the protection of the clock from changes of temperature the shelter should be as substantial as may be.

2.

Buildings for Instruments.

The necessary preparations for observing at a station—assuming the existence of a clock room—are confined to building pillars for the transit telescope, and its collimators, and one for the clock to be hung against, when it is not convenient to hang it against a wall of the room. All these pillars should be founded 2 or 3 feet below the ground level, according to the nature of the soil, and the excavations for the foundations are made slightly larger in plan than necessary for the pillars, so that when these are built there is no contact above their base, and insulation from ordinary tremors is ensured. The vacant space thus left round the pillars is afterwards filled in with dry sand.

3.

The Transit Pillars and Observatory Fittings.

The transit pillars (Plate I) are about 24 × 18 inches in horizontal section, from their base to about 3 feet 2 inches above the ground, above which they are only $13\frac{1}{2} \times 13\frac{1}{2}$ inches, the inner face being all in one plane, thus leaving a ledge round the other three sides. The small upper portion is about 2 feet high, making the total height of these pillars 5 feet 2 inches. They are 2 feet 4 inches apart. They are always built of brick, and capped with slabs of stone, which are carried about with the apparatus; the foundation plates of the instrument rest on the upper surface of these slabs, which is polished so as to allow the plates to be moved about in making the first rough adjustments. After these adjustments have been approximately secured, it has been found advisable to put a disc of paper, soaked in beeswax, under each foot of the bed plates, to prevent accidental movement on the smooth surface of the stone. No very great accuracy is required in the levelling of the stone caps when building, because the universal motion provided in the pivot beds allows them to adapt themselves to considerable variations in that respect. When the soil is yielding, it may be advisable to base both pillars on one foundation, so as to distribute the pressure, but on firm soil the pillars may more conveniently be quite disconnected. The foundation pits are always connected by a narrower excavation about 18 inches deep, which contains an insulating layer of dry sand, of at least a foot in depth, on which the mercury trough is placed in position for observation. The trough requires to be carefully covered to keep out sand and dust, and is further protected by a wooden platform—on which the observer's feet rest when observing zenith stars—with an aperture, which can be opened or closed at pleasure, over the trough. Even with the greatest care to protect the mercury, frequent filterings are necessary, which however is not of much consequence, as the operation is always performed by native assistants, who seem to take considerable pleasure in it.

A pair of perforated iron staples are built into the masonry of the upper, or smaller, portion of each transit pillar, on each of its north and south faces, for the purpose of supporting upright iron bars passed through the perforations, which are left just clear of the brick-work. These bars stand about 3 feet above the pillars, and carry a movable table to support the lamp, which illuminates the Bohnenberger eye-piece when mercury observations are being taken. (Plate I). Only one pair of upright rods, one on each pillar, is necessary at the same time—or indeed at any time—but it is a convenience for the observer always to have the instrument in the same relative position to himself when making mercury observations, to ensure which he—and therefore the lamp and its supports—must change his position from the north to the south side of the instrument, or *vice versâ*, when the latter is reversed on its bearings. Similar staples let into the outer (east and west) faces of the pillars support stands for the axis lamps, both of which should always be kept in position during observation to cancel, so far as possible, any effects of unequal heating.

The equipment of the observatory tent is completed with a set of steps on which the observer stands for mercury observations, (Plate I), two or three stools on which he sits while taking transits, and a light wooden frame, by means of which four men can lift and reverse the telescope on its bearings whenever desired, with the greatest ease, and generally with hardly appreciable disturbance of azimuthal adjustment. A table and chair for an observatory assistant, who acts as recorder, are also provided.

4.

The Collimator Pillars.

The collimator pillars are about 30 × 18 inches in plan, founded generally from 2 to 3 feet below the ground surface, and insulated as in the case of the transit pillars. Their height is such as to bring the axes of the collimators, and that of the transit telescope, as nearly as possible into the same horizontal plane. They are built about 3 inches to the west of the meridian of the transit telescope, and generally about 15 feet distant from it. This interval of 3 inches from the meridian is introduced, in order that the steadying foot of the collimator may not fall inconveniently near the edge of the pillar. Light, and easily movable, frames are provided to cover the collimators and protect them from the weather.

5.

The Clock Pillar.

The clock pillar is founded and insulated like the others. The lower portion is generally about 36 × 24 inches up to within a few inches of the ground level, when it is decreased to 24 × 24, leaving a ledge 12 inches wide in front, and carried up at these dimensions for about 6 feet 8 inches. The ledge is convenient for supporting the clock when about to be bolted to blocks of wood, which are built into the pillar for the purpose. It is very important that this pillar should have weight, or rigidity, sufficient to withstand the oscillation of the pendulum without vibration, which would have an immediate effect on the clock rate.

All the pillars should if possible be built some little time before they are required, to allow for settlement and thorough drying, and great care should always be bestowed on the 'bond' of the brickwork.

6.

Chronograph Stand.

A wooden stand is carried about for the chronograph, which also accommodates the commutator board, and the batteries for the clock, pen, and relay circuits. The line battery is generally in the Telegraph Office, but occasionally accommodation for it must also be provided, which however gives no trouble, as it may be placed outside the building, if convenient, in packing cases.

7.

Arrangement of Wires.

The most convenient arrangement of the numerous connecting wires required, has been found to be as follows. In the observatory tent, where only two wires are necessary, they are brought down through the roof to the outer face of one of the pillars, then round the pillar to its inner face, where they are finally fixed, leaving sufficient free end for convenient attachment to the observer's key, or tappet, to carry which when not in actual use, a small shelf is affixed to the inner face of the pillar. Or as is sometimes more convenient, only one wire need be introduced through the roof in this way, and the other led back under the surface of the ground, as shown in Plate I. In this case neither wire need necessarily be covered, except the ends of one just inside the observatory and clock room, and this plan therefore is a good one in case of economy of covered wire being advisable. In the clock room, all wires—including those to the clock, to the observatory, to line and to earth—are carried over head, and collected in one bundle before they are brought down to the commutator board, through a convenient hole in which they are first passed as a bundle, and then separated and brought up to their respective binding screws. Should the line wire be brought directly into the clock room, the necessity of having a lightning discharger must not be overlooked, and in this case an efficient earth-plate must also be provided. When the observatory is close to the Telegraph Office, the line wire, and earth, connections can be made through the office commutator, and neither earth-plate nor lightning discharger are specially required. As a rule it is most convenient to make all local—observatory and clock room—circuits of metal throughout, avoiding the necessity of an earth-plate for them.

8.

Batteries.

The "Menotti" battery, which is the form adopted by the Indian Telegraph Department, is used for all purposes, and has the advantages of great constancy, while it is easily kept in order. It is not so compact or portable as some other forms, but this is of small consequence in India, as it can be obtained by giving a few days notice at any Telegraph Office, and need not therefore be included in the portable equipment. The number of cells required for local purposes in each observatory may be put at about sixteen. A special line battery is only required when the observatory is some distance from the Telegraph Office, which can generally be avoided, and its strength depends on the length and condition of the line in use. Twenty cells are generally ample for 500 to 600 miles. For the observations between Bombay and Mangalore, the wire being about 1000 miles in length, and somewhat inferior in insulation near Mangalore, a battery of ninety cells at that end gave excellent signals at Bombay.

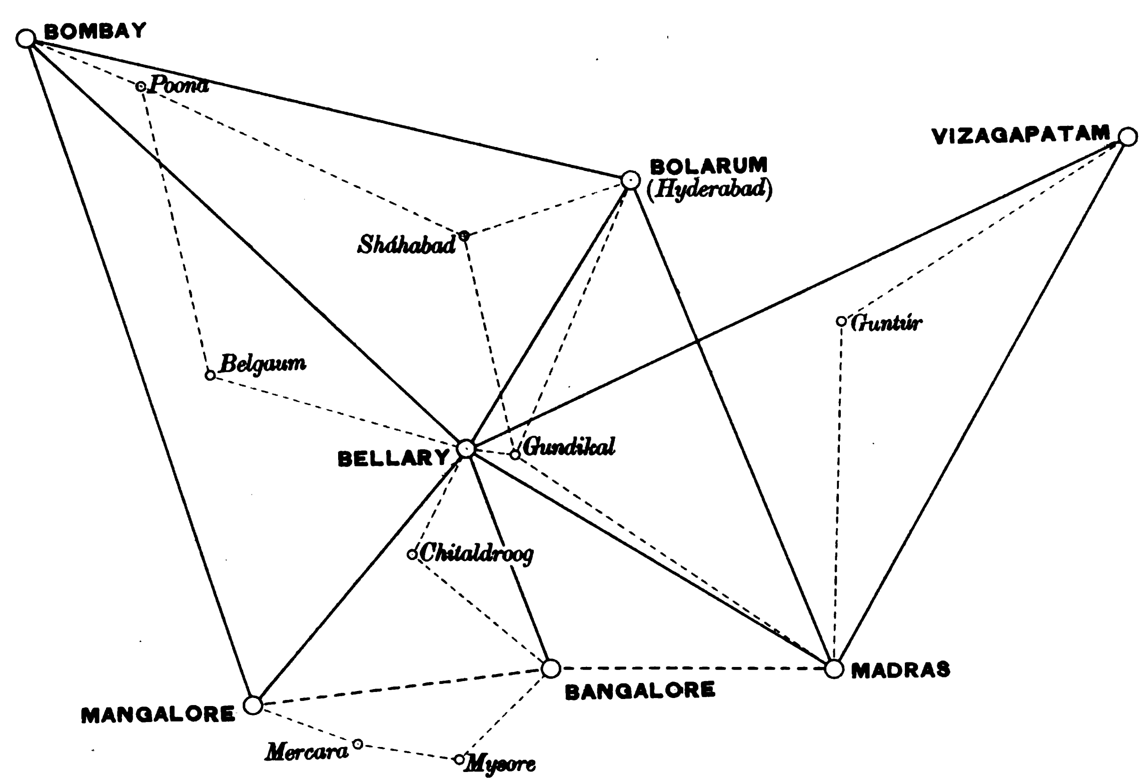
CHAPTER IV.

PROGRAMME OF OPERATIONS AND SYSTEM OF WORKING DURING SEASONS 1875-76-77 AND 1880-81.

1.

Programme.

The programme laid out at the recommencement of operations in 1875 is shown in the diagram, in which the thick black lines indicate the proposed measurements; the thick dotted lines, deduced



values to check former faulty observations of 1872-73; and the thin dotted lines show the approximate course of the telegraph wires available. To this programme the measurements between Bombay, Aden, and Suez by submarine cable were subsequently added.

Of the above land measurements six were executed during the season of 1875-76, *viz.*, Bolarum (C)–Bombay (H); Bellary (C)–Bombay (H); Bolarum (H)–Bellary (C); Madras (C)–Bolarum (H); Madras (C)–Bellary (H); and Bangalore (C)–Bellary (H). In 1876–77 three more measurements were added to the system, *viz.*, Vizagapatam (H)–Madras (C); Vizagapatam (H)–Bellary (C); and Mangalore (H)–Bombay (C), thus completing the original programme with the exception of the arc Bellary–Mangalore, which had to be given up in order to ensure the completion of the measurements Bombay–Aden, and Aden–Suez before the monsoon weather should set in. The above arcs are named in the order of their measurement, the position of the observer in each case being indicated by the letters (C), and (H), for Campbell, and Heaviside respectively.

The diagram shows that, as regards the telegraph wires used, owing to the course of existing lines, the triangular arrangement of the work is more apparent than real, for the third side of a triangle is often only the sum of the two others. So far therefore as the nature, or length, of the wire in use has any effect on the work, the introduction of a station like Bolarum, as a check on the measurement Madras–Bellary–Bombay (affording an apparently independent value Madras–Bolarum–Bombay) is fallacious. With regard to the effect of the wire employed, it must be borne in mind that no idiosyncrasies of the vehicle of signals between the stations, can have any effect whatever on the results of the observations, so long as the transmission of the signals is equally affected in both directions, and it cannot therefore be supposed that the results obtained are affected in any appreciable degree by the nature, or length, of the wire between the stations, provided that it be not necessary to introduce intermediate relays, which has never been the case on these arcs.

The multiplication of stations is valuable, as affording increased chances of eliminating such classes of errors, as are liable to run through the whole of a set of observations at a station—such for instance as changes of personal equation. It also increases the probability of detecting cases of irregular attraction of the plumb-line.

2.

Connection of the Longitude Stations with the Triangulation of the Survey.

The positions of the transit telescopes at the several stations were fixed as follows:—at Bolarum, Bombay, Bellary and Vizagapatam, by special triangulation connecting them with the principal triangulation of the Great Trigonometrical Survey. The station at Bombay was on the premises of the Colaba Observatory, about 50 yards east of the meridian of its transit instrument.

At Madras the transit telescope was placed about 65 feet due north of the meridian circle of the Madras Observatory, which had formerly been connected with the triangulation of the G. T. Survey. At Bangalore the position was on the meridian of the S.W. End of the Base-line of the G. T. Survey, and about 40 feet north therefrom. At Mangalore the transit telescope was placed a few yards due south of the G. T. Station.

All observations necessary for fixing the stations were generally made with a 10-inch Theodolite by Mr. James Bond, Assistant Surveyor, whose duty it also was to precede the Observers, and prepare the pillars &c., at each new station. Whenever a station was visited a second time, the old site was resumed, the original pillars being generally used.

3.

The Systems on which the Observations were taken.

At first it was supposed that the use of the telegraph lines would only be available for short periods at certain intervals; as for instance, during periods of fifteen minutes at intervals of two hours, as was the case during the operations of season 1872-73. Under these conditions, the only possible method of measurement is by comparing the clocks when the line is available, and taking transits locally at each station during the intervals, and the first measurement of 1875-76, Bolarum–Bombay, was begun in this way. It was soon found, however, that the use of the line wire could generally be obtained for an unbroken period of three or four hours each night (although this could never be reckoned on with certainty) and all the other measurements of 1875-76-77 (including the latter part of the first, Bolarum–Bombay) were executed on a system modified accordingly.

The line wire being available for long periods, two other systems of observation, besides that depending on clock comparisons, may be followed. (1) The observations of transits at one station (each alternately) may be transmitted through the line, so that those taken at both stations are recorded on the same chronograph, in terms of the same clock; and (2), the signals of one clock (each alternately) may be transmitted, so that a record of the same clock time is obtained on both chronographs, while at the same time transits are recorded locally at each station. Each of these methods has some points of superiority over that depending on clock comparisons alone, both as regards simplicity while observing, and economy of labor when reducing the results, and their advantages appear to be very equal, except in one respect, *viz.*, the first involves the record of two sets of transits on one chronograph during the same time, and as only one pen is available for the double duty (the other being employed in recording clock time) it follows that the record would be considerably confused, and many signals would be lost by coincidence. It is true, that stars might be so chosen as to obviate this, but such an arrangement would be troublesome, and would generally greatly curtail the number of observations obtained in a certain time. The second method has not this objection, and it was therefore invariably followed.

Although the clock comparisons are not necessary under this system, they were always taken, for two reasons. (1) In case of failure in transmitting the clock signals for transits at the distant station, if the observer there resorts to his own clock, the possession of clock comparisons enables the observations at both stations to be combined; (2) they afford a means of combining the observed rates of the two clocks. The following was the ordinary programme of a night's work.

4.

Programme of each Night's Work.

At East Station	At West Station
Comparison of Clocks.	
Transits for 40 minutes	Interval = difference of longitude
Interval = difference of longitude	Transits for 40 minutes
Comparison of Clocks.	
Transits for 40 minutes	Interval = difference of longitude
Interval = difference of longitude	Transits for 40 minutes
Comparison of Clocks.	

As a general rule, the first set of transits was observed at both stations with East, and the second with West Clock. In the middle of each set of transits the chronograph pens were always made to exchange duties, by which means the sign of the Pen Equation is reversed. The interval, = difference of longitude, was introduced so that the same stars might be observed at both stations. These intervals (and other pauses not noted) were available for taking level, and collimation observations, at least two of the former, and one of the latter, being taken each night. The use of the same stars for transits at both stations has this advantage; that no accurate knowledge of their places, or of clock errors, is required, but only a knowledge of the rate of the clock in use, in order to correct the observed interval between the transits of the same star at the two stations.

A pair of well-known circum-polar stars was observed when possible every night for azimuth, but in the low latitudes in which the first operations were carried on, it often happened that such stars were obscured—especially at their lower culminations—by low-lying clouds when the sky was otherwise clear. Consequently, work which was good in other respects, was liable to be lost unless the determination of azimuth could be made independent of circum-polar stars. This led to the introduction of what were called "Comparative-Azimuth Stars", of about 10° to 12° North Polar distance, which could usually be observed—at their upper culminations—whenever the sky was clear enough generally for transit observations. The exact use of these stars, and the manner of deducing the azimuth from them, will be fully explained in Chapter VI. Observations of well-known north and south stars were also sometimes combined for azimuth determinations.

The system finally adopted in 1875-76, was continued throughout the season of 1876-77, with but slight modifications of the nightly programme of work. The continuance of the observation of transits during 40 minutes as above was considered too long, and it also afforded more stars than were found necessary, while the separation between the two groups—by merely changing the sign of the pen equation in the middle of each 40 minutes—was not distinct enough. The general programme remained exactly the same for 1876-77, but each 40 minute period was divided into two of about 15 minutes each, with about 10 minutes interval between them, to allow the observer some slight rest. In each such period of 15 minutes, at least 10 stars could almost always be observed, which was considered an ample number for each group, and the change was found very beneficial in practice.

The programme was always laid out by sidereal time, so that the same stars were observed night after night, a point of considerable importance both as regards convenience in the observatory, and advantage in reducing the work, especially with reference to clock rates. After the first measurement—which was to a great extent experimental—six fairly complete nights' work on the foregoing programme was considered a full complement. A systematic reversal of the transit telescopes on their bearings was attended to, care being taken to have as nearly as possible equal quantities of observations in each position, but this was sometimes interfered with by uncertainties of weather and other causes. With one or two exceptions—owing to misunderstandings—both telescopes were always reversed at the same time, in order that all the observations taken in each measurement might be divided into two principal groups, according to the position of the instruments. The rule was also followed of having both telescopes always in the same position, *i.e.*, Illuminated Pivot East, or Illuminated Pivot West, at the same time.

5.

Electric Signals between the Stations.

In the measurement of land lines, the signals have always been passed direct between the stations, without the use of intermediate relays outside the observatories. The greatest length so measured during the years 1875-76-77 was the arc Mangalore-Bombay, between which places the wire follows so circuitous a route, that its length is about 1000 miles. Notwithstanding this great distance, and the fact that the section of wire near Mangalore was inferior in insulation to the average of Indian Telegraph lines, no difficulty was found in exchanging signals with batteries of about ninety Menotti cells at each end.

6.

The Electrical Arrangements of the Observatories.

The electrical arrangements for securing the chronographic record, and communicating between the stations, are as follows. Each pen magnet is placed in a short circuit, with a weak battery, which can be passed at pleasure by means of the commutator; (1) through the clock, (2) through the observer's tappet, and, (3) through the armature circuit of the receiving relay, which is in connection with the line wire. In the first case, the pen records the local time, and is called the "Clock Pen"; in the second, it is used for transits, or other observations, and is known as the "Observer's Pen"; and in the third, it records any signals transmitted from the distant station, and repeated by the receiving relay. In the last case the signals are generally those of the distant clock, to be used either for the comparison of clocks, or for the observation of transits. A second relay is used for the transmission of signals through the line by "translation"—*i.e.* the relay coils are placed with a weak battery in a local circuit, into which the clock, or the observer's tappet, can be introduced as required by means of the commutator; and the armature of the relay is in circuit with the line battery and line, and thus passes on the signals to the distant station.

7.

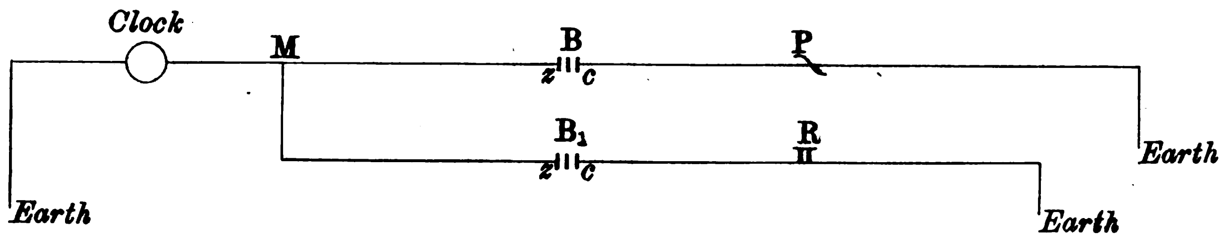
Retardation of Signals.

It is thus evident, that the retardation of a signal, passing (say) from one clock to the distant chronograph, is composed of three parts: (1) due to the translating relay, (2) due to the line, and, (3) due to the receiving relay, including the pen action, at the distant station. A similar return signal is affected in the same way, by different retardations but of like nature, because the two translating relays are of the same pattern and similarly adjusted, while the same is true of the receiving relays, and of the pen actions. The line wire of course remains the same in both cases, but there are no means of determining whether the rate of signal remains constant in both directions, which fortunately is a matter of no practical importance, on land lines, from the present point of view, however interesting it may be as connected with the science of electricity. The relays used in 1875-76-77 were all of the ordinary polarized pattern, those for translation being of much smaller resistance than those for receiving line signals.

8.

Possibility of Error owing to faulty Commutator Arrangements leading to Interference of Currents.

A weak point existed in the commutator arrangements of 1875-76-77, by which the clock signals were recorded locally, and at the same time transmitted to the distant station.



The diagram shows the arrangement by which the clock was introduced into both circuits; that of the chronographic pen coils, P, and the translating relay, R—each with its own battery B, B_1—so as to ensure its beats being simultaneously recorded on the local chronograph by the former, and on the distant chronograph through the line by the latter. Here it will be seen, that when the clock breaks circuit, and cuts off the earth beyond it, the two circuits which branch at M become one, and must be affected by a residual current, unless the two originally separate currents are exactly equal—these being of course always opposed to each other. The resistances of the coils of R and P were very unequal in 1875-76, being nearly as 4 to 1, and to obtain good action of both when in combination as above, it was necessary to use batteries B, B_1, of different strengths, in order to balance the currents. As the apparatus included no means of obtaining nice adjustments of current (such as galvanometers and resistance coils) such balancing was necessarily only approximate, and some residual current always remained effective. This was somewhat improved in 1876-77, when new relays, of resistances nearly equal to those of the pen coils, had been obtained, but the difficulty was not altogether removed.

When taking transits, and transmitting clock signals for use at the distant station, the case is exactly as in the diagram above, and the clock times recorded are affected by the residual current; but when comparing clocks (in 1875-76) the local time was recorded unaffected by the residual current, because the connection at M, with the relay circuit, was cut off, and only that of the pen used. Hence it appears that, supposing the residual current (of whose existence there is no doubt) to retard the pen action, as compared with that of the relay, at both stations, the effect would be to decrease the value of the retardation deduced from star observations. Some experiments made in January 1877 gave evidence that this actually did occur, and if it occurred in one case it probably did so in the same manner, though in different degrees, at all stations, the effect at any one station remaining pretty constant.

9.

Precautions Introduced.

The faulty arrangement above described being recognised, precautions were introduced in 1876-77 to equalize the conditions as much as possible under all circumstances. It was laid down that: (1) During clock comparisons while receiving signals, the local clock should be made to work both pen and translating relay, just as when taking transits and transmitting clock signals. (2) The same arrangement should obtain for any purely local transits, when clock signals are not necessarily transmitted. (3) When transmitting clock signals through the line, one local pen circuit should also be included, although not required for local purposes.

With regard to the first two cases just mentioned, it may be remarked, that although the translating relay is put in circuit by the commutator, it need not be connected with the line wire. The effect desired from the combined action of the local circuit batteries was quite independent of any such connection.

10.

Improvement of Arrangements.

The errors which are likely to arise from the above causes are of a very minute order, but nevertheless it seemed worth while trying to guard against them, which was done by Captain Campbell in 1877-78, by introducing new translating relays, and pen magnets, and making a complete change of commutation arrangements. The new pen magnet coils, and those of the translating relays, are all of low and similar power, *viz.*, about twenty units; and the translating relays, instead of being of the polarized pattern as before, are very similar in construction to the pen magnets, thus it is hoped ensuring more nearly identical action. By the new commutator all branching of circuits is avoided, and therefore there can no longer be any interference of currents; but this was obtained at the expense of greater complication in the commutator. A plan of the new commutator, with the accompanying relays &c., is given in Plate III, and a full description will be found in Section 24 of this Chapter.

11.

The Pen Equation.

A point in the management of the chronograph which requires attention, is the distance between the pens in the line of their (apparent) motion, which cannot be conveniently made much less than half an inch, or about the equivalent of 1·5 seconds of time. This difference is called the "Pen Equation", and it has always been deduced, and applied as a correction to the readings. To guard against errors in the assumed value of the equation, a systematic change of pen duties has always been observed: for instance, in the middle of every set of transits the clock and observer's pens are changed, so that for one half of the observations the equation is positive, while for the other half it is negative, and similarly, when comparing clocks the pens are exchanged between the local and distant clocks during each comparison. When the clock comparisons are reduced, the value of pen equation is one of the results arrived at, and this method was followed in 1875-76, but in 1876-77 it was not considered necessary to reduce the clock comparisons for the land measurements, and therefore the pen equation was determined as follows:—A run of equation was always recorded on the chronograph twice during the night, the clock working both pen circuits by an arrangement exactly similar to that shown in figure 2, and thus giving a value of the equation for each signal recorded. Here as before there was the risk of error by interference of currents, to guard against which the connections were changed in the middle of each run, so as to make the pens exchange batteries, whereby it might be fairly assumed that the sign of the effect would be reversed, and therefore the effect itself would be eliminated by taking a mean of the two results.

It is necessary to bear in mind that the actual pen equation is the absolute linear distance between the pens, which has to be converted into seconds of time before being applied as a correction to the observations, which conversion must therefore be dependent on the rate of the chronograph. Hence, when transcribing the chronographic record, that rate must be carefully watched, with a view to applying a special correction to the pen equation, in cases where the variations of the rate exceed certain limits.

12.

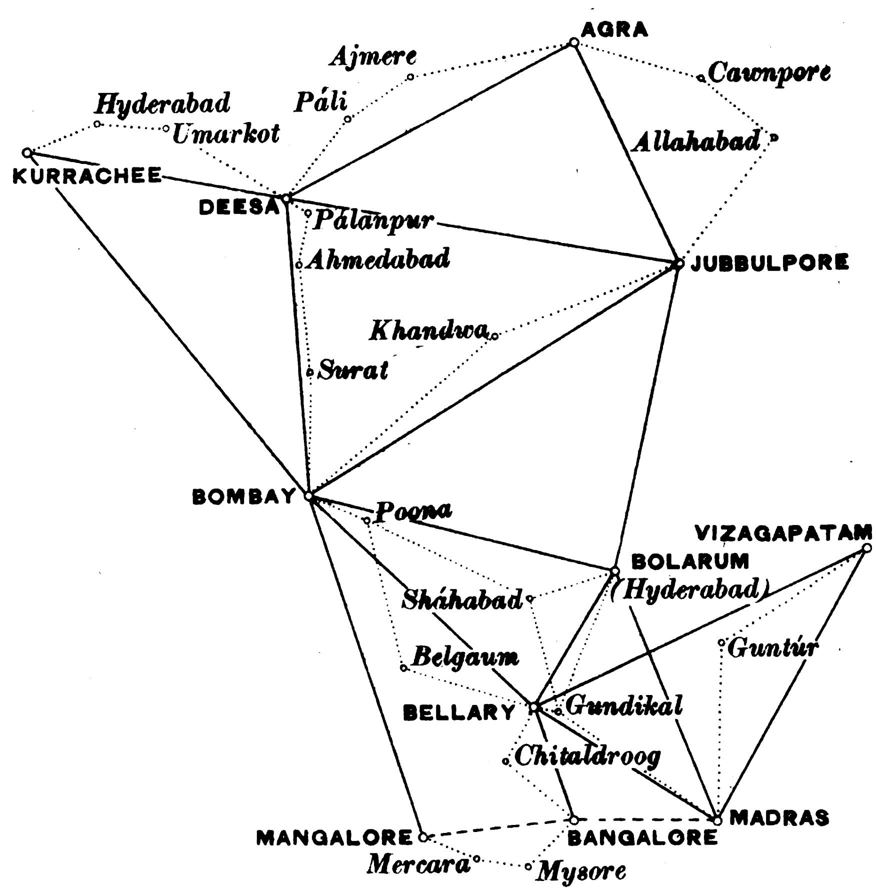
Clock Comparisons taken in 1876-77 *not made use of.*

The non-reduction of clock comparisons which were recorded in 1876-77 may appear to call for explanation. The chief reason for continuing these comparisons was, as stated in Section 3 of this Chapter, to secure results in case of anything interfering with the transmission of clock signals for transit observations at the distant station. The second object—*i.e.*, securing a means of combining the locally determined clock rates, by means of their relative rate deduced from the comparisons—is of very slight importance in the case of arcs of such small differences of longitude as those already measured, when the greatest correction on account of clock rate has been that due to an interval of 23 minutes only, and it was not considered necessary to go through the great labor of reducing the clock comparisons, for the sake of probably an inappreciable improvement. In the case of long arcs nearly due East and West being measured in the future, it may again become advisable to use the clock comparisons for this purpose, but even that is doubtful.

13.

Programme for Season 1880-81.

The Longitude operations, which had remained in abeyance since 1877, were resumed at the end of 1880 by the same two officers who had last been employed; *viz.*, Captain (now Lieut.-Colonel) W. M. Campbell, R. E., and Captain (now Major) W. J. Heaviside, R. E. The programme for the season of 1880-81 comprised the measurement of the following eight arcs; *viz.*, Bombay (C)–Deesa (H); Deesa (H)–Kurrachee (C); Bombay (H)–Kurrachee (C); Jubbulpore (H)–Bombay (C); Jubbulpore (H)–Bolarum (C); Jubbulpore (C)–Agra (H); Jubbulpore (C)–Deesa (H); and Agra (C)-Deesa (H), which are given in the order of execution, the positions of the two observers being indicated as before by the letters (C), (H). These were all successfully executed between 13th December 1880, and 16th April 1881, the weather having throughout been extraordinarily favourable. The system of triangular circuits for checking purposes was adhered to, and the new operations were joined to those of former seasons by the use of the two stations Bombay and Bolarum. The diagram shows the eight arcs measured during 1880-81, added to those previously executed, as already shown in the diagram on page 16, and thus the diagram here given shows the whole work completed up to the close of the field operations of 1880-81.



14.

Connection of the Longitude Stations with the Triangulation of the Survey.

The points used as stations at Bombay and Bolarum were the same as those occupied in previous years. The positions of all the newly occupied stations—*viz.*, those at Deesa, Kurrachee, Jubbulpore, and Agra—were fixed as before by special triangulation in connection with the principal triangulation of the Great Trigonometrical Survey. This work was executed by Mr. James Bond when visiting each station to prepare it for the observations, except in the case of the point at Deesa, which had been laid down in anticipation of these operations, by Major (then Captain) M. W. Rogers, R. E., by connection with the Principal Triangulation of the Kurrachee Longitudinal Series, in 1875-76.

15.

Preparations.

The season's work was begun by some preliminary preparations at Poona—where the instruments had been left in store—comprising observations on five nights for the determination of personal equation, and a small amount of necessary practice with those portions of the equipment which had been newly introduced at Calcutta in 1878, in order to ensure a clear mutual understanding between the two observers as to all details of future procedure.

The most notable changes in the instruments were; (1) the substitution of much lighter and smaller coils, of very low resistance, for all the electro-magnets intended for local circuits only—*viz.*, those of the pens, and of the translating relay; (2) a new commutator by means of which all combinations of circuit were brought into one common circuit, so as to avoid any such branching of currents as occurred under the old arrangement (*vide* page 21); (3) a new Bohnenberger eye-piece for No. 2 telescope, by means of which the two instruments were made more nearly alike; (4) new pendulums for the clocks, made on Airy's principles of compensation, in supersession of the mercurial pendulums in former use; and (5) the addition of an idiometer, of Lieutenant-Colonel Campbell's designing, for each observer, to enable him to determine his own absolute personal equation at any time. This instrument is shown in Plate IV, and will be fully described in Chapter V.

The new commutator—which was made in 1878 in the workshops of the Telegraphic Department at Calcutta, from a design furnished by Lieutenant-Colonel Campbell—is shown in Plate III, with the several relays, and other adjuncts with which it is connected. A description of the plate, and the various combinations employed in the course of observations, will be given in Section 24 of this Chapter.

A certain amount of additions, and alteration of small details were required to bring everything into thoroughly satisfactory working order, which was accomplished without much trouble or delay, and no difficulty afterwards occurred throughout the season's work, except in one respect.

16.

Temporary Failure of one Clock.

This exception was caused by the behaviour of Major Heaviside's clock at his first station, Deesa, during the first set of observations with Bombay, when it went very irregularly, and finally stopped altogether. The cause of this was found to be the great weight of the new pendulum, as compared with the old, combined with the manner of its suspension, which left very little room between the oscillating top of the rod, and the fixed framework of the clock. The suspending bracket, affixed to the wooden back of the clock case, seemed to give gradually under the weight, causing a forward movement, which at last brought the top of the rod against the frame of the clock-work. The friction which then ensued gradually reduced the swing of the pendulum until the escapement caught, and one or more seconds were lost, which occurred several times during the measurement, and finally the friction increased so much as to stop the clock altogether.

Fortunately the results of the observations are not seriously affected by this failing of one of the clocks, because whenever a second beat was actually missed by the second hand, the fact is of course apparent, and the loss can be allowed for; and after such allowances have been made the resulting rate of the clock is sufficiently good, because it fortunately so happens that Bombay and Deesa are nearly on the same meridian—their difference of longitude being only $2^m\ 30^s$—so that even gross irregularities of the rate of the clock in use for star observations at both stations would not have an appreciable effect on the results.

17.

System of Observations and Nightly Programme.

The general system of observing remained exactly the same as during the last season of operations, 1876-77, but some slight changes were made in the programme for each night's work, with a view to increase still farther the separation of the groups of observations, which had been carried out in that season, as described in Section 4, of this Chapter. Each group remained of about 15 minutes duration, or a little more or less as might be necessary in order to secure the observation of at least 10 stars, and the interval between each pair was made sufficiently long—about 15 minutes—for determination of dislevelment by observation of the mercury trough.

The interval between the two pairs of groups—*i.e.*, between the observations taken with each clock—was calculated to afford ample time for the determination by each observer of his absolute personal equation by means of the idiometer, which was done every night.

Regularly concerted clock comparisons were dropped out of the programme, because experience had shown that they would hardly ever be required, and their execution complicated the work. As a matter of precaution however, each observer always secured a comparison at his own convenience, by simply causing his own clock to record its time on the chronograph, alongside of the record received from the distant station, an operation which could always be carried out during any interval of a few seconds otherwise disengaged.

18.

Azimuth Determinations.

The observation of pairs of well-known circum-polar stars for azimuth was very carefully attended to, and as a general rule two pairs were obtained each night. The use of comparative-azimuth stars as in former seasons (see page 19) was continued as a precaution, but the reduction of the observations taken has never been necessary, as in only one case have the circum-polar stars altogether failed, when the comparative stars were also lost. Indeed, as the field of operations is carried northward, the system of comparative-azimuth stars must necessarily lose its value and distinctive features, because such stars, if near enough the pole to be of much use as regards rate of movement, become nearly as liable to obscuration by clouds as the circum-polar stars which are observed in pairs, above and below the pole.

19.

Clocks used as Invariable Pendulums.

A feature in the observations of the season which calls for remark, is the frequently excessively large clock rates, which were permitted to obtain for the following reason. Before the season commenced, the Surveyor General, General Walker, C.B., R.E., expressed a wish that the clocks should be used as "invariable pendulums"; that is to say, that their pendulums should be kept at the same adjustment throughout the operations, in order that the rates obtained at the different stations visited might become available as data for future investigations concerning the figure, and density of the earth, as indicated by the force of gravity. With a view to carrying out this idea, each observer tried to secure such an adjustment of his pendulum, once for all, as should give a fairly mean rate for all latitudes visited, and therefore the rates at the stations of extreme latitudes were necessarily abnormally high. This of course causes no detriment to the work, because a large rate can be as accurately determined as a small one, but unless explained it would have a slovenly appearance. The results of the experiment were disappointing, and lead to the conclusion that clocks used as these are, cannot be expected to maintain a constant rate—exclusive of the changes due to variations in the force of gravity—at successive stations of observation. This is not surprising when it is recollected that a change of stations necessitates the removal of the pendulum, and a journey of generally several hundred miles by railway.

20.

Progress during Season 1875-76.

A few words may be added regarding the progress of the observations. After the two observers met at Bolarum in December 1875, less than three weeks sufficed for all preliminary training and practice, including observations for the determination of their relative personal equation on four nights. The work was altogether new to Captain Heaviside, while the most important part of the apparatus having only just been introduced by Captain Campbell, was being practically tried for the first time, and the experience gained during the preliminary practice at Bolarum, led to the detection and removal of several weak points in the details of the new arrangement, and in the intended method of working it.

During the first measurement, *viz.*, Bolarum–Bombay, changes were found desirable in a few more details, and after these were effected the method of working was maintained without further alteration throughout the season of 1875-76. Notwithstanding these changes—involving loss of time—and the loss of one or two nights from causes beyond the observers' control, the first measurement was satisfactorily completed in ten days. After this the three succeeding arcs were all completed in six nights each, except when occasionally delayed by cloudy weather, and on one or two occasions when a night was lost owing to a fault on the Telegraph line. The measurement of the two last arcs of the season, *viz.*, Madras–Bellary, and Bangalore–Bellary, was greatly interfered with by clouds.

The observers met twice during the season for the purpose of determining their relative personal equation, and they secured a fourth value after joining company at Bangalore at the close of the operations.

21.

Progress during Season 1876-77.

The work of 1876-77 was continued as already remarked on nearly the same general arrangements as were followed in 1875-76, the principal differences being in connection with the observers' personal equations, as will be explained in the next chapter. Clouds were exceedingly troublesome during the measurement of the first two arcs, *viz.*, Vizagapatam–Madras, and Vizagapatam–Bellary, and these arcs occupied fifteen, and eighteen nights, respectively, in consequence. This was much to be regretted, because it threw the observations so far in arrears that it became necessary to abandon the measurement Bellary–Mangalore, in order to leave time for the contemplated observations between Bombay, Aden, and Suez by submarine cable. The work of the season was therefore terminated, so far as regarded Indian arcs, by the measurement Mangalore–Bombay, which even then had to be unduly curtailed—only four nights' observations being obtained in place of the usual complement of six—in order that Captain Heaviside might avail himself of a passing steamer to reach Bombay.

The arc Bellary–Mangalore was much wanted, because its combination with two of those measured in the previous season, *viz.*, Madras–Bellary, and Bangalore–Bellary, would have afforded direct checks on the two arcs (Madras–Bangalore, and Bangalore–Mangalore) measured in 1872–73, when the condition of telescope No. 2 was quite untrustworthy, as already described. The value of the arc Bangalore–Mangalore can now only be deduced by a combination of Bangalore–Bellary, Bellary–Bombay, and Mangalore–Bombay, the last of which is, as stated above, the weakest of all those measured, as regards the number of nights of observation.

The operations between Bombay, Aden, and Suez, which closed the season of 1876–77, are described in Part II of this volume.

22.

Progress during Season 1880-81.

The rate of progress during the operations of the field season 1880-81 was extremely good, owing to the exceptionally fine weather which was experienced throughout, and the work generally progressed very smoothly, with the exception of the failure of a clock during the first measurement, as already noticed.

Two of the arcs measured, *viz.*, Jubbulpore–Bolarum, and Jubbulpore–Deesa, involved the use of a great length of wire between the stations, because in each case the wire used passed through Bombay, making a total mileage of 1124 for the first, and 1031 miles for the second. In both instances the portion of the wire between Jubbulpore and Bombay was carried on the posts used for several other wires, some of which were in constant use for messages between Calcutta and Bombay worked on the duplex system, and the result was at first great confusion in the chronographic record, owing to the occurrence among the transmitted clock signals, of irregular signals arising from induced currents. This annoyance was afterwards obviated by the kindness of the Superintendent of the Telegraph Office in Bombay, who reduced the strength of the currents used for messages, so as to decrease the induction to a point where it did not suffice to interfere with the longitude signals.

It is very questionable, however, whether in the case of such long distances, where the wire used is suspended on the same poles as other wires, it would not be better to introduce a relay mid-way between the observatories, than to attempt through signalling with batteries only at the two ends. The current in the latter case must be very weak, which necessitates the adjustment of the receiving relays at each station so as to be acted on by very slight changes of magnetism, the consequence being that weak induced currents, or earth currents, cause that action, and introduce irregular signals to the confusion of those used for longitude work. The introduction of an intermediate relay is chiefly objectionable because it cannot be under the control of the observers, and precautions would have to be taken against the possibility of its use introducing error and uncertainty in the work. It is believed, however, that this could be easily arranged, and in case of such long lines being used in future, the use of an intermediate relay is strongly recommended, at least as an alternative method.

An addition was made to the apparatus in each observatory early in the season, which proved a great convenience. This was the introduction of the coils of a polarized relay of low resistance into the line circuit, so that every signal transmitted by the translating relay through the line, was first passed through the coils introduced. This arrangement in no way interfered with the direct transmission of signals through the line—except by the slight increase of the resistance in circuit—but the armature of the polarized relay being placed in a local circuit with the sounder, the passage of each signal was intimated to the ear by the latter instrument. It is obvious that if anything should occur to interfere with the transmission of the signal through the line—as for instance a fault in the local connections, or a want of earth connection at the distant station—the action of the relay, and therefore that of the sounder must instantly cease, the cessation of the latter immediately directing attention to the fact that something had gone wrong. Hence the new relay was named the "Tell-tale relay." The advantage obtained was great; (1) because formerly the observer had no means of knowing whether his transmitted signals were successfully sent or not, and (2) the Tell-tale relay gave the distant observer—*i.e.*, the one receiving signals through the line—the power of calling the attention of his colleague in case of any contingency arising, as for instance if clouds should render the continuance of work useless for the night, or should an emergency arise calling for the use of the wire by the telegraph officials.

23.

Relations with the Officers of the Telegraph Department.

Throughout the operations, all the Officers of the Telegraph Department whose co-operation has in any way been required, have continually shown the greatest courtesy, and readiness to give every assistance in their power. In many instances the prosecution of the Longitude observations has unavoidably caused considerable trouble in the several Telegraph Offices involved, but this has invariably been cheerfully undertaken, and the relations of the officers of the two departments have always been most cordial.

24.

The Commutator Board.

A simple outline plan of the commutator board is given in Plate III—on a scale of about one third real size—while symbols for the clock, idiometer, observer's tappet, chronograph recording pens, and the several batteries &c., are added, in order that the various wire circuits may be traced. On the commutator board; *C C* is the commutator itself, *R R* the translating relay, *S S* the sounder, *D D* the talking key, and *E E* a bar which is used as an "Earth"; *F*, *G* are the receiving, and tell-tale relays respectively, and *M*, *N* are two supplementary switches. Permanent wire connections between the different instruments on the board are shown by double lines, and those wires which are only temporarily attached at each station are indicated by single lines.

The commutator *C C*, and the switches *M*, *N*, are each composed of plates of brass, which are mounted on blocks of ebonite so as to be perfectly insulated from each other. These separate plates are shaded. The circular indentations, with numbers for reference, indicate holes between the plates which can be filled at pleasure by the insertion of pegs, so as to bring two plates into connection. The letters on the several plates indicate the parts of the apparatus with which they are connected, either permanently, or by wires attached temporarily to binding screws provided for the purpose, all of which can be traced in Plate III. Thus the plates marked A_C, B_C, and R_C are connected by wires to the copper poles of the batteries for A, and B pens, and the translating relay, respectively; while A_Z, B_Z, and R_Z are similarly connected with the zinc poles of these batteries. K is connected with a wire which passing through the break-circuit apparatus of the clock is carried to the earth, $E\ E$. I is similarly connected with the star-frame of the idiometer, while a second wire attached to the wire-frame (see description of idiometer in Chapter V) is carried to the earth. O is intended for the observer's tappet—or signalling key—and can be connected with the one used at the transit telescope, or at the idiometer, as required, by means of the switch N. The line wire is attached to L. The plates similarly lettered, *viz.*, three marked B_Z, and two marked A_Z, are connected by bars passing underneath the ebonite mounting. The plate marked R_C, which is inconveniently placed for the attachment of a temporary wire, is permanently connected to the binding screw marked R_C. The two plates without any marks are simply dummies through which other plates can be connected. The long plate marked E' is connected with the earth EE, and the latter is furnished with a number of binding screws for attaching several wires. The latter plate is called the 'earth' because it is introduced as a convenient means of completing the commutator local circuits, which are all purely metallic. For the purpose of line signalling a real earth-plate is required, and EE is connected therewith as shown.

The following are the ordinary combinations effected by the commutator in the course of observations, the connections of which can be readily traced by reference to Plate III. The pegs used for completing the various circuits are numbered consecutively throughout the commutator, and the switches M, N.

No. I.	The clock recording time by A pen, ...	Pegs	6 4 8
	„ „ B „	„	2 10
„ II.	Determination of pen equation, clock time being recorded simultaneously by both pens on the chronograph,	Pegs	2 14 8
„ III.	Observation of transits with local clock—		
	Observer, pen A; clock, pen B	Pegs	25 20 17 8 : 2 10
	Observer, pen B; clock, pen A	„	25 15 10 : 6 4 8
„ IV.	Observation with the idiometer—		
	Observer, pen A; clock, pen B	Pegs	26 20 17 8 : 2 10
	Observer, pen B; clock, pen A	„	26 15 10 : 6 4 8
„ V.	Clock comparisons, both clocks recording time on the chronograph—		
	Local clock, pen A; distant clock, pen B ...	Pegs	6 4 8 : 23 22 19 10
	„ B; „ A ...	„	2 10 : 23 22 18 8
„ VI.	Transmitting clock signals for use at the distant station,	Pegs	1 9
„ VII.	Observing transits, and transmitting clock signals to distant station—		
	Observer, pen A; clock, pen B	Pegs	25 20 17 8 : 1 12 10
	„ B; „ A	„	25 15 10 : 1 13 8
„ VIII.	Observing transits with clock time received from the distant station—		
	Observer, pen A; distant clock, pen B ...	Pegs	25 20 17 8 : 23 22 19 10
	„ B; „ A ...	„	25 15 10 : 23 22 18 8
„ IX.	For talking, or interchanging conventional signals,	Pegs	23 24

It will be noticed that in all of the combinations given above, the different circuits combined are brought into one simple circuit, so that a break of circuit at any point entirely stops the current in the whole. There is no branching of circuits, which should always be carefully avoided. Such branching would be afforded by the following combination of pegs, which exactly reproduces the conditions shown in the diagram on page 21, and is therefore faulty, *viz.*:—

For pen equation, instead of combination No. II, ... Pegs 2 10, 6 4 8

The commutator affords the means of measuring the retardation due to the local instruments, by causing the clock time to be simultaneously recorded on the chronograph by both pens, one worked by the clock direct, and the other through the translating, tell-tale, and receiving relays, which is done thus—

A pen direct; *B* pen through relays	... ...	Pegs	1 13 8, 23 22 19 10
B „ ; *A* „	... ...	„	1 12 10, 23 22 18 8

If the retardations of the receiving relays, and of the chronograph pens could be looked upon as respectively equal at the two stations, it is evident that the above experiment would give an exact measurement of the retardation of a transmitted signal recorded on the distant chronograph, only excepting the retardation of the line wire. Unfortunately such equality cannot safely be reckoned upon, but the experiment should prove a useful guide in testing the condition of the adjustments of the local relays, and it is to be regretted that its feasibility was not noticed until pointed out by Major Heaviside after the conclusion of the operations of 1880–81.

25.

Reduction of the Observations.

An abstract of the observations, and the reduction of the results for all the land measurements executed during the seasons 1875-76-77, and 1880-81, are given in the tables contained in Part I of this volume. Full explanations of these tables, and of the methods employed in carrying out the reductions contained therein, will be found in Chapter VI. All these reductions were made under the superintendence of Lieut.-Colonel Campbell, in co-operation with Major Heaviside.

The object held in view in drawing up the tables, was to afford all the data necessary for any reader who might wish to examine the reductions, and re-produce the results arrived at. No attempt has been made to assign probable errors to the final values of difference of longitude obtained, because these are not required until the work of combining all the results is undertaken, and any mathematician who may in the future approach that task, with a view to investigations of the figure of the earth, and local attractions, will probably prefer to compute the theoretical errors for himself, ample data for doing which will be found in the tabular details.

The geodetic elements of the several stations of observation are given in the appendix, at the end of the tabular matter of Part I; and in the case of stations connected with the Principal Triangulation of the Great Trigonometrical Survey of India by special minor triangulation, an abstract of the latter is furnished. A table is added in which the geodetic, and electro-telegraphic values of the several differences of longitude measured are collated for comparison.

26.

Remarks on the Results Obtained.

The results of the checks furnished by the system of working in triangular circuits are generally most satisfactory, going far to prove a very high degree of accuracy in the final mean value of each measurement. But the differences between the subordinate mean values of the same arc, obtained from the several groups of observations, sometimes attain a magnitude which is disappointing, being greater than the refined nature of the 'modus operandi' appears at first sight to justify.

Now on this point it may be remarked, that the sources from which errors may arise are very numerous, owing to the number of instruments involved, some of which are subjected from time to time to changes of adjustment carrying with them accidental, as well as constant, errors. Thus the work of each observer is liable to occasional large discrepancies owing to the accumulation of many errors, which though individually minute amount in the aggregate to a serious quantity, when they happen to occur with the same sign. As the differences noticed above result from a combination of two sets of observations by the two observers, each liable to such occasional accumulated errors, cases must sometimes occur when large errors of each set will combine, and produce unexpectedly large discrepancies.

The fact that these observations are liable to more considerable errors than was anticipated, as indicated by the differences described above, leads to some regret that the system of using clock comparisons to combine the observations of transits made locally by each observer, was not continued throughout the operations, in addition to the simpler method of comparing only the observations of transits made at both stations with the same clock, which was solely adopted, as explained at page 18. The use of both systems conjointly would have afforded a greater variety of conditions tending to eliminate error from the final result.

The objection to the system of working by clock comparisons lies in the increase of labour involved; first in making the observations, and secondly—in a much higher degree—in carrying out the reductions. If this objection is not held to be insuperable, the adoption of a combination of both methods is strongly recommended for the future. The only instance in which such a combination has been carried out hitherto is in the case of the measurement Bolarum–Bombay, where the result was highly satisfactory, the two methods giving absolutely identical values, (*vide Table XIX*, page 141).

In examining the results, due allowance must be made for the unfavorable conditions, in some respects, under which the observations were carried out. For instance, it was sometimes impossible to complete the masonry pillars—on which the instruments were supported—more than a very few days before they were required for use, and thus settlements affecting the constancy of the level and azimuth adjustments may have occurred. Again, the telescopes and collimators were subject to excessive changes of temperature, being often heated to considerably over 100° during the day, and cooled down to 50°, or 60°, during the observations of the succeeding night. Lastly, economy of time being of great importance, observations were sometimes begun at a station more immediately after setting up the instruments than was in many respects desirable.

CHAPTER V.

PERSONAL EQUATION.

1.

Importance of the Equation.

The personal equation of the observers in taking star transits enters directly into the deduced difference of longitude, and is therefore a point of the first importance. This fact was fully recognised from the beginning of the operations, but during their progress new lights have been thrown on the question, showing up features which were not originally suspected.

2.

Method of Determination.

The relative personal equation of the observers has always been determined by the observation of 'divided transits', in which both observers use the same telescope, one taking the transit of a star over the first ten wires, and the other completing the observation of the same star over the last ten wires, whence, by reduction to the central wire, a value of personal equation is at once obtained. This method repeated with numerous stars—the observers alternating their order of observation—affords an excellent value of their relative personal equation. It was carried out as frequently as possible during the work of each season, being put in practice on nine nights in season 1875-76, on seven nights in 1876-77, and on thirteen nights in 1880-81.

3.

Recognition of two Distinct Equations according to the Direction of Motion of the Object Observed.

At first the result directly obtained was accepted, and applied to all star observations, but as the reductions of 1875-76 were being completed, a rough method of observing *absolute* personal equation by means of the chronograph was tried, which gave rise to the suspicion that two distinct equations existed, according as the motion of the object observed was from right to left, or *vice versâ*. This was a matter of importance because the observer sits facing north, or south, according as the star under observation is north, or south, of the zenith, and the construction of the eye-piece invariably used was such, that the apparent motion was from east to west, and therefore from right to left for stars of north aspect, and left to right for those of south aspect. The term 'aspect' is introduced to indicate the direction of the observer's face, and therefore that of the star's motion, and it does not necessarily agree always with the position of the star with reference to the zenith, because evidently a star very near the zenith may be equally conveniently observed with either aspect. The suspicion so aroused was fully verified on examination of the divided transit observations, a re-discussion of which, with the stars arranged in groups on opposite sides of the zenith, afforded two distinct equations, the figures being $0^s \cdot 10$ for north stars, and $0^s \cdot 04$ for south stars. The application of these distinct equations to the observations, instead of the general equation originally adopted, improved the accordance of the final results in a marked degree.

4.

Consequent Precautions.

This point was not lost sight of in the work of following seasons, and several precautions were introduced to give it full effect. When observing divided transits for personal equation, care was taken to keep the results by north and south stars perfectly distinct. During ordinary transits for difference of longitude, the observers noted the aspect under which each star was observed (otherwise doubtful in the case of zenith stars) as a guide in combining the results. Certain stars close to the zenith were always taken under both aspects, the observer recording the first ten wires in one position, and the last ten in the opposite, the object being twofold: *viz.* (1) to determine the *absolute* equation of each observer for north, as compared with south, stars—known as his 'N − S equation'—whereby his observations of the two groups might be made comparable; and (2) to ensure the observation of every star under the same aspect at both stations, where the difference of latitude is small. In order fully to secure compliance with the latter condition it becomes necessary to avoid using any stars within certain limits of declination, whenever the latitudes of the two stations of observation differ by more than 3° or 4°; for supposing the stations to be m° apart in latitude, and n° to be the limit (which may be considered as about 2°) within which each observer can conveniently observe a star with a false aspect—*i.e.* as north when it is really south of the zenith, and *vice versâ*—there will be a zone of $m^\circ - 2\,n^\circ$ of declination within which no stars can be used.

Accepting the fact that two relative personal equations exist, depending on the direction of the stars' apparent motions, no star observations can properly be combined—for the deduction of difference of longitude—which are not taken by both observers under the same aspect, *unless* the absolute N − S equations of the observers for their own observations of north and south stars are known, in which case one, or other, of these can be applied so as to make two observations on different aspects suitable for such combination.

5.

Influence of Differences between the two Transit Telescopes.

The system of divided transits was somewhat imperfect owing to the difference between the Bohnenberger eye-pieces of the two transit telescopes, which were always used for star observations—one of these as already mentioned (*vide* page 2) being much inferior to the other—which led to the deduction of personal equation from observations taken by one of the observers under different conditions to those he was accustomed to in ordinary work. This was guarded against as far as possible by using both telescopes equally in taking divided transits, and adopting the mean of their results. There is another drawback to the system in the difficulty of carrying it out in case of a material difference of eye-sight between the two observers, as there is no time to change the focus of the eye-piece during the observation of each star. Captains Campbell and Heaviside were fortunately able to work with the same focus.

6.

Consequent Alterations.

Both these defects were partially remedied in 1877-78, in the Mathematical Instrument Department, Calcutta, under Captain Campbell's supervision, the first by making a second eye-piece more nearly equal in power to the better of the original pair; and the second by providing a series of spectacle lenses sliding in front of the eye-piece, to allow of observation by eyes of widely different focal length without changing the adjustment of the eye-piece. With these improvements the method of divided transits may be looked upon as perfectly trustworthy, for the determination of relative personal equation at any particular time, but the constancy of this equation remains a question for consideration.

7.

Probable Inconstancy of the Equation.

The numerous determinations of the relative personal equations made during 1875-6-7 showed that it varied from time to time, and the results obtained from the reduction of the longitude observations led to uneasiness lest its changes might sometimes be sudden and of considerable magnitude. For instance, when it was found that the subordinate mean values of the same arc, obtained on several nights, differed by larger quantities than had been anticipated (*vide* page 31) changes of personal equation appeared to offer the most plausible explanation. An instrument for the easy determination of *absolute* personal equation seemed therefore a great desideratum, and it was hoped that the idiometers, which were introduced in 1880-81, and will be described in Section 9 of this Chapter, would supply this want. The idiometers were as a rule used nightly throughout the season by both observers, and the results obtained afforded the strongest evidence—if not actual proof—that the personal equations of the observers were not liable to variations of such magnitude as had been feared might possibly occur.

8.

Personal Equation in transcribing the Chronographic Records.

The chronographic record is transcribed—that is, converted into a numerical record—with the aid of a glass scale of diverging lines, by which the position of a star's transit-signal between two second-signals of the clock can be measured in tenths of a second, while hundredths may be readily estimated by eye. It is evident that there is some room for the effect of a personal equation in this operation, which was guarded against throughout the measurements contained in Part I of this volume—with one exception—by the records of both stations being always transcribed by the same person, so as to eliminate any constant equation of reading. The single exception was the arc Vizagapatam–Madras, in which case each observer transcribed his own chronographic record, and an equation was subsequently applied, the value of which was obtained by comparing the mean results of a quantity of transcription of the same record by both observers.

9.

Description of the Idiometer.

The Idiometer is shown in Plate IV.

It was constructed in the Government Mathematical Instrument Department, Calcutta, under the supervision of Mr. Bolton, Mathematical Instrument Maker.

The general arrangement is that of a movable frame, **A**, passing in front of a fixed imitation star, and carrying vertical threads to represent the wires of the transit telescope; with a simple clock work, **E**, to afford the requisite motion. A small observing telescope, **B**, is mounted on a pivot, and attached to the frame **A** so as to follow its movements, and thus the appearance of fixed wires and moving star is satisfactorily obtained. The instrument is used in connection with the chronograph, and two signals are recorded thereon as each wire passes the star, one by the observer, and the other automatically by the instrument, as will be explained.

The details are as follows:—

A light iron foundation-frame carries,—

(1) A vertical brass plate, **C**, called the 'star-frame.'

(2) The erecting eye-piece of a terrestrial telescope, with illuminating lamp, **D**, behind the star-frame. The eye-piece cannot be seen in Plate IV, being hidden by the star-frame.

(3) In front of the star-frame, and close to it but sunk below its level, a small driving clock, **E**; again at about 24 inches in front of the star-frame is the axis, **F**, on which the observing telescope revolves.

The foundation-frame rests on a firm wooden trestle, which is fitted with arms and pulleys for the driving weights of the clock-work.

To the front face of the star-frame three rollers, **R**, **R**, **R**, revolving in a vertical plane, are fixed; two near the extremities of its lower edge, and one midway between these, about 5 inches above them. The last roller is carried on a hinged arm, and fitted with an adjustment, **G**, for altering its level. The frame, **A**, carrying the wires, called the 'wire-frame', runs on the two lower rollers, and is held in position by the upper, under a pressure which can be regulated by **G**. Along the lower edge of **A** is a series of teeth, which connect it with the driving wheels of the clock-work. A projecting bracket joined to a light rod, **H**, (which can be disconnected if desired) connects the wire-frame with the observing telescope. The wires are fifteen in number, arranged in three groups of five. They are made of silk thread and let into shallow nicks at the back of the frame, so as slightly to project above its surface. The whole wire-frame is capable of being reversed end for end if desired.

In the centre of the star-frame a hole is cut, and in front of it is fixed the 'star-plate', **L**, a thin plate of whitish metal with a minute star hole in its centre. The size of L is sufficient to occupy the whole field of the telescope, and its face has a dull half polished surface. The parts are so adjusted that, as the wire-frame passes in front of the star-frame, the wires just clear the star-plate.

Two cylindrical plungers of steel are nicely fitted in cylindrical sockets attached to blocks of ebonite, and the latter are affixed to the back of the star-frame, with provision for slight lateral movement intended to allow of the adjustment of the plungers in the vertical line passing through the star hole. Holes are cut in the star-frame to allow the plungers to pass through until they come into contact with those portions of the wire-frame, which are crossed at intervals by the silk wires in their nicks, and the plungers are lightly pressed against the surface of the metal by means of spiral springs. The ends of the plungers are filed so as to form an obtuse V, the apex line being vertical, and the corners are rounded off to obviate the chance of cutting the silk wires as these pass under the plungers. As only one of the plungers is intended for use at the same time, each is provided with a movement by which it can be readily drawn back in its socket, so as to be clear of the wire-frame.

By means of the erecting eye-piece, the rays from the illuminating lamp, D, are focussed on the star hole, which is practically in the same plane as the wires, or if this is found not to be the case the light may readily be focussed on one of the wires. The necessary adjustments are provided for this purpose. A level bubble is provided for levelling the instrument in the line of the wire-frame's motion.

It has been mentioned above, that the observing telescope is mounted on an axis, and attached by the arm H to the wire-frame so as to follow its movements, but a quick motion tangent-screw, N, is added, by which it can be turned rapidly round its axis, and directed to any part of the wire system. Thus, while the star is constantly passing out of the field of view owing to the clock movement, it can be quickly brought back to any part of the field by the tangent-screw. This completes a very exact imitation of the details of observing a transit with one of the transit telescopes, when it is necessary constantly to move the eye-piece across the transit wires—by a rapid screw motion provided for the purpose—in order to keep the star near the middle of the field. The star is always at the same distance from the telescope, therefore no change of focus is necessary. The telescope is provided with a prism, which can be placed in front of the eye-piece, or removed at pleasure. The effect of the prism is to reflect the rays at right angles, and to reverse the apparent direction of motion of the imitation star. When using the prism the observer must sit on one side of the telescope. It should be noted that a prism has been previously used in a similar manner, with an American instrument designed for the measurement of personal equation. Between the telescope and the wire-frame there is a stand for a lamp, which throws a subdued light through a ground-glass screen upon the wires, to imitate the illumination of the wires of a telescope.

Connecting the clock-work and the wire-frame is an appliance for reversing the motion of the latter without interfering with that of the clock. (1) A toothed wheel, P, gears with the teeth along the lower edge of the wire-frame. (2) between P and the clock-work below it are two similar toothed wheels S, S, so mounted as to be movable bodily round a centre by means of the lever, W. Both the wheels S, S, always run in gear with a toothed wheel of the clock-work, but by moving the lever W either one of them can be put also in gear with the wheel P, while the other runs free, and it is evident that the wire-frame A will move in opposite directions according to which of the wheels S, S, connects it with the clock-work. The lever W can be so placed as to disconnect both of the wheels S, S, from P, when the wire-frame can be moved by hand, and placed wherever desired. The rate of motion given to the wire-frame is capable of considerable alteration by varying the weights, of which there are two, *viz.*, Q, the driving weight, and T, a small weight to keep the cord stretched by which Q can be drawn up after running down.

Lastly, the instrument is connected with the chronograph by two wires (with a battery in circuit) one of which is attached to the star-frame, and the other to the plunger in use, which is insulated from the star-frame by the block of ebonite on which it is mounted, and thus there is no complete metallic circuit unless the plunger touches the metal of the wire-frame, and as the latter travels along, the wires successively pass under the plunger, each causing a break of circuit, and a corresponding signal on the chronograph. The observer at the same time records on the chronograph with the other pen the apparent transit of each wire across the star, by a key held in his hand. The value of the observer's equation is then arrived at by comparing the distance on the chronographic sheet between the two signals thus recorded, with the known distance between the two pens, and combining the difference found with the linear value of a second of time on the sheet. A switch, V, is provided for changing the connection from one plunger to the other. The wires for effecting the connections with the chronograph are not shown in Plate IV.

The chief instrumental error to be guarded against is that which would arise from the apex of the plunger in use not being placed vertically over the star—the wires being supposed to be vertical—and this error is cancelled by reversing the motion of the wire-frame. Let N and S be an observer's absolute equations for stars of north and south aspect, or in other words, for stars traversing the field with apparent motions from right to left, and from left to right, respectively; then the instrument affords the means of measuring these for the artificial star in the following ways:—

(1) N—with plain eye-piece S—with prism "	with right to left motion of wire-frame, and therefore subject to *the same instrumental errors.*
(2) N—with prism eye-piece S—with plain "	with left to right motion of wire-frame, and therefore subject to *the same instrumental errors.*

and by combining (1) and (2), N and S can each be obtained cancelling instrumental errors. All the above can be obtained in four different ways—for there are two plungers, only one of which is used at a time, and the wire-frame can be reversed end for end—and thus the facilities for eliminating instrumental errors are very great.

10.

Faults found and remedied.

The idiometers worked generally very smoothly and satisfactorily during the season 1880-81—except in the case of the one with Colonel Campbell, the driving clock of which broke down on 21st March entailing its despatch for repairs to Calcutta, whence it was not received again until after the close of the observations at Agra—but the experience gained indicated some weak points in their design, steps for the correction of which were taken immediately after the close of the season's observations.

The chief of these was the use of the silk wires under the plungers, in order to break the electric circuit, and generate a signal on the chronograph. Several objections showed themselves: (1) the silk was liable to wear out; (2) its position, though sunk in a nick in the brass wire-frame, was not stable enough to prevent slight movement under the plunger; (3) the plunger collected dust in travelling across the surface of the wire-frame, which was deposited in front of the silk threads, where it gradually accumulated, and formed a non-conducting substance which sufficed to break the metallic circuit, causing the signal to be made before the arrival of the plunger at the thread itself, *i.e.*, before the transit of the star across the wire; (4) the projection of the threads above the surface of the wire-frame, and their instability, made it very difficult to clean the plate when desired without disturbing the threads, and this was a great defect, because the cleanness of the plate is a most essential point, for if the slightest speck of dust comes under the plunger, it may suffice to break the circuit and record a false signal.

In order to remove these objections, Colonel Campbell substituted thin bars of ebonite, as circuit-breakers, instead of the silk threads. The latter are still used as before to represent the transit wires, but they are not extended across the plates of the wire-frame in nicks as was formerly the case, their place being taken by the ebonite bars in prolongation of the lines of the silk threads. The advantages gained by the use of ebonite bars are several: (1) they are firmly fixed and flush with the surface of the brass plate, so that there is no difficulty in cleaning the surface of both; (2) they will not wear out; (3) a different form of plunger is used, terminating in a fine point, just blunt enough to avoid scratching the metal, or ebonite. This greatly facilitates the adjustment of the plunger vertically over the star, because the position of a point only has to be attended to, instead of the verticality—as well as position—of a line, as was the case with the apex line of the V-shaped plunger used with the silk threads; (4) the silk threads are fastened at the edges of the frame, and their renewal in case of accidental breakage will be much easier than before; (5) with the ebonite the breaks of circuit are considerably shorter than with the silk threads; (6) these breaks should be also more uniform in duration, because of the absence of the dust accumulation referred to above; and because of the lasting powers of the ebonite as compared with the silk, for when it became necessary to renew a silk thread, it was impossible to calculate on getting one of exactly the same thickness as the old one, a point which directly affected the duration of the break, and therefore the instant of its beginning, which affords the signal to be read off the chronograph; and (7) when the plungers pass over a continuous smooth surface, the rate of the instrument must be more constant than was the case when each silk thread presented a slight obstacle to be overcome.

It must, however be borne in mind that no degree of perfection in the idiometer itself will certainly ensure the desired end, because, from the way in which it is used in combination with the chronograph, the results obtained depend on the constancy of the rate of the latter instrument. It may be added, that the degree of accuracy aimed at is a very high one, for the one hundredth part of a second of time is an appreciable quantity, when compared with the magnitude of the equations which it is desired to measure, and it need hardly be remarked that great refinement is required to deal certainly with such small quantities.

11.

Final Remarks.

During the season of 1880-81, three determinations of the relative personal equations between the two observers were obtained from star observations (*vide Tables XXVI,* and *XXVII,* pages 165–168) and therefore the *absolute* equations arrived at by means of the idiometers were not necessary, and could be dispensed with when reducing the longitude observations. But both sets of equations—*viz.*, those depending on star, and idiometer observations, respectively—being available, the question arose as to their employment.

The idiometers having been in use for only one season, it was considered that some further experience was required, before the results obtained from them could be looked upon with the same confidence as those depending on actual star observations, and the latter have therefore been solely used in reducing the observations of 1880–81.

The idiometer results are, however, given in the Appendix at the end of the tabular matter of Part I, in order that the reader may form his own opinion as to the reliance that may be placed upon them, and the prudence of using such instruments either in combination with, or in supersession of, star observations for the determination of personal equation.

CHAPTER VI.

DETAILED DESCRIPTION OF THE METHODS OF OBSERVING AND REDUCING THE RESULTS, WITH FULL EXPLANATIONS OF THE TABLES.

1.

Introductory.

The methods employed in reducing the observations will now be explained in detail, with particulars regarding the system of observing, whenever these seem called for, and full explanations of the tables containing the results of the observations, and their reductions.

2.

Instrumental Constants.

Wire Intervals. The whole system of transit wires—twenty-five in number—is attached to the micrometer slide, by means of which the central wire of the group can be placed in a position of no collimation error, or, as is generally more convenient, in a position for which that error has been determined. The usual practice was to observe the transit of each star over the fifteen central wires, but it was a very common occurrence to miss one or more wires, and the custom was frequently varied purposely; for instance, when it was desirable to observe two stars of nearly the same right ascension, the first fifteen of the twenty-five wires were used for the first, and the last fifteen for the second star. The combination of these circumstances, *viz.*, the readily adjustable collimation error of the central wire, and the frequent variation in the groups of wires over which transits were observed, led to the system of reducing the observation on each wire, to the central wire, in preference to using the mean of the wires. To carry this out, the interval of each wire from the central wire must be known with accuracy, and this was carefully determined by observing transits of slow moving stars, from which all the intervals, in equatorial seconds, were deduced. These equatorial intervals being known, the computation of time intervals for every star observed, and the reduction thereby of the observations to the central wire, can be rapidly effected. This method has the great advantage of showing at a glance the accordance of individual wire observations in each transit, and leads to the detection of mistakes—such as observations of wrong stars, or mis-readings of the chronographic record—at an early stage of the reductions. The stability of the wire intervals was found to be satisfactory.

Telescope Micrometer. The determination of collimation and level errors being made by means of the telescope micrometer, the value of its screw was required, and this was obtained from the known intervals between the wires, in two ways: (1) by bringing the movable wires successively into coincidence with the single vertical wire, which is fixed independently of the micrometer slide; and (2) by using the mercury trough, and observing the coincidence of a certain wire, first with its own reflection, and then with that of other wires. Under both these methods, the known intervals being observed in terms of the micrometer head afforded the value of its revolution, which was practically identical in the two instruments.

Collimator Micrometer. Owing to the system of observing for collimation error, which will be described below, the value of the micrometer screw of the collimator was required in terms of the telescope micrometer, and this was readily obtained by directing the transit telescope on the collimator, and measuring with the collimator micrometer the known intervals between the wires of the telescope; or by measuring the distance between the two vertical wires of the collimator, first by means of its own micrometer, and then by that of the telescope.

The foregoing instrumental constants being known, the first operation in actual observations is the determination of the collimation correction for the central wire, which was carried out as follows.

3.

Determination of Collimation.

The collimation of the telescope was always tested in the usual way, by reference to a pair of collimators approximately horizontal, but as some of the details practised may possess a certain amount of novelty they will be here described.

It was considered a great object to make all observations entering into the process of a similar nature; *viz.*, the intersection of a pair of crossed wires by a vertical wire, and the means of doing this were afforded by the construction of the collimators. One collimator, (N), always placed to the north of the transit telescope, is provided with a fixed pair of crossed wires, while the other, (S), placed to the south, possesses a similar fixed cross, and also two vertical wires movable by a micrometer. The cross of (N) was always placed as nearly as possible in the meridian, and that of (S) slightly to one side, so that the observer looking through (S) should see the two crosses separated by a convenient distance, (A), which he measured by the micrometer of (S). Proceeding to the transit telescope he then observed the cross wires of (N) and (S) on the central transit wire, obtaining a mean micrometer reading of each. The reading of (S) so found, corrected by (A) converted in terms of the telescope micrometer, affords the reading of a supposititious point exactly opposite the cross of (N) collimator, which latter reading being combined with the observed reading of (N), the mean of the two gives the reading of the telescope micrometer when the central transit wire is exactly collimated. This last reading was named C_0. No attempt was ever made to observe star transits with the micrometer set at C_0, in order to avoid the necessity of a collimation correction, but a convenient round number—called C_8—was always adopted, and generally used throughout the observations at a station. It is thus evident that the collimation error of the central transit wire at any time was the difference between C_0 and C_8, which difference is called c_1, the sign given being plus, or minus, according as the position C_8 caused the transit of a star earlier, or later, than would have been the case if the position had been C_0, so that c_1 becomes a correction as regards the effect on star transits. The motion of the micrometer screw of each transit telescope is such, that when the telescope is *I.P.E.* the micrometer readings increase or decrease, as the wires are moved eastward or westward, respectively, and the reverse obtains when the telescope is *I.P.W.* Now considering that if a wire is too far west, the image of a star will transit over it too soon, it is apparent that the formulæ for the positions *I.P.E.* and *I.P.W.* must be $c_1 = C_0 - C_8$, and $c_1 = C_8 - C_0$, respectively.

At least one determination of collimation error was made every night, and the value of c_1 obtained is the correction-constant for collimation for the night, by which the collimation correction for each star observed must be computed. In making these observations several readings of the collimators were taken by the telescope, and the precaution was followed of causing the telescope to oscillate—or wholly revolve—after each reading, varying the direction of its rotation.

4.

Diurnal Aberration.

The effect of the diurnal aberration on the time of a star's transit was not lost sight of, although for all the arcs measured—or indeed for any ever likely to be measured—that effect is inappreciable when the observations taken at both stations are combined. The correction for diurnal aberration is a constant quantity for each station, which, like that for collimation, must be multiplied by the secant of each star's declination to obtain the correction in time for that star's observed transit, hence the two corrections may be combined. The correction used for aberration was $-\ 0^{s}{\cdot}0207 \times$ the cosine of the latitude, and this, converted into terms of the micrometer and applied to c_1, gave c, which was used as the correction-constant for collimation and aberration combined for each night.

During season 1875-76, the quantity c_1 was used as resulting from each night's observations, but in 1876-77 it was considered that the change of the line of collimation, while the telescope remained in one position, was probably less than the error of observation of one night, and therefore the plan was adopted of deducing c_1 from the mean of all values of C_0 observed in each position. This method was also followed in reducing the observations of 1880-81. The use of a mean value of c_1 involved the necessity of using the same value of C_8 during the corresponding observations, and in the rare cases when C_8 was altered by mistake, a special correction-constant for collimation became necessary. These points will be found clearly indicated in *Table I.*

5.

Determination of Level Error.

The dislevelment of the instrument was always obtained by the use of a mercury trough. Supposing the telescope to be perfectly levelled, then if the central wire be collimated, it will exactly coincide with its reflection from the mercury when the telescope is directed towards the nadir; and if the levelling be disturbed by a certain angular quantity, the wire must be moved by the micrometer through a space representing the same angle, in order to regain coincidence with its reflection. This coincidence was always observed several times, and the mean micrometer reading being called M, it is evident that the dislevelment is the difference between M and C_0 (the reading of no collimation error) which difference is called b, and is the level correction-constant, for combination with the constant for each star to correct the time of transit for dislevelment. The sign of b is governed by the same considerations as those which apply to c_1 as already explained, so that the formulæ are; $b = C_0 - M$, and $b = M - C_0$, for the positions *I.P.E.*, and *I.P.W.*, respectively. As a rule two determinations of dislevelment were made each night, and their mean used to obtain b for all the star observations of the same night; but occasionally three values of b were obtained, in which case the means of the first and second, and second and third, were used for the stars observed during the corresponding intervals. This fact is pointed out in *Table I* by a remark, specifying the group of transits taken with east, or west, clock. It may be remarked, that no reading of the mercury trough for determination of dislevelment is of any value without a corresponding determination of collimation error, unless the line of collimation may be looked upon as practically constant—*i.e.* constant within the limits of observation error. It has already been noted that the assumption of such constancy was considered justifiable, and therefore it was not deemed necessary to determine the collimation and level errors very closely at the same time.

An abstract of all collimation and level determinations for seasons 1875-76-77 is given in *Table I*, the arrangement of which will be readily followed with the help of the foregoing explanation, while to facilitate reference, a recapitulatory explanation of the symbols employed is given immediately preceding the table.

6.

Determination of Deviation, or Error in Azimuth.

In order to determine the azimuthal error of the transit telescope, or its 'deviation', two well-known circum-polar stars were always observed when possible, one at its upper, and the other at its lower culmination. In the low latitudes of Southern India, however, such observations were often lost owing to clouds near the horizon when the rest of the sky was clear, and on these occasions the best alternative method of obtaining the deviation error, was by combining the observed times of transits of two stars of large north and south declination respectively. But well-known stars sufficiently far south to have a rate of movement suitable for the purpose, besides being comparatively rare, were unfortunately nearly as liable to be obscured by clouds as the polar stars, which led to the introduction of a system of observing what were called 'comparative-azimuth stars'.

7.

Comparative-Azimuth Stars.

Certain stars of from 8° to 15° North Polar Distance were selected for observation every night, merely with reference to the convenience of their times of transit—as fitting in with other observations—without regard to any special knowledge of their places in right ascension, or declination. These stars were named 'comparative-azimuth stars', and observations of them were combined with those of well fixed circum-polar (or other) stars, in a way which will now be described. Although no special knowledge was required of their places, these were always known with sufficient accuracy to admit of their daily change in right ascension being computed by Bessel's Independent Quantities. When the observed times of transit of such a star on consecutive nights, are corrected for change in right ascension, and also for clock-rate—being of course also reduced for collimation and level errors—a comparison of the differences of the reduced times *inter se* will afford excellent indications of the changes in azimuthal adjustment from night to night, although giving no clue to the absolute deviation error. If therefore such nightly variations can be determined for a set of observations, while the absolute deviation is obtained on any one night, it is evident that the deviation may be deduced for each night. This system was introduced during the middle of the second measurement (Bellary-Bombay) of 1875-76, and regularly continued afterwards. The observation of standard circum-polar stars in pairs was by no means neglected, being continued nightly whenever possible, but the comparative-azimuth stars were found a great comfort whenever the weather was at all cloudy, and sometimes saved the observations of a night which would otherwise have been lost owing to the want of a deviation correction. During the season of 1880-81, the field of operations being in a generally higher latitude than in former seasons, it was more easy to observe circum-polar stars, and two pairs of these were usually obtained.

The method of combining the observations of comparative-azimuth stars, with those made to well fixed stars, will be best followed if given with the explanation of the several tables in which the results are abstracted and reduced.

8.

Explanation of Table II—" Deduction of Deviation Correction, from Star Observations."*

This table contains only the determinations of absolute deviation correction from observations of circum-polar, and other well fixed stars. When a star is entered as a number, with the letters R.P.L., the reference is to the Radcliffe Polar List. The first eight columns require no explanation, beyond a remark that the same clock was always used for both stars of a pair, except on rare occasions when one of them being observed in the middle of a set of transits in the course of being recorded with the time transmitted from the distant clock, it was most convenient to use that clock for the azimuth star also, although its companion star had been observed with the local clock. The clock used is noted by the letter in the column headed "Clock in use", and when both clocks are used for one pair of stars, the observed time by the distant clock is entered in brackets, in column 10, with the corresponding local time below it, the latter being deduced by means of the clock comparisons which were always made. This occurred at Madras on 1st April 1876 (*vide* page 11) and on other occasions. When both stars of a pair are observed with the distant clock no such conversion is required. The quantity A, in the ninth column, is the azimuth-constant for each star, equal to, $m. \sin \zeta. \sec \delta$—where ζ stands for zenith distance, positive when south and negative when north, δ for declination, and m is a constant numerical factor required to convert divisions of the telescope micrometer into seconds of time: m will be referred to again. This formula gives the sign proper to A under all circumstances, if the declination of a lower culmination is considered the supplement of the actual declination.

The "Observed Time of Transit", in the tenth column, is the mean of the times observed on all wires after the reduction of each to the central wire. The "Corrections for Collimation and Level", columns 11 and 12, are those obtained by multiplying the corresponding correction-constants given in *Table I*, by the proper constants for each star; *viz.*, $m. \sec \delta$ for collimation, and $m. \cos \zeta. \sec \delta$ for level, the symbols being as above. The stars in *Table II* being all well known, it was not thought necessary to enter their declinations, but the approximate latitudes of the stations are given in order to facilitate the re-computation of the corrections if required. The factor m was introduced because the collimation and level corrections were originally obtained in terms of the micrometer, and it was more convenient to retain that denomination—and employ it for the deviation correction also—than to convert into seconds directly. The values of the telescope micrometers, as determined by observation from time to time, varied so slightly that the mean value, 1 div. $= 0^{s}.0225$ (equatorial) has always been used for both instruments, therefore $m = 0.0225$. Column 13 contains the correction for pen equation, Q, required to reduce the observer's record on the chronograph to that made by the clock; it was daily obtained by observation

* In the heading of *Table II* the word "Error" was used by an oversight instead of "Correction".

as explained elsewhere, (Chapter IV, Section 11). The "Correction for Clock Rate", column 14, is required for the interval between the transits of the two stars forming a pair; it was always applied to the later observation, and the interval was so small that a very accurate knowledge of the rate was not necessary. The fifteenth column, headed "Seconds of Corrected Time of Transit", contains merely the sum of the five preceding quantities, the seconds only being entered. The "Right Ascension", in column 16, was computed from the Nautical Almanac in the case of stars taken from there, and by Bessel's Independent Quantities for other stars. In the latter case the term involving the longitude of the moon was not lost sight of, but it was never used in the reduction of right ascension, as its effect on the stars employed was found to be inappreciable. When a lower culmination was observed, the computed Right Ascension at the time of observation, increased by twelve hours, was entered.

The "Apparent Clock Corrections", in column 17—being the difference between the two preceding columns—afford the means of computing the deviation correction a_1, as follows. Let ΔT be the true clock correction, while Δt and Δt_1 are respectively those obtained by the upper and lower culminating stars of a pair; then we have the two equations, $\Delta T = \Delta t - A\,a_1$, and $\Delta T = \Delta t_1 - A_1\,a_1$ (where A, A_1 are the values of the azimuth-constant for the two stars respectively) by combining which ΔT is eliminated, and there remains one equation from which a_1—expressed in terms of micrometer divisions—is deduced, and entered in the next column. The sign of a_1 is positive, or negative, according as the plane of rotation of the telescope cuts the horizon to the west, or east, of the north point, and thus the quantity Aa_1 affords the correction for deviation to be applied to the time of transit of any star, for which A is computed by the formula given above. The last column contains the weight assigned to a_1 according to a system which will be explained hereafter.

9.

Explanation of Table III—"Reduction of Comparative-Azimuth Star Observations."

The first two columns in *Table III* show the arc, and the stations of observation, with their approximate latitudes. In the third column the number of the star in the British Association Catalogue is given, with its approximate declination and right ascension, and its azimuth-constant, A. The next eight columns require no explanation in addition to what has been given for *Table II*. In column 12 corrections are entered for clock-rate in order to reduce all subsequent observed times to that of the first day of observation. Column 13 contains a similar correction for change in the Right Ascension of the star in use, which was computed by means of Bessel's Independent Quantities. Thus column 14, headed "Reduced Observation, daily", contains reduced times—the sums of the quantities in the six preceding columns—which are freed from all known causes of variation excepting changes in the azimuthal adjustment. The mean of these last quantities for all days is next entered for each star, and in column 16, under head Aa_2, are given the differences obtained by subtracting each daily reduced observation from the mean of all. These last quantities when divided by A—the azimuth-constant of the star—afford a_2, which represents (in terms of the telescope micrometer) the deviation correction for one night, minus the mean of such corrections for all nights. The weight of a_2, in column 18, was assigned on a system which will be explained hereafter.

In the next four columns are entered: (1) the absolute deviation correction found in *Table II* for each day on which the star being treated was observed; (2) the mean of these corrections for all such days; (3) δa_1, the difference of the last two columns; and (4) the weight of δa_1, which will be referred to again. The quantities δa_1 are obtained by subtracting the mean, from each value, of a_1, and represent exactly the same thing as those called a_2, the former being deduced from one set of star observations, and the latter from another. The last operation is to combine δa_1, and a_2 according to their weights, and add the results for each day to the mean a_1. This is carried out in the last column, where the quantities therefore represent the daily value of deviation correction, deduced from the observations of well-known stars, combined with those of comparative-azimuth stars. It is to be noted that when there is no quantity a_1, or value of absolute deviation correction, on a day when a comparative-azimuth star was observed, the reduced observation of the latter for that day must not be used in taking out the mean in column 15, a fact which is always pointed out in a foot-note. If this were not attended to, the mean position of the telescope as indicated by comparative-azimuth stars, would be compared with that deduced from circum-polar stars for a different period. The clock-rates employed in this table for reducing the comparative-azimuth star observations to that of the first day, were obtained from the observations of stars near the zenith on successive days, corrected by the value of deviation correction as deduced from fixed stars alone.

February 1st, 1877, was cloudy at Vizagapatam, and 51 Cephei was the only star observed for azimuth, and the observation obtained was therefore treated somewhat as that of a comparative-azimuth star, and compared with a similar one of the day before to obtain the change in azimuth, see *Table III* page 22, where the change of azimuth between January 31 and February 1, is computed, and entered under a_2, as $-$ 6^d·4*. The operation cannot be carried out further in this Table because of the absence of a value of a_1 for that day, but it is completed and explained in a foot-note in *Table IV*.

10.

Explanation of Table IV—"Deduction of $\mathfrak{a}$ the Final Value of Deviation Correction†."

In this table are abstracted the results obtained in *Table III* for each comparative-azimuth star observed, the mean of which, combined according to their weights, affords the final value of deviation correction for the day, which is called a. During the measurement of the arc Bolarum-Bombay, and the first part of that of Bellary-Bombay, no comparative-azimuth stars were observed, and the quantities entered for a are those obtained directly from known stars.

11.

Assignment of the Weights of Azimuth Observations in Tables II and III.

The weights used in the reduction of azimuth observations were assigned in the following arbitrary manner. During season 1875-76 a probable error of observation (*p.e.*) was assumed empirically for each star used for azimuth determinations, as follows. For close circum-polar stars observed in pairs, $p.e. = \pm \frac{\epsilon}{\sqrt{n}}$; for all comparative-azimuth stars, except B.A.C. No. 4222, $p.e. = \pm \frac{\epsilon}{\sqrt{\frac{n}{2}}}$; for star B.A.C. No. 4222 (of 20° N.P.D.) $p.e. = \pm \frac{\epsilon}{\sqrt{\frac{n}{3}}}$; for α and θ Ursæ Majoris, η and ι Argûs, $p.e. = \pm \frac{\epsilon}{\sqrt{\frac{n}{8}}}$; and for all stars within 20° of the zenith, $p.e. = \pm \frac{\epsilon}{\sqrt{\frac{n}{16}}}$: n being the number of wires observed. On this hypothesis the probable error of a determination of deviation correction by a pair of

* This quantity is erroneously printed + 6^d·4 in *Table III*.

† In the heading of *Table IV*, the word "Error" was used by an oversight instead of "Correction".

circum-polar (or other well-known) stars was computed. Thus for a value deduced from observations of δ Ursæ Minoris on three wires, and 51 Cephei on five wires, the *p.e.* was $\pm \frac{1}{2}\sqrt{\frac{\epsilon}{3}+\frac{\epsilon}{5}}$. Similarly the probable error of an observation of a comparative-azimuth star on nine wires, finally reduced, was $\pm \frac{\epsilon}{\sqrt{\frac{9}{2}}}$.

It may be remarked that the symbol ϵ here used, is an adopted mean probable error of observation of a star over one wire, expressed in time. This error increases in proportion as the N.P.D. (and therefore the rate of motion) of the star decreases, but its effect on azimuth observations decreases in a more rapid ratio, and it was considered that the latter effect would be approximately represented by using the same quantity ϵ for all stars, while varying the denominator of the fraction expressing probable error inversely as the rate of motion of the star. As these probable errors were only required in order to compute combination weights for the several observations, no value of ϵ was necessary, and it remains therefore a mere symbol.

From the probable errors so arrived at a weight was found for each observed value of a_1, and also for the finally reduced observation of each comparative-azimuth star. No attempt was made to deduce from these (avowedly empirical) figures the resulting theoretical weights of δa_1 and a_2, but these compound quantities were combined with the weights belonging to the corresponding observations for the day; *i.e.* the weight of a_1 was assigned to δa_1, and the weight of the comparative-star observation to a_2. Lastly, in combining the results arrived at in *Table III* to obtain the final value of a—which is done in *Table IV*—the results by the different stars were used with the weights of the corresponding values of a_2.

It was afterwards concluded that this system had the fault of assigning too high a weight to the comparative-azimuth stars, which led to the endeavour to improve it during the next season's operations, *viz.*, those of 1876-77, in the following manner.

The actual probable error of an observation *on one wire* was approximately determined by experiment for each of the stars used in azimuth observations, which were arranged for the purpose in groups; then supposing these probable errors for two stars, observed above and below the pole, to be e, and e_1; the number of wires observed to be n, n_1; and the azimuth-constants to be A, A_1; the value of deviation correction, or a_1, deduced from the pair has a probable error, $E_a = \pm \frac{\sqrt{\frac{e^2}{n}+\frac{e_1^2}{n_1}}}{A - A_1}$.

The comparative-azimuth stars were weighted on a different system. From the manner in which these stars are employed, the results are affected by errors in adopted clock-rate corrections, and changes in personal equation from day to day, which do not enter—or enter in a much smaller degree—into the observations of pairs of circum-polar (or other) stars as used for deducing a_1, and it is therefore evident that probable errors deduced simply from the comparison of observations over individual wires reduced to the central wire, if assigned to comparative-azimuth stars, would give their results far higher weights than they deserve for combination with those obtained from circum-polar stars.

The probable errors of an observation over one wire for different stars (which may be called generally, e) may be properly used as measures of the comparative values to be given to the observations of stars over different numbers of wires, although no conclusion can be drawn from them as to the probable error of the deduced time of transit of a star—*i.e.*, the mean time by all wires observed. Let the latter probable error be called E (generally). Then E includes the errors arising from inaccuracy in the collimation, level, and deviation corrections applied in the reduction of the observation, and also from variations in the personal equation of the observer, none of which it is evident affect the amount of e. The number of wires over which the star is observed must also of course affect the value of E—or in other words e is included in E—but in a degree insignificant in comparison with the uncertainty arising from the other sources mentioned. An approximate mean value of $E, = \pm 0^s \cdot 13$, for all fast moving stars, was obtained from a discussion of the results of the season 1875-76. For the same class of stars the mean value of e was found to be about $\pm 0^s{\cdot}04$, and as E was evaluated from transits of stars taken over an average of at least twelve wires each, the effect of e—say, $\pm \frac{0^s{\cdot}04}{\sqrt{12}}$—on the value of E so arrived at may be considered inappreciable.

The finally reduced observations of comparative-azimuth stars, as employed, are affected by all the sources of error which affect the value of E, except that due to uncertainty of deviation correction, for which reason an average probable error considerably smaller than E might fairly be assigned to each; but on the other hand, if the probable error of the observed time of transit of a comparative-azimuth star were deduced directly from such stars (which are slow moving stars) it would certainly somewhat exceed the value of E—*viz.*, $\pm 0^s{\cdot}13$—which was deduced from stars having a much faster rate of motion. Taking both these facts into consideration the probable error of the transit of a comparative-azimuth star was empirically assumed at $\pm 0^s{\cdot}12$, and considered to represent the uncertainty affecting the observation of these stars as a class, not including the value of e peculiar to each. But as the value of e varies considerably among these stars, and as also the number of wires on which they were observed greatly varied, it was thought desirable to take these facts into consideration, and therefore a compound probable error, E_c, was assigned to each finally reduced transit, where $E_c = \pm\sqrt{0^s{\cdot}12^2 + \frac{e^2}{n}}$, n being the number of wires on which the star was observed.

Having now an assumed value of probable error E_c (generally) for each reduced observation of a comparative-azimuth star, and E_a (generally) for each observed deviation correction a_1, theoretical probable errors were not computed for a_2 and δa_1 but these were combined as before with the weights derived from the corresponding values of E_c and E_a. Lastly, in deducing the final value of a in *Table IV*, the values arrived at in *Table III* were combined with the sum of the weights of a_2 and δa_1. By this method the weights assigned to comparative-azimuth stars are very much smaller, in proportion to those given to the results by circum-polar stars, than was the case in season 1875-76.

An examination of the results of the system just explained, proves that the observations of comparative-azimuth stars so treated afford excellent values of deviation correction, for there is a close general agreement between the values of a_2, and the corresponding quantities δa_1. It has been already remarked, that the use of such stars is a great comfort to an observer whenever the sky is not quite clear about the pole, because when he has obtained a good comparative-star observation he knows that his night's work is safe, as regards the deviation correction. For these reasons their systematic use is recommended, in low latitudes, whenever a referring mark is not available. On the other hand the reductions show, that when an absolute value of deviation correction has been obtained from a pair of well-known circum-polar stars, the use of comparative-azimuth star results to combine therewith is superfluous, and the labor of carrying out the combination is thrown away.

The conclusion is, that while guarding against contingencies by the employment of comparative-azimuth stars when observing in low latitudes, the trouble of reducing the results should never be undertaken, except to deduce a value of deviation which cannot otherwise be satisfactorily obtained.

12.

Clock Comparisons.

The next four tables contain the results of the clock comparisons taken during 1875-76, so far as they are required in the subsequent reductions; *viz.*, for the first arc Bolarum-Bombay only. These comparisons were carried out on two systems, known as 'Comparison of Clocks by Longitude Signals', and 'Direct Comparison of Clocks', respectively, which will now be described, the arrangement of the tables in which their results are embodied and reduced being at the same time explained.

13.

Table V.—"Comparison of Clocks by Longitude Signals."

In the comparison of clocks by longitude signals a double key was used, which was constructed with a view to breaking two circuits simultaneously, thus affording two synchronous signals. At the station transmitting signals for comparison the double key was connected: (1) with one of the pens of the local chronograph so as to record signals thereon, and (2) with the translating relay (see page 20, Section 6) so as to transmit signals to the distant station; while at the same time the clock was connected to record local time by the other pen. The corresponding arrangement at the distant station, for receiving the signals, was as follows. One pen was connected with the receiving relay, so as to record the signals received, while the other was in the circuit of the local clock and recorded local time. The observer at the transmitting station then made a series of signals with his double key—generally twenty in number, at varying intervals so as to assist the recognition of individual signals in case of the failure of some of the series—which were recorded on both chronographs, and could therefore be read off in terms of each clock. Supposing the action of the double key to be perfectly synchronous, and the record of the two signals on the local and distant chronographs also to be simultaneous, each double signal so recorded would afford an exact difference between the clock times at a particular instant. The effect of any want of synchronism in the action of the double key was guarded against by exchanging the duties of its two members, and that of the retardation of the signal in reaching the distant station—generally spoken of as the 'retardation' simply—was cancelled (so far as possible) by transmitting the signals from the two stations in alternate sets.

Table V contains the times of these signals as read from the two chronographic records, each full comparison consisting of four sets of signals, two sent in each direction. The direction of transmission of signals from East to West (E to W) or *vice versâ*, and the sign of the pen equation (Q) at both stations, are given above the columns containing the corresponding times of each signal by the two clocks. At the foot of each column the mean time* is taken out, and corrected by the proper value of Q. Q was obtained by direct measurement at each station (*vide* page 22) and it will be observed that its sign was systematically reversed—by exchanging the duties of the two pens of each chronograph—with a view to eliminating any residual error in its value.

14.

Table VII.—"Reduction of Comparisons of Clocks by Longitude Signals."

The reduction of the comparisons by longitude signals is continued in *Table VII*, where the corrected mean times are abstracted from *Table V*, and their differences, d, taken out. To afford epochs for reference the time by east clock is always used, and the mean time of each comparison by that clock is called t_E, which it is only necessary to use to the nearest second. The direction of the signals, from which each value of d is obtained, is indicated, and the mean value of d is taken out for each comparison. The next step is to obtain a relative hourly rate correction for the clocks, from the successive mean values of d, and the corresponding epochs t_E. This correction—called R—is considered to belong to the mean of the two epochs from which it is derived. R_1 is then interpolated from R for each epoch t_E, and lastly each

* As the expression "mean time" will be constantly used, the reader is warned once for all, that mean *solar* time is never referred to. The term 'mean time' always indicates the mean of several values of time.

value of R_1 is employed to correct the values d of the group to which it belongs, so as to clear them from the effect of relative clock-rate. The sign of R—or R_1—is always such, that if applied to correct the rate of the west clock, it would cause it to keep time with the east clock. The reduced values of d are entered as d_1, and temporarily named α, β, γ, δ, in each group; α and γ being always obtained from signals transmitted from east to west, while β and δ are derived from those in the reverse direction.

Now as the differences d are obtained by subtracting the time of west clock from that of the east clock, it follows that the retardation of a signal through the line will cause d to appear too great, or too small, according as the direction of transmission is from west to east, or east to west; and the difference between two values of d obtained from signals in opposite directions, will represent the sum of the two retardations, which must be considered equal to each other, as there is no possibility of separating them. The difference between two values of d_1 will give the same quantity cleared of the effect of relative clock-rate.

Hence the formula is arrived at, which is given at the head of the next column—

$$\text{Retardation} = \frac{\beta + \delta}{4} - \frac{\alpha + \gamma}{4}.$$

Again, on the supposition of equal retardation in the two directions, it follows that its effect must be eliminated from the mean of a set of differences derived equally from signals in each direction, which mean therefore represents an exact difference between the two clock times. The last column contains clock differences, D, interpolated from the means of d for certain epochs, T_E, at which they will be required in the course of subsequent reductions.

It is evident that for this purpose the means of d_1 might equally well be used, as they are in fact identical with the means of d, but the latter are mentioned, because, for the purpose of computing D, the use of R_1 and d_1 is superfluous, these quantities being merely introduced in order to determine the retardation. The values of retardation are not as a rule required for purposes of reduction, but they are of interest, and their accordance *inter se* affords some test of the accuracy of the process of comparing clocks.

15.

Table VI.—" Direct Comparison of Clocks."

For the direct comparison of clocks no hand signals were employed, and the method was as follows. The clock at the east station—generally known as E clock—was put in circuit with the translating relay, so that its beats were transmitted to the distant (or west) station for about $1^m\ 15^s$, during which time these signals were received at the west station by the receiving relay, and recorded on the chronograph by one pen, while the local (or W) clock time was recorded alongside by the other pen. The procedure was then reversed, a similar set of signals being sent from west to east, and it is evident that a clock difference obtained from the double process must be cleared of the effect of retardation, considered equal in both directions. In order to eliminate the pen equations, a second exchange of signals was repeated exactly as above, except that the pens of the receiving station were made to exchange duties, thus reversing the sign of the equation. Such a set of four simple comparisons was considered a 'full comparison', which was always secured—by repetition if necessary. The comparison was transcribed from the chronographic record at the receiving station, by reading the integral second-signals of the distant clock, in terms of those recorded by the local clock, read to the nearest hundreth part of a second, and the results are given in *Table VI.*

The headings show the station—E, east, or W, west—at which the comparison was made, and at the head of each column the sign of the pen equation, *Q*, is entered. In the columns are given the decimal parts which must be added to each second recorded by the local clock, in order to obtain its time corresponding to the next later second received from the distant clock, and at the foot of each column the full corresponding mean time of the signals transcribed is given for each clock. The mean time of the transmitting clock—*i.e.*, the time by E clock for a comparison made at W, and *vice versâ*—is always entered to an integral second, being the mean of the integral seconds transcribed. The corresponding mean time of the clock at the comparing station, is composed of the corresponding time to the next earlier integral second, *plus* the mean of all the decimal portions read off the record, and entered in the upper part of the column. The difference between these mean times is taken out at the foot of the table, and affords an approximate clock difference from which the effects of pen equation and retardation have still to be eliminated, which is done in *Table VIII.* It will be noticed that the number of clock signals read off for comparison is always twenty, while their mean is entered as an integral second, which is manifestly impossible as the exact mean must in every such case comprise a half second. This departure from rigorous procedure was permissible for the convenience of computing, because the relative change of clock times during half a second—the difference between the epoch used and the true epoch—is quite inappreciable. Although each comparison extended over about $1^m\ 15^s$, it was considered amply sufficient to use only twenty of the recorded signals, but the possession of the larger number was an advantage in affording a choice of the portion of the minute, and the part of the chronographic revolution—which occupies a period of two minutes—to be selected for the comparison, with a view to cancelling the effects of any imperfection in the toothed-wheels of the clocks which generate the signals, or any recurring irregularity in the rate of the chronograph. In the decimal readings of each second a regular alternate change of amount is sometimes apparent, which is due to one, or both, of the clocks having been slightly out of beat. The pen equation Q is always the quantity which should be applied to the time of the distant clock, in order to reduce it to that of the local clock, on the chronographic record.

16.

Table VIII.—"Reduction of Direct Comparisons of Clocks."

The reduction of the results obtained from the direct comparisons of clocks is carried out in *Table VIII.*

The observed differences are abstracted from *Table VI* under the head d, with the direction of signals from which each is derived, while the corresponding times by east clock are entered to the nearest second in the preceding column, and the mean of the latter—called t_E—is taken out for each comparison. The remaining columns correspond exactly to the similar columns of *Table VII*, and require no further explanation except as regards the deduction of the pen equations.

It is evident that the quantities d_1 marked α and γ differ by double the pen equation at W station, while β and δ differ by double that at E station, whence the value of each pen equation is deduced. The pen equation is a very constant quantity only liable to minute accidental variations, except when sometimes altered on purpose.

17.

Remarks on the Comparative Merits of the two Systems of Comparing Clocks.

A few remarks may be here made on the comparative merits of the two systems of comparing clocks which have just been explained. The method by longitude signals was introduced at the beginning of season 1875-76 for three chief reasons, *viz.*, (1). At that time no translating relay was used, and consequently, in order to transmit a clock signal to the distant station, the current of the powerful line battery had to be passed through the break-circuit apparatus of the clock, which was held to be objectionable, and the necessity for it was obviated by the adoption of the double key for making longitude signals. (2). With a view to the observations by means of sub-marine cables, which were at that time in prospect, it was thought advisable to practise a method of comparison which did not require any connection of the clocks with the line wire. (3). The transcription of a comparison by the direct method is apt to be the repetition of nearly the same fraction of a second over and over again—unless the relative clock-rate is abnormally large, or the apparatus is working irregularly—which seemed to render possible the occurrence of a constant error of reading.

The use of longitude signals was found more difficult to carry out in practice, and the transcription and reduction of comparisons effected by such signals are more laborious, than in the case of the alternative system of direct comparison, and the chief objection to the latter having been removed at the very outset of the operations, by the introduction of the translating relay, it was adopted for regular use.

18.

Table IX.—" Abstract of Observed Values of Personal Equation between Captains Campbell and Heaviside."

Table IX contains an abstract of the individual values of personal equation observed during 1875-76-77, by the method of divided transits with the same telescope, as described in Chapter V, Section 2. The heading of the table shows which transit telescope was in use, and the results are entered in two groups according as the stars observed were of north or south aspect, while lastly, the observations are entered under the dates on which they were made, in three columns: the first giving the number of the star in the British Association Catalogue; the second, its declination; and the third, the difference in seconds of time between the reduced transits by the two observers, the time by Captain Heaviside being always subtracted from that by Captain Campbell. This difference is the observed personal equation, and is called $C_N - H_N$, or $C_S - H_S$, according as it is derived from stars of north, or south aspect. The mean of each group, with its probable error, is taken out.

19.

Table X.—" Deduction of the Final Values of the Relative Personal Equation between Captains Campbell and Heaviside."

In *Table X* the mean results given in *Table IX* are abstracted in two divisions, according to the aspect of the stars observed; the dates, telescope used, and mean values of the equation with their weights being given. The general means arrived at by using combination weights are entered, and the final values of the equation adopted for use in the reduction of the observations are added in notes.

20.

Table XI.—" Abstract of Observed Values of the Absolute (N — S) *Equations."*

During the season 1876-77, as explained in Chapter V, each observer made a point of observing a few zenith stars every night under both north and south aspects, in order to obtain a value of the absolute equation—which is called the 'N—S' equation—peculiar to himself, depending on the aspect of the star observed, or, in other words, on the direction of its apparent motion. The results of such observations are given in *Table XI*, which is arranged in groups for each station, showing the British Association Catalogue number of the star used, and the difference between the two observed times, that obtained under south aspect being always subtracted from the other. The mean of all these differences at each station is taken out, and adopted as the N — S equation for that set of observations, the use of which will be explained hereafter. The general symbol, N — S, indicates a correction to be added to the times of transit of stars observed under south aspect, before they are compared with those derived from stars of north aspect.

21.

Reduction of Star Observations—Explanation of Terms M, $\Delta L - \rho$, *and* $\Delta L + \rho$.

In *Tables XII, XIII* and *XIV*, the star observations are given in abstract, and their reduction is carried out to the determination of the quantities M, $\Delta L - \rho$, and $\Delta L + \rho$, the meanings of which will now be explained.

The quantity M only occurs in the case of measurements made on the system of transits taken with local clocks and combined by clock comparisons, and is therefore only used for a portion of the first arc, Bolarum–Bombay, measured in 1876, the reduction of which is contained in *Table XII*. The same stars were always observed at both stations, and the difference of the times of transit reduced for all instrumental errors is taken out, subtracting the time observed at the east, from that at the west, station. The mean of such differences for a group of observations, corrected for clock-rate and the observers' relative personal equation, is called M. If both clocks were exactly correct, and there were no errors of observation, it is evident that M would disappear.

The quantities $\Delta L - \rho$, and $\Delta L + \rho$, are the results deduced in *Tables XIII*, and *XIV* from observations on the system adopted for all the land measurements of 1875-76—except a portion of the first as above mentioned—when the transits were taken at both stations with the same clock, the same stars being observed at both stations as before. $\Delta L \mp \rho$ (generally) is the difference between the corrected times of transit of the same star observed at the two stations, the time at east, being always subtracted from that at west, station. Here it is evident, that if the clock in use were perfectly rated to keep true time, and if its beats were recorded at both stations synchronously—and if also there were no errors of observation, including personal equations—then the difference between the times of transit of the same star at the two stations, would be exactly equal to the difference of longitude, called ΔL. But the result actually obtained is affected—in addition to errors of observations—(1) by the rate of the clock used, during the interval between the transits at the two stations, and (2) by the retardation of the beats of the clock transmitted through the wire to the distant station. A correction for clock-rate is applied in these tables, but the retardation—which is called ρ—remains for elimination at a later period.

Tables XV and *XVI*—containing an abstract of the observations of season 1876-77—correspond to *Tables XIII* and *XIV*, with slight differences which will be hereafter explained, and the above remarks apply equally to them.

22.

The Sign of ρ.

The correction for ρ changes its sign according to the clock in use. The retardation always causes the times of observations made at the far station—*i. e.* the station receiving the clock beats through the line—to appear slow as compared with those obtained from the clock locally, *i.e.*, at its own station, because the time at the far station is recorded by beats of the clock, which are generated an instant earlier than they are received, the interval being ρ. Therefore whichever clock is in use, the correction ρ must be applied to increase the time observed at the distant station, and as the difference between the observed times of transit is always obtained, in *Tables XIII* to *XVI*, by subtracting east, from west, time, the correction it requires is $+\rho$ when east clock, and $-\rho$ when west clock, is used. It should be noted that the quantity ρ includes all sources of retardation, those arising from the instruments employed in the observatories—to generate the signals transmitted, or to record those received—as well as the simple time of transmission of a signal through the line wire between the stations, and there can be no doubt that the latter portion is not only a minute fraction of the whole, but also very constant in amount.

There is no way in which ρ can be determined separately for each clock, *i. e.* for the transmission of signals in opposite directions through the line, and it is therefore necessary to consider it the same for both. Any variation from such equality is probably very small in proportion to the whole quantity, and as it arises chiefly from irregularities in the action of relays and chronograph pens in the observatories, it must be itself irregular, and liable to elimination in a course of observations. As the largest value of 2ρ, found throughout the operations of 1875-76-77, only amounted to $0^s.08$, it may be safely assumed that any variation to which it was liable cannot have had an appreciable effect on the results of the observations. The arrangement of *Tables XII* to *XVI* inclusive, is so nearly the same, that one explanation will suffice for the greater portion of all.

23.

Explanation of Tables XII, XIII, XIV, XV and XVI.

These tables are arranged in groups, each containing the results of the measurement of one Arc. The first group, containing the reduction of the arc Bolarum–Bombay, comprises *Tables XII, XIII* and *XIV*, of which *Table XII* is devoted to the "Observations of Transits with Local Clocks, and Deduction of the Corrected Difference of Observed Times, M." This table does not occur again, as the system of observation by local clocks was not again employed. *Tables XIII* and *XIV* contain respectively the reduction of the observations taken with East, or West, clock in use at both stations, and these tables recur in pairs for all the arcs measured in 1876. In 1877 a slight change having been introduced in the application of personal equation, a corresponding alteration was required in the tables containing the results, and *Tables XV* and *XVI* were substituted for *XIII* and *XIV*.

At the head of each table the stations, with their approximate latitudes and longitudes, are entered, and below this, the central part of the body of the table is divided into two halves—the left hand, and right hand portions being assigned to the observations at the east, and west station, respectively—outside which both to the left and right are some columns common to both stations.

Beginning from the left hand,

Column 1, contains the astronomical date.

„ 2, contains the number of the star observed in the British Association Catalogue.

„ 3, contains the star's approximate declination.

Columns 4 and 9, contain the aspect under which the star was observed at each station; N. and S. meaning that the observer sat facing the north, or the south, respectively.

„ 5 and 10, contain the position of the instrument, and the correction-constants for each group of observations. The letters *I.P.E.*, or *I.P.W.*, mean that the illuminated pivot of the transit telescope was east, or west, respectively, a position that was never altered during the work of one night. c and b are the correction-constants for collimation (including diurnal aberration) and level, abstracted from *Table I.* a is the deviation correction abstracted from *Table IV.* c, b, and a are expressed in divisions of the micrometer. Q is the correction for pen equation, in seconds of time, the sign of which occasionally changes during a group of transits, in which cases it is marked $\pm$, and a foot-note is added to indicate when the alteration occurred. This occasional change of sign arose from a misconception on the part of one of the observers as to the grouping of the stars observed, combined with the systematic change of the sign of Q, by both observers, between two groups. It was thought better to retain an observation disagreeing with the rest of its group in the sign of Q, than to lose it altogether, which was the only alternative.

Columns 6 and 11, contain the "Mean Observed Time" of transit at each station. The transit of a star was generally observed over fifteen wires, the individual observations were reduced to the central wire, and the mean of all is here given. These reductions are effected by multiplying the known equatorial wire-intervals by the secant of the declination of the star observed, and applying the products to the observed times of individual wires, by addition or subtraction as the case may be.

„ 7 and 12. In these columns, under the head of "Total Correction", the sum of the instrumental corrections at each station is entered. The total correction includes the corrections for collimation, level, deviation, and pen equation, or Q. With the data afforded—*viz.*, the latitude of the station, the declination of the star, the value of the telescope micrometer (*i.e.*, $1^d = 0^s.0225$, as noted at the foot of each page of these tables) and the constants c, b, *a* and Q, the separate corrections can be computed, and the quantities in columns 7 and 12 checked.

„ 8 and 13, contain the seconds of the corrected times of transit, obtained simply by taking the sum of the two preceding columns.

Column 14, contains the difference between the corrected times at the two stations, east being always subtracted from west, time.

„ 15, contains the mean of each group in the preceding column.

„ 16, contains a correction required on account of clock-rate, as follows:—The quantity M arrived at in *Table XII* will afterwards be combined with an absolute clock-difference, D, deduced from clock comparisons for an epoch, T_E, by east clock time. The difference of corrected times entered in column 14, is a difference between the time shown by east clock at a certain moment, and that by west clock at an instant later than the former by the exact difference of longitude between the two stations, or the interval between the transits of the same star at the two stations. It is thus evidently affected by the rate of the west clock during that interval, for which it must be corrected before it can be combined with D. The quantity in column 15 of *Tables XIII, XIV, XV* and *XVI*, requires a similar correction for the rate of the clock in use, because this quantity is a direct difference between two observed times by the same clock, and is therefore affected by the rate of that clock during the interval between the observations. The corrections for rate used in these tables are deduced in *Tables XVII* and *XVIII*. After the sixteenth column the arrangement of the tables under notice, *viz.*, *Tables XII* to *XVI*, becomes different, and the remaining columns must be separately explained.

24.

Explanation of Tables XII to XVI.—(Continued).

In *Tables XII, XIII* and *XIV*, the seventeenth column contains a final correction for the observers' relative personal equations. Separate equations are used for stars of north and south aspect, the values of which are abstracted from *Table X*, and entered at the head of column 17. These two equations are then combined in proportion to the numbers of stars of each aspect observed in a group, and a correction is computed for application to the mean result of the group, and entered in column 17. The sign of this correction must of course depend on the relative positions of the observers. It will be noticed that all the stars used in these tables are observed under the same aspect by both observers.

In *Table XII* the last column contains the sum of the three preceding columns, and this quantity, which is called M, is the finally corrected mean difference of the two clock times, of the transits of a group of stars observed at both stations. The epoch to which M is considered to belong is the mean time of transit of the stars observed, which is taken out for each group by the east clock, and entered in column 6, as T_E. The reduction carried on in *Table XII* is continued in *Table XIX*, where the difference of longitude is arrived at.

In *Tables XIII*, and *XIV* the last column contains as above the sum of the three preceding columns, which is now called $\Delta L - \rho$, or $\Delta L + \rho$, according as it is deduced from observations by the east, or west clock, and represents the difference of longitude under observation, corrected for everything except the retardation of the clock signals between the stations. The combination of the several values of $\Delta L - \rho$, and $\Delta L + \rho$, obtained on different nights of observation, is carried out in *Table XX*, where the final values of the difference of longitude ΔL, and of retardation ρ are deduced.

25.

Tables XV and XVI—Deduction of $\delta L_N - \rho$, *and* $\delta L_N + \rho$, *during Season* 1876-77.

Owing to the recognition of a distinct personal equation for each observer, between his own observations of stars of north and south aspect, and the determination of its value by special observations for use in the reductions of the season 1876-77, slight changes in the method of executing these were introduced.

In *Tables XV* and *XVI*—which otherwise correspond exactly to *Tables XIII* and *XIV* of the preceding season—no correction is applied for the *relative* personal equation of the observers, which remains to be done at a later period, but each observer's *absolute*, N — S, equation—as given in *Table XI*—is entered at the head of column 17, and used to compute a correction, which, when applied to the mean difference of corrected times deduced from stars of both aspects combined, affords that difference as it would have stood if all the stars of south aspect had been observed as north stars, by both observers. This correction is entered in column 17, with a sign depending on the relative position of the observers.

The last column of each table contains the sum of the three preceding columns, entered under the head of $\delta L_N - \rho$, or $\delta L_N + \rho$, according as it is deduced from observations with east, or west clock, respectively, and each such quantity is a supposititious apparent difference of longitude, as deduced from the observation of all stars, when considered to have been observed on north aspect only. Corrections are still required for the relative personal equation of the observers, and for the retardation of the clock signals between the stations, which are applied in *Table XXI*, where the final values of the difference of longitude ΔL, and of retardation ρ, are deduced.

26.

Explanation of Tables XVII and XVIII—Deduction of Clock-Rate Corrections.

The clock-rate corrections used in *Tables XII* to *XVI*, are deduced in *Tables XVII* and *XVIII*, as explained below.

Clock-rate corrections for the intervals between nights of observation were found by comparing the corrected transits of the same stars on successive days, and entered in *Table XVII* under the head α. In doing this the effect of changes in the right ascensions of the stars observed was not lost sight of, but this effect—as computed by Bessel's Independent Quantities—was found in all cases to be quite inappreciable. For all the arcs measured on the system of using the same clock at both stations—*i.e.*, all except Bolarum-Bombay—two values of the rate-corrections, α, were available for each clock, and from the means of these quantities, hourly rate-corrections, β, were interpolated for each night of observation. The correction to be applied to the difference of observed times of transits, is simply the quantity β for the night, multiplied by the difference of longitude in decimals of an hour, and these products are shewn in *Table XVII.*

For the arc Bellary-Bombay, *Table XVII* is not quite complete, owing to an alternation in the duties of the two clocks, which was at first practised. In the case of the arc Madras-Bellary, the uniformity of the table is marred by the fact that no observations with the west clock were obtained on 29th March, and none with the east clock on 1st April. Explanatory notes are entered under the head of remarks where they seem necessary.

For the arc Bolarum-Bombay there is only one set of rate-corrections deduced from star observations for each clock, but the clock comparisons can be used for combining them by the process carried out in *Table XVIII,* where the hourly rate-corrections computed in *Table XVII* under the head, β, are entered under the heads of r_e and r_w. Next, the clock comparisons, *Tables VII* and *VIII,* afford R, which is the hourly correction required to be applied to the rate of west clock, to make it keep time with east clock. It is therefore evident that the equation $R = r_w - r_e$ should hold good if these three quantities were quite correct, and this affords a second value for each of the rate-corrections obtained from star observations, *viz.*, $r_w - R$, and $R + r_e$, corresponding to r_e, and r_w, respectively. In *Table XVIII* these corresponding values of the same rate-corrections are combined, and the means, called r_E, r_W, in columns 5 and 6, are adopted as the final rate-corrections to be used for computing the corrections entered in column 16, of *Tables XII, XIII* and *XIV,* which is carried out in the last two columns of *Table XVIII,* where these corrections are given.

27.

Table XIX.—" Deduction of the Difference of Longitude, ΔL, *from Observations of Transits with Local Clocks, combined by Clock Comparisons."*

In *Table XIX* the reduction is completed for the first portion of the measurement of the arc Bolarum-Bombay, *viz.*, those observations made with the clocks used locally, for combination by means of the clock comparisons. In the first three columns the dates, and the positions of the two instruments are noted. The fourth contains the mean, T_E, of all the observed times of transit at east station for each group of stars, and the fifth column contains the corresponding values of M; both T_E and M are abstracted from *Table XII.* The sixth column contains the value of D, corresponding to T_E, abstracted from *Table VII* or *VIII.* D is the absolute difference between the clocks at the instant T_E, as deduced from the clock comparisons, the time by the west clock being subtracted from that shown by the east clock. If the clocks were both errorless, D would be equal to the difference of longitude, ΔL, and as it stands it is equal to ΔL, plus the error of the east clock, minus that of the west clock. Again, M is the difference between the means of the times of transit of the same group of stars observed at both stations—the time observed at east being subtracted from the time at west station—reduced to the above epoch T_E by the necessary corrections for clock-rate. If both clocks were errorless M would vanish, and as it stands it represents the error of the west clock, minus that of the east clock, at the instant T_E. Hence it follows that $\Delta L = D + M$, and the values of ΔL so obtained are given in the seventh column. Lastly, the means of these are taken out in two groups, according to the position of the telescopes, and the mean of the two values so arrived at is the final value of ΔL obtained from this portion of the measurement.

28.

Table XX.—" Deduction of the Difference of Longitude, ΔL, *and the Retardation of Signals,* ρ, *from the Observations of Transits at both Stations with the same Clock, Season* 1875-76."

The final deduction of ΔL from the observations of season 1875-76, in which the same clock was used at both stations—*viz.,* for all the measurements except the portion of Bolarum-Bombay treated in

Table XIX—is carried out in *Table XX*. The first three columns of this table give the dates and instrumental positions; the fourth and fifth contain the mean values of $\Delta L - \rho$, and $\Delta L + \rho$, abstracted from *Tables XIII* and *XIV*, respectively. Lastly, ΔL and ρ are deduced by combining the quantities $\Delta L - \rho$, and $\Delta L + \rho$, in two groups according to the position of the instruments, and a final mean value of each is obtained. In one instance, *viz.*, the measurement of the arc Madras-Bellary, the positions of the instruments were not changed simultaneously at the two stations, and accordingly the results cannot be treated in two groups, but all are reduced together. In the case of Bolarum-Bombay, the difference of longitude is finally arrived at by taking the mean of the two values of ΔL deduced in *Tables XIX* and *XX*, and the result is entered at the foot of the former table.

29.

Table XXI.—"*Deduction of the Difference of Longitude,* ΔL, *and the Retardation of Signals,* ρ, *from the Observations of Transits at both Stations with the same Clock, Season* 1876-77."

In *Table XXI* the reduction of the observations of Season 1876-77 is continued from *Tables XV* and *XVI*, in which the quantities $\delta L_N - \rho$, and $\delta L_N + \rho$ remained uncleared of the effects of relative personal equation. The first two columns give the dates and instrumental positions. In the third and fourth the mean values of $\delta L_N - \rho$, and $\delta L_N + \rho$ are abstracted from *Tables XV*, and *XVI*.

The general means of the quantities $\delta L_N - \rho$, and $\delta L_N + \rho$ are found by taking their values in two groups according to the position of the instruments, and from these means δL_N and ρ are deduced. The quantity δL_N is now corrected by the relative personal equation for stars of north aspect, with its proper sign, *viz.*, $C_N - H_N$, or $H_N - C_N$ according to the position of the observers, and the result is called ΔL_N, being the final value of the difference of longitude obtained from the observation of all stars, reduced as if they had been all observed with a north aspect.

Again, from δL_N a corresponding quantity δL_S is obtained by applying to δL_N the difference of the two observers' absolute, N—S, equations, taken from *Table XI*, with the proper sign required by their positions during the measurement. δL_S corrected by the relative personal equation, $C_S - H_S$, or $H_S - C_S$ as the case may be, affords ΔL_S, which corresponds exactly to ΔL_N, only substituting south, for north, aspect. Lastly, having now obtained two values of the difference of longitude—*viz.*, ΔL_N and ΔL_S—which are considered to be equally reliable, their arithmetic mean is adopted as the final value, ΔL. The value of ρ is obtained by taking half the difference between the general mean values of $\delta L_N - \rho$, and $\delta L_N + \rho$.

30.

Reduction of the Observations of Season 1880-81.

The observations of Season 1880-81 were carried out on almost exactly the same system as those of 1876-77, and the results are contained in *Tables XXII* to *XXXII* inclusive, which will now be noticed.

Table XXII—"Abstract of Determinations of Collimation and Level Correction-Constants."—corresponds exactly to *Table I*, and requires no further explanation.

Table XXIII—"Deduction of Deviation Correction, a_1, from Star Observations."—corresponds with *Table II* in every respect except that no weights are assigned to the results arrived at, and whenever more than one value of deviation correction was obtained on the same night, the simple arithmetic mean was adopted. This change of procedure was partly due to the fact, that although comparative-azimuth stars were observed as in former seasons, it was not found necessary to use these observations for the reduction of the work, and therefore the values of absolute deviation required no weights for combination with the results by comparative-azimuth stars. Also, as regarded any discrepancy between values of deviation correction deduced on the same night from different pairs of stars; it was considered so doubtful whether such discrepancy arose from an actual change of instrumental position, or was due to errors in the accepted places of the stars observed, that, bearing in mind the difficulty of assigning weights to these places, it was held best to adopt the simple arithmetic mean of all values obtained. During the season it frequently happened that three circum-polar stars were observed for azimuth, one at one culmination and two at the opposite, in which case the first was always taken out with each of the others. On a few occasions an observation of one star at its lower culmination was similarly combined with those of three stars above the pole. Again on several days two stars close together in right ascension were observed at one culmination, for combination with two others at the opposite culmination at a considerable interval of time apart. As for instance on April 14th, see page 161—when star R. P. L. 98 was reduced with both R. P. L. 12, and Polaris, the mean of the two results being entered against No. 98; and the same course was followed with R. P. L. 99, on the same night.

Table XXIV—"Deduction of the Deviation Correction, a_1, at Jubbulpore on 10th and 13th February 1881." On 10th and 13th February all observations for azimuth were lost at Jubbulpore owing to clouds, except those to R. P. L. No. 60 on 10th, and 13th, and to R. P. L. No. 70 on 10th, and it became necessary to treat these somewhat as comparative-azimuth star observations in order to deduce the deviation corrections for the two nights, which was carried out in *Table XXIV*. Both of the above stars were observed on 9th and 14th February—on each of which nights a value of deviation correction was obtained in the usual way—and these observations were abstracted from *Table XXIII*, and entered in *Table XXIV* for comparison with those made on the 10th and 13th. The method followed in the latter table was exactly the same as that already explained as regards *Table III*, so far as the twelfth column, headed "Reduced Observation" in which the reduced observation for each day is entered, and the means of those for February 9th, and 14th are taken out. In the last column of the table are entered the final values of deviation correction obtained on February 9th, and 14th, with their mean, which represents the mean azimuthal position of the instrument, corresponding to the mean of the reduced observations of these two days which has been already obtained in column 12. In column 13, under head $A \times \delta a_1$, each of the reduced observations on 10th, and 13th February is subtracted from the mean of those on 9th, and 14th; the result is the correction in time required to be applied to the observations of the two former days, in order to correct them for the *change* in azimuthal adjustment on these days as compared with the mean azimuthal position on 9th, and 14th. $A \times \delta a_1$, divided by A, the azimuth-constant for the star, gives δa_1 (in column 14) the corrections to be applied to the mean deviation correction found on 9th, and 14th, in order to give those for the 10th, and 13th, which is carried out in the last column. In this way a value of deviation correction is deduced for the 10th February from stars Nos. 60 and 70, the mean of which is adopted for that night; while for the 13th February only one value, deduced from star No. 60, is available.

Table XXV—"Values of Deviation Correction, a, Finally Adopted."—contains simply an abstract of the results arrived at in *Tables XXIII*, and *XXIV* for easy reference, the mean of the values of a_1 found on each night being adopted as a, the final deviation correction for that night.

There are no tables in the reductions for Season 1880-81 corresponding to *Tables V, VI, VII* and *VIII*, because no clock comparisons were reduced.

Tables XXVI, XXVII and *XXVIII*, containing the results of all star observations for the determination of personal equations, correspond exactly with *Tables IX, X* and *XI*, and require no further explanation.

In *Table XXVIII* no probable errors were computed for the mean results, as in *Table XI*, and these are now given, to allow of a comparison with the former table if desired.

Arc Bombay–Deesa,	$C_N - C_S$	$= + 0^s.041 \pm 0^s.004$,	$H_N - H_S$	$= + 0^s.018 \pm 0^s.006$,
„ Deesa–Kurrachee,	„	$= + 0.026 \pm 0.006$,	„	$= + 0.013 \pm 0.006$,
„ Bombay–Kurrachee,	„	$= + 0.056 \pm 0.005$,	„	$= + 0.026 \pm 0.008$,
„ Jubbulpore–Bombay,	„	$= + 0.041 \pm 0.005$,	„	$= + 0.033 \pm 0.007$,
„ Jubbulpore–Bolarum,	„	$= + 0.055 \pm 0.006$,	„	$= + 0.048 \pm 0.006$,
„ Jubbulpore–Agra,	„	$= + 0.055 \pm 0.005$,	„	$= + 0.060 \pm 0.007$,
„ Jubbulpore–Deesa,	„	$= + 0.071 \pm 0.006$,	„	$= + 0.059 \pm 0.005$,
„ Agra–Deesa,	„	$= + 0.076 \pm 0.009$,	„	$= + 0.051 \pm 0.006$.

There are no tables for Season 1880-81 corresponding to *Tables XII, XIII* and *XIV*, because no observations were made with local clocks for combination by clock comparisons, as reduced in *Table XII*, and the method of reduction followed in *Tables XIII* and *XIV* was not again used.

Tables XXIX and *XXX*—containing "Observations of Transits with E (or W) Clock, and Deduction of the Apparent Difference of Longitudes, $\delta L_N - \rho$ (or $\delta L_N + \rho$)."—correspond exactly with *Tables XV* and *XVI* and require no further explanation.

Table XXXI—"Deduction of Clock-Rate Corrections from the Observations of Transits."—corresponds exactly with *Table XVII*.

Tables XVIII, XIX and *XX* have no corresponding tables in the reductions of 1880-81.

Table XXXII—" Deduction of the Difference of Longitude, ΔL, and the Retardation of Signals, ρ, Season 1880-81."—corresponds exactly with *Table XXI*.

31.

Remarks on the Method Adopted in applying the Corrections for Personal Equations in Seasons 1876-77 *and* 1880-81.

The system followed of dealing with supposititious results, in the work of Seasons 1876-77, and 1880-81, obtained by reducing observations of stars taken under one aspect, as if they had been taken under the other, seems to call for some remark, and perhaps justification. The most obvious advantage gained was the possibility of combining the observations of a star, made under different aspects by the two observers, which would not otherwise have been available for use (see Section 4, Chapter V). Such cases have but seldom occurred throughout the operations, and then only by accident, because it was always considered an object to select only such stars as could be observed at both stations under the same aspect, and the small differences of latitude between the stations made this possible. The loss of results would therefore have been but slight if all observations disagreeing in aspect had been rejected, in which case the method of reduction followed in Season 1875-76 (*Tables XIII, XIV*) would have been continued in 1876-77, and 1880-81. It was considered, however, that the method adopted offered increased chances of eliminating the effects of relative personal equation, a point on which serious doubt must always be felt, owing to the fact that values of that equation can only be determined by star observations, on the rare occasions when it is convenient for the two observers to meet for the purpose, while the equation is certainly liable to variation during the intervals between such determinations. The N−S equation for each observer is a *boná fide* quantity well determined for each arc—as indicated by the small probable errors obtained in *Table XI*, and those given above for the values contained in *Table XXVIII*—and is worthy of quite as much confidence as the determinations of the relative equation between the two observers, while it is moreover obtained *pari passu* with the star observations to which it is applied in the process of reduction. It is also to be noted, that although these N—S equations are deduced from the observations of stars very close to the zenith, they may with confidence be applied to all stars observed for difference of longitude, as these were almost invariably selected within 15° of zenith distance, and the attitude of the observer—which may be supposed to have an effect on his habit of observing—practically varies but slightly within these limits.

ELECTRO-TELEGRAPHIC LONGITUDES

PART I.

INDIAN ARCS

ABSTRACT OF THE OBSERVATIONS

AND

REDUCTION OF THE RESULTS

OF

1875-76, 1876-77 AND 1880-81.

EXPLANATION OF *TABLE I.*

"*Abstract of Determinations of Collimation and Level Correction-Constants.*"

The method followed in making the observations to determine Collimation and Level correction-constants is fully explained in Chapter VI preceding.

The results obtained are given in abstract in the following table, and the meaning of the symbols used therein are here briefly recapitulated.

The contents of the table are divided into groups, one for each arc measured; and, in each group, the left and right hand sides contain data belonging to the East and West stations, respectively.

All the transit wires are movable by the telescope micrometer, on the reading of which, therefore, the collimation of the telescope depends.

Column 1 contains the astronomical date, which is common to both sides of the table.

Columns 2 & 11 contain the names of the stations, and indicate the telescope in use at each.

„ 3 & 12 show the position of the telescopes on each day. *I.P.E.* (or *W*) meaning, Illuminated Pivot East (or West).

„ 4 & 13. Headed C_o. This is the reading of the telescope micrometer, when so set that the centre wire is truly collimated, as found by observation.

„ 5 & 14. Headed C_s. This is the reading of the telescope micrometer as set during the observation of star transits. It is simply a matter of convenience and is generally constant for each station.

„ 6 & 15. Headed c_1. This is the collimation correction-constant. It is equal to $C_o - C_s$, or $C_s - C_o$, when the position of the telescope is *I.P.E.*, or *I.P.W.*, respectively.

„ 7 & 16. Headed c. This is simply c_1 altered to include the correction-constant for diurnal aberration. c is used in combination with each star's constant for computing the correction for collimation, which therefore includes the correction for diurnal aberration.

„ 8 & 17. Headed M. M is the reading of the telescope micrometer when the centre wire, and its reflection by mercury, coincide.

„ 9 & 18. Headed b. This is the level correction-constant. It is equal to $C_o - M$, or $M - C_o$, when the telescope is *I.P.E.*, or *I.P.W.*, respectively.

All these quantities are expressed in divisions of the telescope micrometer head, the values of which are as below

In 1876. Telescope No. 1, 1 division = $0^s.02245$: Telescope No. 2, 1 division = $0^s.02261$
„ 1877. „ „ = 0·02239 : „ „ = 0·02259

The quantities c and b are generally constant for the observations of each night, but it sometimes happens that two values of b are given on the same date. In the latter case the note, "For observations with E. (or W.) clock", indicates which value of b should be used for the group of transits taken with the clock at East (or West) station.

During 1876 the values of c and b were deduced from the observations of each day. In 1877 it was found better to use the mean value of C_0 for each group of observations taken *I.P.E.* and *I.P.W.*, and these means are accordingly shown in the columns for remarks.

Astronl. Date	Station	Instrumental Position	Collimation C_0	Collimation C_s	Collimation c_1	Collimation c	Level M	Level b	Remarks	Station	Instrumental Position	Collimation C_0	Collimation C_s	Collimation c_1	Collimation c	Level M	Level b	Remarks
1876			*d*	*d*	*d*	*d*	*d*	*d*				*d*	*d*	*d*	*d*	*d*	*d*	
Jan. 11	At BOLARUM (Telescope No. 1)	*I.P.E.*	24·7	25·0	−0·3	−1·2	25·8	−1·1		At BOMBAY (Telescope No. 2)	*I.P.E.*	95·1	95·0	+0·1	−0·8	88·5	+6·6	
„ 12		*I.P.W.*	26·7	25·0	−1·7	−2·6	29·3	+2·6			*I.P.W.*	95·6	95·0	−0·6	−1·5	94·9	−0·7	
„ 13		„	25·5	25·0	−0·5	−1·4	28·4	+2·9			„	94·4	95·0	+0·6	−0·3	96·2	+1·8	
„ 14		*I.P.E.*	23·2	25·0	−1·8	−2·7	21·9	+1·3			*I.P.E.*	95·2	95·0	+0·2	−0·7	90·4	+4·8	
„ 16		„	21·7	25·0	−3·3	−4·2	20·0	+1·7			„	95·8	95·0	+0·8	−0·1	94·3	+1·5	
„ 17		„	20·5	25·0	−4·5	−5·4	19·2	+1·3			„	96·3	95·0	+1·3	+0·4	93·2	+3·1	
„ 18		„	22·3	20·0	+2·3	+1·4	18·0	+4·3			„	96·4	95·0	+1·4	+0·5	89·9	+6·5	
„ 19		„	21·3	20·0	+1·3	+0·4	18·1	+3·2			„	97·1	95·0	+2·1	+1·2	88·8	+8·3	
„ 20		*I.P.W.*	26·4	20·0	−6·4	−7·3	32·1	+5·7			*I.P.W.*	94·9	95·0	+0·1	−0·8	95·8	+0·9	
„ 21		„	25·7	25·0	−0·7	−1·6	28·2	+2·5			„	94·3	95·0	+0·7	−0·2	97·5	+3·2	
Jan. 28	At BELLARY (Telescope No. 1)	*I.P.E.*	55·3	55·0	+0·3	−0·6	54·4	+0·9	For observations, with E clock.	At BOMBAY (Telescope No. 2)	*I.P.E.*	96·4	95·0	+1·4	+0·5	96·0	+0·4	
							53·5	+1·8	„ W „									
„ 29		*I.P.W.*	58·1	55·0	−3·1	−4·0	56·1	−2·0	„ W „		*I.P.W.*	94·5	95·0	+0·5	−0·4	98·7	+4·2	
							55·5	−2·6	„ E „									
„ 30		„	59·3	55·0	−4·3	−5·2	56·4	−2·9	„ E „		„	94·1	95·0	+0·9	0·0	94·3	+0·2	
							56·9	−2·4	„ W „									
Feb. 8		*I.P.E.*	56·0	55·0	+1·0	+0·1	51·1	+4·9			*I.P.E.*	95·3	95·0	+0·3	−0·6	96·8	−1·5	
„ 9		„	57·1	55·0	+2·1	+1·2	55·2	+1·9	„ E „		„	96·3	95·0	+1·3	+0·4	97·2	−0·9	
							55·3	+1·8	„ W „									
„ 10		*I.P.W.*	57·5	55·0	−2·5	−3·4	58·8	+1·3			*I.P.W.*	95·2	95·0	−0·2	−1·1	97·4	+2·2	
Feb. 19	At BELLARY (Telescope No. 1)	*I.P.W.*	58·9	60·0	+1·1	+0·2	58·4	−0·5	For observations, with E clock.	At BOLARUM (Telescope No. 2)	*I.P.W.*	100·2	95·0	−5·2	−6·1	95·0	−5·2	For observations, with E clock.
							58·7	−0·2	„ W „							94·9	−5·3	„ W „
„ 20		„	58·1	60·0	+1·9	+1·0	58·8	+0·7			„	100·7	95·0	−5·7	−6·6	93·4	−7·3	
„ 21		„	60·6	60·0	−0·6	−1·5	61·2	+0·6			„	101·1	95·0	−6·1	−7·0	99·5	−1·6	„ E „
																99·0	−2·1	„ W „
„ 22		*I.P.E.*	54·5	55·0	−0·5	−1·4	60·7	−6·2			*I.P.E.*	98·6	95·0	+3·6	+2·7	102·4	−3·8	
„ 23		„	55·3	55·0	+0·3	−0·6	52·1	+3·2			„	98·1	95·0	+3·1	+2·2	100·9	−2·8	
„ 24		„	54·4	55·0	−0·6	−1·5	51·1	+3·3			„	99·4	95·0	+4·4	+3·5	101·2	−1·8	
Mar. 3	At MADRAS (Telescope No. 1)	*I.P.E.*	48·1	50·0	−1·9	−2·8	53·1	−5·0		At BOLARUM (Telescope No. 2)	*I.P.E.*	100·5	100·0	+0·5	−0·4	96·7	+4·8	
„ 5		„	49·6	50·0	−1·3	−0·4	49·4	+0·2			„	100·2	100·0	+0·2	−0·7	100·3	−0·1	
„ 6		„	46·9	50·0	−4·0	−3·1	49·4	−2·5			„	100·8	100·0	+0·8	−0·1	100·2	+0·6	
„ 7		*I.P.W.*	48·1	50·0	+1·0	+1·9	50·3	+2·2			*I.P.W.*	97·9	100·0	+2·1	+1·2	97·5	−0·4	
„ 8		„	48·5	50·0	+0·6	+1·5	48·8	+0·3			„	97·2	100·0	+2·8	+1·9	97·5	+0·3	For observations, with E clock.
																96·1	−1·1	„ W „
„ 12		„	48·3	50·0	+0·8	+1·7	47·5	−0·8			„	99·1	100·0	+0·9	0·0	97·4	−1·7	

Astronl. Date	Station	Instrumental Position	Collimation				Level		Remarks	Station	Instrumental Position	Collimation				Level		Remarks
			C_0	C_s	c_1	c	M	b				C_0	C_s	c_1	c	M	b	
1876			d	d	d	d	d	d				d	d	d	d	d	d	
Mar. 22	At MADRAS (Telescope No. 1)	*I.P.W.*	48·6	50·0	+1·4	+0·5	47·1	−1·5		At BELLARY (Telescope No. 2)	*I.P.E.*	71·2	75·0	−3·8	−4·7	79·5 76·8	−8·3 −5·6	For observations, with E clock. „ W „
„ 24		„	48·2	50·0	+1·8	+0·9	48·7	+0·5			„	71·4	75·0	−3·6	−4·5	69·6 68·0	−1·8 +3·4	„ E „ „ W „
„ 26		„	48·6	50·0	+1·4	+0·5	48·9	+0·3			*I.P.W.*	70·4	75·0	+4·6	+3·7	75·4 76·2	+5·0 +5·8	„ E „ „ W „
„ 29		*I.P.E.*	47·0	50·0	−3·0	−3·9	47·6	−0·6			„	69·6	75·0	+5·4	+4·5	72·7	+3·1	
„ 30		„	46·6	50·0	−3·4	−4·3	47·1	−0·5			„	70·4	75·0	+4·6	+3·7	66·6 67·4	−3·8 −3·0	„ E „ „ W „
„ 31		„	51·7	50·0	+1·7	+0·8	48·2	+3·5			„	70·1	75·0	+4·9	+4·0	65·7 66·9	−4·4 −3·2	„ E „ „ W „
April 1		„	52·6	50·0	+2·6	+1·7	48·6	+4·0			*I.P.E.*	71·0	75·0	−4·0	−4·9	63·7	+7·3	
„ 2		„	51·1	50·0	+1·1	+0·2	47·9	+3·2			„	70·9	75·0	−4·1	−4·9	63·4 63·3	+7·5 +7·6	„ E „ „ W „
April 11	At BANGALORE (Telescope No. 1)	*I.P.E.*	48·0	50·0	−2·0	−2·9	48·0	0·0		At BELLARY (Telescope No. 2)	*I.P.E.*	73·0	70·0	+3·0	+2·1	73·0	0·0	
„ 12		„	48·5	50·0	−1·5	−2·4	47·9	+0·6			„	72·6	70·0	+2·6	+1·7	72·9 72·8	−0·3 −0·2	For observations, with E clock. „ W „
„ 13		„	49·9	50·0	−0·1	−1·0	47·7	+2·2			„	71·9	70·0	+1·9	+1·0	73·2 72·9	−1·3 −1·0	„ E „ „ W „
„ 14		*I.P.W.*	49·9	50·0	+0·1	−0·8	52·6	+2·7			*I.P.W.*	67·9	70·0	+2·1	+1·2	62·4	−5·5	
„ 17		„	49·8	50.0	+0·2	−0·7	49·1	−0·7			„	69·1	70·0	+0·9	0·0	67·9 67·3	−1·2 −1·8	„ E „ „ W „
„ 18		„	50·0	50·0	0·0	−0·9	49·3	−0·7			„	68·8	70·0	+1·2	+0·3	69·5 68·1	+0·7 −0·7	„ E „ „ W „
1877 Jan. 18	At VIZAGAPATAM (Telescope No. 1)	*I.P.E.*	77·2							At MADRAS (Telescope No. 2)								
„ 19		„	78·5								*I.P.E.*	84·2						
„ 20		„	76·1								„	83·3						
„ 21		„	76·8															
„ 22		„	75·0	80·0	−3·5	−4·4	81·3	−4·8			„	79·2	85·0	−3·3	−4·2	84·8	−3·1	
„ 23		„	76·1	80·0	−3·5	−4·4	81·8	−5·3	Mean C_0		„	80·8	85·0	−3·3	−4·2	84·7	−3·0	Mean C_0
„ 24		„	76·9	80·0	−3·5	−4·4	74·2	+2·3	d *I.P.E.* = 76·5		„	82·1	85·0	−3·3	−4·2	84·6	−2·9	d *I.P.E.* = 81·7
„ 25		„	77·5	80·0	−3·5	−4·4	75·7	+0·8	*I.P.W.* = 75·5		„	81·9	85·0	−3·3	−4·2	85·7	−4·0	*I.P.W.* = 82·5
„ 26		„	74·5	80·0	−3·5	−4·4	74·7	+1·8			„	80·2	85·0	−3·3	−4·2	84·9	−3·2	
„ 27		*I.P.W.*	74·8	80·0	+4·5	+3·6	76·6	+1·1			*I.P.W.*	83·6	85·0	+2·5	+1·6	86·6	+4·1	
„ 29		„	75·6	80·0	+4·5	+3·6	75·9	+0·4			„	82·1	85·0	+2·5	+1·6	87·1	+4·6	
„ 31		„	76·2	80·0	+4·5	+3·6	76·4	+0·9			„	82·4	85·0	+2·5	+1·6	87·6	+5·1	
Feb. 1		„	75·5	80·0	+4·5	+3·6	77·3	+1·8			„	81·8	85·0	+2·5	+1·6	88·6	+6·1	

Astronl. Date	Station	Instrumental Position	Collimation				Level		Remarks	Station	Instrumental Position	Collimation				Level		Remarks
			C_0	C_s	c_1	c	M	b				C_0	C_s	c_1	c	M	b	
1877	At VIZAGAPATAM (Telescope No. 1)		d	d	d	d	d	d		At BELLARY (Telescope No. 2)		d	d	d	d	d	d	
Feb. 8		*I.P.W.*	75·6	80·0	+3·8	+2·9					*I.P.E.*	74·7	75·0					
„ 9		„	75·9	80·0	+3·8	+2·9					„	72·6	75·0					
„ 14		„	76·9	80·0	+3·8	+2·9												
„ 17		„	76·6	80·0	+3·8	+2·9	79·1	+2·9	Mean C_0 = 76·2 d		*I.P.W.*	75·3	75·0	−0·8	−1·7	72·6	−3·2	
„ 19		*I.P.E.*	76·7	80·0	−2·9	−3·8					*I.P.E.*	74·8	75·0	−0·6	−1·5			Mean C_0 d
„ 21		„	76·8	80·0	−2·9	−3·8	74·5	+2·6			„	75·8	75·0	−0·6	−1·5	75·7	−1·3	*I.P.E.* = 74·4
„ 22		„	77·9	80·0	−2·9	−3·8	74·2	+2·9	„ = 77·1		„	74·1	75·0	−0·6	−1·5	76·9	−2·5	*I.P.W.* = 75·8
„ 23		*I.P.W.*	78·4	80·0	+2·2	+1·3	82·2	+4·4			*I.P.W.*	75·7	75·0	−0·8	−1·7	75·6	−0·2	
„ 24		„	77·3	80·0	+2·2	+1·3	81·7	+3·9	„ = 77·8		„	76·4	75·0	−0·8	−1·7	73·9	−1·9	
„ 25		*I.P.E.*	82·3	80·0	+2·3	+1·4	75·7	+6·6			*I.P.E.*	74·0	75·0	−0·6	−1·5	81·5	−7·1	
	At MANGALORE (Telescope No. 1)									At BOMBAY (Telescope No. 2)								
Mar. 22		*I.P.E.*	70·4	70·0	−0·1	−1·0	75·9	−6·0			*I.P.E.*	68·2	70·0	−2·0	−2·9	70·4	−2·4	
„ 24		„	70·0	70·0	−0·1	−1·0	71·2	−1·3	Mean C_0 d		„	68·8	70·0	−2·0	−2·9	71·6	−3·6	Mean C_0 d
„ 25		„	69·4	70·0	−0·1	−1·0	71·0	−1·1	*I.P.E.* = 69·9		„	67·1	70·0	−2·0	−2·9	72·1	−4·1	*I.P.E.* = 68·0
„ 26		*I.P.W.*	77·9	70·0	−7·9	−8·8	73·0	−4·9	*I.P.W.* = 77·9		*I.P.W.*	69·7	70·0	0·0	−0·9	70·4	+0·4	*I.P.W.* = 70·0
„ 27											„	70·3	70·0	0·0	−0·9			

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for				Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
										Collimation	Level	Pen Equation Q	Clock Rate					
									h m s	s	s	s	s	s	h m s	m s	d	
BOLARUM (E) AND BOMBAY (W)	BOLARUM (Latitude 17° 30′)	1876 Jan. 11	I.P.E.	E	ν Orionis	U	15	+0·001	6 0 48·69	−0·03	−0·02	+1·03		49·67	6 0 30·95	− 0 18·72	+ 9·9	
					δ Ursæ Minoris	L	3	+0·370	6 12 10·75	+0·45	+0·10	+1·03	−0·01	12·32	6 11 57·25	− 15·07		
		„ 12	I.P.W.	„	δ Ursæ Minoris	L	3	+0·370	6 12 12·95	+0·98	−0·24	+1·04		14·73	6 11 57·29	− 17·44	+ 5·4	
					51 Cephei	U	3	−0·439	6 42 38·35	−1·20	+0·41	+1·04	−0·04	38·56	6 42 16·72	− 21·84		
		„ 13	„	„	δ Ursæ Minoris	L	3	+0·370	6 12 12·57	+0·54	−0·27	+1·70		14·54	6 11 57·35	− 17·19	+ 5·9	
					51 Cephei	U	3	−0·439	6 42 37·24	−0·67	+0·47	+1·70	−0·04	38·70	6 42 16·73	− 21·97		
		„ 14	I.P.E.	„	51 Cephei	U	4	−0·439	6 42 37·93	−1·24	+0·21	+1·69		38·59	6 42 16·69	− 21·90	− 0·1	
					λ Ursæ Minoris	L	3	+1·155	7 47 6·25	+3·20	−0·49	+1·69	−0·07	10·58	7 46 48·52	− 22·06		
		„ 16	„	„	51 Cephei	U	3	−0·439	6 42 41·72	−1·93	+0·27	+1·69		41·75	6 42 16·56	− 25·19	− 4·1	
					ι Argûs	U	14	+0·042	9 14 17·05	−0·18	+0·02	−1·69	−0·18	15·02	9 13 47·86	− 27·16		
		„ 17	„	„	δ Ursæ Minoris	L	2	+0·370	6 12 21·57	+2·05	−0·12	+1·68		25·18	6 11 57·81	− 27·37	+ 0·6	
					51 Cephei	U	3	−0·439	6 42 45·00	−2·53	+0·21	+1·68	−0·04	44·32	6 42 16·48	− 27·84		
		„ 18	„	„	δ Ursæ Minoris	L	3	+0·370	6 12 27·28	−0·51	−0·40	+1·69		28·06	6 11 57·93	− 30·13	+ 0·5	
					51 Cephei	U	3	−0·439	6 42 43·96	+0·63	+0·70	+1·69	−0·04	46·94	6 42 16·40	− 30·54		
		„ 19	„	„	δ Ursæ Minoris	L	5	+0·370	6 12 30·03	−0·16	−0·29	+1·69		31·27	6 11 58·06	− 33·21	− 2·2	
					51 Cephei	U	4	−0·439	6 42 45·46	+0·19	+0·51	+1·69	−0·04	47·81	6 42 16·34	− 31·47		
		„ 20	I.P.W.	„	δ Ursæ Minoris	L	3	+0·370	6 12 28·99	+2·76	−0·53	+1·68		32·90	6 11 58·17	− 34·73	− 1·0	
					51 Cephei	U	3	−0·439	6 42 51·01	−3·39	+0·92	+1·68	−0·04	50·18	6 42 16·28	− 33·90		
		„ 21	„	„	δ Ursæ Minoris	L	3	+0·370	6 12 37·41	+0·60	−0·23	+1·70		39·48	6 11 58·28	− 41·20	− 8·2	
					51 Cephei	U	3	−0·439	6 42 52·85	−0·74	+0·40	−1·70	−0·04	50·77	6 42 16·22	− 34·55		
	BOMBAY (Latitude 18° 54′)	1876 Jan. 11	I.P.E.	W	δ Ursæ Minoris	L	3	+0·367	6 12 1·14	+0·31	−0 67	+1·52		2·30	6 11 57·25	− 5·05	− 3·4	
					51 Cephei	U	4	−0·435	6 42 19·82	−0·39	+1·14	−1·52	−0·04	19·01	6 42 16·69	− 2·32		
		„ 12	I.P.W.	„	δ Ursæ Minoris	L	3	+0·367	6 12 1 91	+0·57	+0·07	−1·53		1·02	6 11 57·29	− 3·73	+ 3·2	
					51 Cephei	U	3	−0·435	6 42 22·35	−0·70	−0·12	+1·53	−0·04	23·02	6 42 16·72	− 6·30		
		„ 13	„	„	δ Ursæ Minoris	L	3	+0·367	6 12 1·43	+0·11	−0·19	+1·52		2·87	6 11 57·35	− 5·52	+ 5·3	
					51 Cephei	U	4	−0·435	6 42 27·92	−0·14	+0·32	−1·52	−0·04	26·54	6 42 16·73	− 9·81		
		„ 14	I.P.E.	„	δ Ursæ Minoris	L	3	+0·367	6 12 4·05	+0·26	−0·49	+1·52		5·34	6 11 57·45	− 7·89	+ 1·2	
					51 Cephei	U	6	−0·435	6 42 23·56	−0·32	+0·84	+1·52	−0·04	25·56	6 42 16·69	− 8·87		

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Dediation d_1	Weight of d_1
									h m s	s	s	s	s	s	h m s	m s		
BOLARUM (E) AND BOMBAY (W)	BOMBAY (Latitude 18° 54′)	1876 Jan. 16	*I.P.E.*	W	δ Ursæ Minoris	L	4	+0·367	6 12 6·09	+0·04	−0·15	+1·55		7·53	6 11 57·68	− 0 9·85	+ 9·8	
					51 Cephei	U	3	−0·435	6 42 32·58	−0·05	+0·26	+1·55	−0·04	34·30	6 42 16·56	− 17·74		
		„ 17	„	„	δ Ursæ Minoris	L	3	+0·367	6 11 42·23	−0·15	−0·32	−1·55		40·21	6 11 57·81	+ 17·60	+12·3	
					51 Cephei*	U	3	−0·435	6 42 6·54	+0·18	+0·54	+1·55	−0·04	8·77	6 42 16·48	+ 7·71		
		„ 18	„	„	δ Ursæ Minoris	L	4	+0·367	6 11 40·75	−0·21	−0·66	−1·57		38·31	6 11 57·93	+ 19·62	+22·4	
					ν Orionis †	U	15	+0·002	6 7 50·04	+0·01	+0·15	−1·57	0·00	48·63	6 8 0·03	+ 11·40		
					μ Geminorum	„	15	−0·001										
		„ 19	„	„	δ Ursæ Minoris	L	4	+0·367	6 11 38·91	−0·45	−0·84	+1·66		39·28	6 11 58·06	+ 18·78	+21·3	
					51 Cephei	U	3	−0·435	6 42 11·05	+0·55	+1·44	+1·66	−0·04	14·66	6 42 16·34	+ 1·68		
		„ 20	*I.P.W.*	„	δ Ursæ Minoris	L	3	+0·367	6 11 39·79	+0·29	−0·09	+1·66		41·65	6 11 58·17	+ 16·52	+21·0	
					51 Cephei	U	3	−0·435	6 42 18·48	−0·35	+0·15	−1·66	−0·04	16·58	6 42 16·28	− 0·30		
		„ 21	„	„	δ Ursæ Minoris	L	4	+0·367	6 11 44·90	+0·06	−0·32	−1·66		42·98	6 11 58·28	+ 15·30	+22·9	
					51 Cephei*	U	4	−0·435	6 42 17·16	−0·07	+0·55	+1·66	−0·04	19·26	6 42 61·22	− 3·04		
BELLARY (E) AND BOMBAY (W)	BELLARY (Latitude 17° 30′)	1876 Jan. 28‡	*I.P.E.*	E	δ Ursæ Minoris	L	4	+0·371	6 11 45·80	−1·68	−0·02	+1·86		45·96	6 11 59·20	+ 13·24	+19·3	
					51 Cephei	U	5	−0·443	6 42 16·50	−0·26	+0·04	+1·86	+0·01	18·15	6 42 15·70	− 2·45		
		„ 29	*I.P.W.*	„	δ Ursæ Minoris	L	5	+0·371	6 11 40·60	+1·50	+0·12	+1·86		44·08	6 11 59·39	+ 15·31	+22·7	
					51 Cephei	U	5	−0·443	6 42 18·90	−1·85	−0·21	+1·86	+0·01	18·71	6 42 15·53	− 3·18		
		„ 30	„	„	δ Ursæ Minoris	L	5	+0·371	6 11 40·34	+1·95	+0·23	+1·87		44·39	6 11 59·60	+ 15·21	+21·7	
					51 Cephei	U	5	−0·443	6 42 18·72	−2·39	−0·44	+1·87	+0·01	17·77	6 42 15·33	− 2·44		
		„ 31	*I P.E*	„	δ Ursæ Minoris	L	5	+0·371	6 11 56·48	−0·80	−0·08	+1·87		57·47	6 11 59·82	+ 2·35	−11·5	
					51 Cephei	U	5	−0·443	6 42 0·38	+0·99	+0·15	+1·87	+0·01	3·40	6 42 15·11	+ 11·71		
		Feb. 8	„	„	51 Cephei	U	4	−0·443	6 42 6·69	+0·05	+0·45	+1·88		9·07	6 42 13·71	+ 4·64	+19·1	5
					λ Ursæ Minoris	L	2	+1·168	7 46 16·63	−0·13	−0·93	−1·88	+0·03	13·72	7 46 49·19	+ 35·47		
		„ 9	„	„	δ Ursæ Minoris	L	3	+0·371	6 11 35·49	−0·47	−0·13	+1·88		36·77	6 12 1·67	+ 24·90	+26·3	8
					51 Cephei	U	6	−0·443	6 42 7·29	+0·57	+0·24	+1·88	+0·01	9·99	6 42 13·49	+ 3·50		
		„ 10	*I.P.W.*	„	δ Ursæ Minoris	L	6	+0·371	6 11 43·80	+1·27	−0·59	+1·89		46·37	6 12 1·92	+ 15·55	+ 1·6	8
					51 Cephei	U	3	−0·443	6 41 58·46	−1·56	+0·18	+1·89	+0·01	58·98	6 42 13·23	+ 14·25		

* 51 Cephei was observed on 17th and 21st with E Clock. The observed times here given are converted into terms of W Clock by applying the difference deduced from clock comparisons. † The observations of both ν Orionis and μ Geminorum are utilised by taking the mean of their results to combine with the observation of δ Ursæ Minoris. ‡ On 28th January, the collimation correction-constant for δ Ursæ Minoris was, by a mistake in setting, = +4·44 d instead of −0·56 d, as for all other stars. The level correction-constant was = +0·30 d for both δ Ursæ Minoris, and 51 Cephei, instead of +0·90 d, as for all other stars.

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
									h m s	s	s	s	s	s	h m s	m s	d	
BELLARY (E) AND BOMBAY (W)	BOMBAY (Latitude 18° 54′)	1876 Jan. 28	*I.P.E.*	W	δ Ursæ Minoris	L	5	+0·367	6 12 30·63	−0·19	−0·04	+1·64		32·04	6 11 59·20	− 0 32·84	+ 6·1	9
					51 Cephei	U	4	−0·435	6 42 51·51	+0·23	+0·08	+1·64	−0·06	53·40	6 42 15·70	− 37·70		
		„ 29	*I.P.W.*	„	δ Ursæ Minoris	L	5	+0·367	6 12 34·78	+0·14	−0·43	−1·68		32·81	6 11 59·39	− 33·42	+12·3	8
					51 Cephei	U	3	−0·435	6 42 59·98	−0·17	+0·73	−1·68	−0·06	58·80	6 42 15·53	− 43·27		
		„ 30	„	„	δ Ursæ Minoris	L	6	+0·367	6 12 33·81	+0·01	−0·02	+1·64		35·44	6 11 59·60	− 35·84	+16·4	6
					51 Cephei	U	2	−0·435	6 43 2·70	−0·01	+0·04	+1·64	−0·06	4·31	6 42 15·33	− 48·98		
		„ 31	*I.P.E.*	„	δ Ursæ Minoris	L	5	+0·367	6 12 40·42	+0·40	−0·34	−1·62		38·86	6 11 59·82	− 39·04	+ 9·4	9
					51 Cephei	U	4	−0·435	6 43 3·30	−0·49	+0·58	−1·62	−0·06	1·71	6 42 15·11	− 46·60		
		Feb. 1	„	„	δ Ursæ Minoris	L	5	+0·367	6 12 44·36	+0·50	−0·45	−1·61		42·80	6 12 0·05	− 42·75	+10·2	10
					51 Cephei	U	5	−0·435	6 43 7·37	−0·61	+0·76	−1·61	−0·06	5·85	6 42 14·88	− 50·97		
		„ 8	„	„	51 Cephei	U	4	−0·435	6 42 31·49	−0·27	−0·26	−1·57		29·39	6 42 13·71	− 15·68	+ 7·7	7
					λ Ursæ Minoris	L	3	+1·156	7 46 49·75	+0·69	+0·56	+1·57	+0·01	52·58	7 46 49·19	− 3·39		
		„ 9	„	„	δ Ursæ Minoris	L	5	+0·367	6 12 7·68	−0·15	+0·09	+1·59		9·21	6 12 1·67	− 7·54	+10·1	8
					51 Cephei	U	3	−0·435	6 42 27·50	+0·19	−0·15	+1·59	+0·01	29·14	6 42 13·49	− 15·65		
		„ 10	*I.P.W.*	„	δ Ursæ Minoris	L	5	+0·367	6 12 8·49	+0·41	−0·23	−1·57		7·10	6 12 1·92	− 5·18	+14·6	9
					51 Cephei	U	4	−0·435	6 42 31·81	−0·50	+0·39	−1·57	+0·01	30·14	6 42 13·23	− 16·91		
BOLARUM (E) AND BELLARY (W)	BOLARUM (Latitude 17° 30′)	1876 Feb. 19	*I.P.W.*	W	η Argûs	U	9	+0·0427	10 33 58·75	−0·27	−0·05	+1·63		60·06	10 40 17·03	+ 6 16·97	−28·9	2
					l Leonis	U	15	+0·0025	10 36 26·63	−0·14	−0·12	+1·63		28·00	10 42 46·13	+ 6 18·13		
		„ „	„	„	α Ursæ Majoris	U	10	−0·0345	10 49 50·76	−0·30	−0·19	−1·63		48·64	10 56 8·05	+ 6 19·41	−31·9	2
					χ Leonis	U	12	+0·0038	10 52 22·68	−0·14	−0·12	−1·63		20·79	10 58 38·98	+ 6 18·19		
																19th, Mean	−30·4	4
		„ 20	„	E	ι Argûs	U	15	+0·0423	9 13 15·07	−0·29	−0·07	−1·61		13·10	9 13 48·05	+ 6 34·95	−22·3	4
					θ Ursæ Majoris	U	15	−0·0210	9 23 61·94	−0·24	−0·22	−1·61	+0·21	60·08	9 24 36·44	+ 6 36·36		
		„ „	„	W	η Argûs	U	5	+0·0427	10 33 1·00	−0·29	−0·07	−1·61		59·03	10 40 17·04	+ 6 18·01	−20·1	2
					l Leonis	U	15	+0·0025	10 36 29·26	−0·15	−0·17	−1·61		27·33	10 42 46·15	+ 6 18·82		
		„ „	„	„	α Ursæ Majoris	U	9	−0·0345	10 49 47·10	−0·32	−0·25	+1·61		48·14	10 56 8·08	+ 6 19·94	−28·5	2
					χ Leonis	U	11	+0·0038	10 52 18·84	−0·15	−0·16	+1·61		20·14	10 58 38·99	+ 6 18·85		
																20th, Mean	−23·3	8
		„ 21	„	E	ι Argûs	U	15	+0·0423	9 12 43·97	−0·30	−0·02	+1·62		45·27	9 13 48·04	+ 6 62·77	−21·3	4
					θ Ursæ Majoris	U	15	−0·0210	9 23 30·79	−0·26	−0·04	+1·62	+0·21	32·32	9 24 36·44	+ 6 64·12		

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
									h m s	s	s	s	s	s	h m s	m s	d	
BOLARUM (E) AND BELLARY (W)	BOLARUM (Latitude 17° 30′)	1876 Feb. 22	*I.P.E.*	W	η Argûs	U	7	+0·0427	10 33 57·58	+0·12	−0·04	−1·62		56·04	10 40 17·05	+ 6 21·01	+ 3·0	2
					l Leonis	U	15	+0·0025	10 36 26·92	+0·06	−0·08	−1·62		25·28	10 42 46·17	+ 6 20·89		
		” ”	”	”	α Ursæ Majoris	U	6	−0·0345	10 49 45·05	+0·13	−0·13	+1·62		46·67	10 56 8·11	+ 6 21·44	−12·8	2
					χ Leonis	U	15	+0·0038	10 52 16·46	+0·06	−0·08	+1·62		18·06	10 58 39·01	+ 6 20·95		
																22nd, Mean	− 4·9	4
		” 23	”	E	δ Ursæ Minoris	L	7	+0·3696	6 10 12·39	−0·84	+0·26	−1·61		10·20	6 12 5·52	+ 1 55·32	− 1·5	14
					51 Cephei	U	7	−0·4392	6 40 13·50	+1·02	−0·45	−1·61	+0·58	13·04	6 42 9·57	+ 1 56·53		
		” ”	”	”	ι Argûs	U	15	+0·0423	9 11 46·70	+0·10	−0·03	+1·61		48·38	9 13 48·01	+ 1 59·63	+ 0·5	4
					θ Ursæ Majoris	U	15	−0·0210	9 22 35·02	+0·08	−0·08	+1·61	+0·21	36·84	9 24 36·44	+ 1 59·60		
		” ”	”	W	η Argûs	U	6	+0·0427	10 33 53·58	+0·10	−0·03	+1·61		55·26	10 40 17·05	+ 6 21·79	+ 0·7	2
					l Leonis	U	15	+0·0025	10 36 22·81	+0·05	−0·06	+1·61		24·41	10 42 46·17	+ 6 21·76		
		” ”	”	”	α Ursæ Majoris	U	10	−0·0345	10 49 47·26	+0·11	−0·10	−1·61		45·66	10 56 8·12	+ 6 22·46	−15·9	2
					χ Leonis	U	14	+0·0038	10 52 18·79	+0·05	−0·06	−1·61		17·17	10 58 39·02	+ 6 21·85		
																23rd, Mean	− 2·2	22
		” 24	”	E	ι Argûs	U	10	+0·0423	9 11 22·06	+0·15	−0·02	−1·61		20·58	9 13 48·00	+ 2 27·42	− 0·9	2
					θ Ursæ Majoris	U	15	−0·0210	9 22 10·29	+0·13	−0·06	−1·61	+0·21	8·96	9 24 36·44	+ 2 27·48		
		” ”	”	W	η Argûs	U	10	+0·0427	10 33 55·65	+0·15	−0·02	−1·61		54·17	10 40 17·06	+ 6 22·89	+ 5·7	2
					l Leonis	U	15	+0·0025	10 36 25·09	+0·08	−0·04	−1·61		23·52	10 42 46·18	+ 6 22·66		
		” ”	”	”	α Ursæ Majoris	U	10	−0·0345	10 49 43·42	+0·17	−0·06	+1·61		45·14	10 56 8·14	+ 6 23·00	− 8·1	2
					χ Leonis	U	15	+0·0026	10 52 14·69	+0·08	−0·04	+1·61		16·34	10 58 39·03	+ 6 22·69		
																24th, Mean	− 1·1	6
	BELLARY (Latitude 15° 9′)	1876 Feb. 19	*I.P.W.*	W	δ Ursæ Minoris	L	5	+0·3706	6 11 45·24	−0·09	+0·02	+1·59		46·76	6 12 4·43	+ 17·67	+58·7	11
					51 Cephei	U	6	−0·4425	6 42 39·00	+0·11	−0·03	+1·59	+0·02	40·69	6 42 10·67	− 30·02		
		” ”	”	E	ι Argûs	U	15	+0·0417	9 19 57·37	−0·01	+0·01	+1·59		58·96	9 13 48·06	− 6 10·90	+61·8	4
					θ Ursæ Majoris	U	14	−0·0221	9 30 49·47	−0·01	+0·01	+1·59	+0·21	51·27	9 24 36·43	− 6 14·84		
																19th, Mean	+59·5	15
		” 20	”	W	α Ursæ Majoris	U	7	−0·0356	10 56 11·96	+0·05	+0·02	−1·59		10·44	10 56 8·07	− 2·37	+15·4	2
					χ Leonis	U	15	+0·0028	10 58 43·50	+0·02	+0·02	−1·59		41·95	10 58 38·99	− 2·96		
		” 21	”	E	ι Argûs	U	15	+0·0417	9 19 4·74	−0·07	+0·01	+1·60		6·28	9 13 48·04	− 5 18·24	− 4·1	4
					θ Ursæ Majoris	U	15	−0·0221	9 29 52·64	−0·05	+0·02	+1·60	+0·21	54·42	9 24 36·44	− 5 17·98		
		” 22	*I.P.E.*	W	α Ursæ Majoris	U	8	−0·0356	10 56 10·93	−0·07	−0·20	−1·59		9·07	10 56 8·11	− 0·96	− 2·6	2
					χ Leonis	U	14	+0·0028	10 58 41·83	−0·03	−0·14	−1·59		40·07	10 58 39·01	− 1·06		

TABLE II. DEDUCTION OF DEVIATION ERROR FROM STAR OBSERVATIONS.

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for				Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
										Collimation	Level	Pen Equation Q	Clock Rate					
		1876							h m s	s	s	s	s	s	h m s	m s	d	
BOLARUM (E) AND BELLARY (W)	BELLARY (Latitude 15° 9')	Feb. 22	I.P.E.	E	ι Argûs	U	15	+0·0417	9 18 37·04	−0·06	−0·07	+1·60		38·51	9 13 48·03	− 4 50·48	0·0	4
					θ Ursæ Majoris	U	15	−0·0221	9 29 25·34	−0·05	−0·18	+1·60	+0·21	26·92	9 24 36·44	− 4 50·48		
																22nd, Mean	− 0·9	6
		„ 23	„	W	α Ursæ Majoris	U	8	−0·0356	10 56 9·85	−0·03	+0·11	−1·60		8·33	10 56 8·12	− 0·21	+ 1·8	2
					χ Leonis	U	14	+0·0028	10 58 40·70	−0·01	+0·07	−1·60		39·16	10 58 39·02	− 0·14		
		„ „	„	E	ι Argûs	U	14	+0·0417	9 18 8·75	−0·03	+0·04	+1·60		10·36	9 13 48·01	− 4 22·35	+ 5·0	3
					θ Ursæ Majoris	U	10	−0·0221	9 28 57·23	−0·02	+0·09	+1·60	+0·21	59·11	9 24 36·44	− 4 22·67		
																23rd, Mean	+ 3·7	5
		„ 24	„	W	δ Ursæ Minoris	L	5	+0·3706	6 11 59·86	+0·58	−0·26	+1·60		61·78	6 12 5·83	+ 4·05	+ 7·1	10
					51 Cephei	U	5	−0·4425	6 42 9·56	−0·71	+0·47	+1·60	+0·02	10·94	6 42 9·24	− 1·70		
		„ „	„	„	α Ursæ Majoris	U	9	−0·0356	10 56 9·13	−0·07	+0·11	−1·60		7·57	10 56 8·14	+ 0·57	+ 6·3	2
					χ Leonis	U	15	+0·0028	10 58 39·77	−0·03	+0·08	−1·60		38·22	10 58 39·03	+ 0·81		
		„ „	„	E	ι Argûs	U	15	+0·0417	9 17 40·64	−0·06	+0·04	+1·59		42·21	9 13 48·00	− 3 54·21	+ 9·2	4
					θ Ursæ Majoris	U	15	−0·0221	9 28 29·39	−0·05	+0·10	+1·59	+0·21	31·24	9 24 36·44	− 3 54·80		
																24th, Mean	+ 7·5	16
MADRAS (E) AND BOLARUM (W)	MADRAS (Latitude 13° 4')	1876 Mar. 3	I.P.E.	E	l Leonis	U	15	+0·001	10 42 43·67	−0·06	−0·12	+1·71		45·20	10 42 46·25	+ 1·05	−69·2	3
					Polaris	L	3	+0·933	13 13 12·98	+2·65	+0·97	+1·71	+0·16	18·47	13 12 15·05	− 1 3·42		
		„ 5	„	„	R.P.L.* 99	U	3	−0·206	12 48 18·25	−0·28	+0·01	+1·75		19·73	12 48 31·10	+ 11·37	−31·2	6
					Polaris	L	3	+0·933	13 12 35·28	+1·23	−0·03	+1·75	+0·03	38·26	13 12 14·07	− 24·19		
		„ 6	„	„	R.P.L. 99	U	4	−0·206	12 48 14·18	−0·87	−0·18	+1·59		14·72	12 48 31·19	+ 16·47	−44·0	7
					Polaris	L	3	+0·933	13 12 41·17	+3·82	+0·49	+1·59	+0·03	47·10	13 12 13·51	− 33·59		
		„ 7	I.P.W.	„	R.P.L. 99	U	4	−0·206	12 48 16·19	+0·23	+0·15	+1·60		18·17	12 48 31·28	+ 13·11	−22·7	5
					Polaris	L	2	+0·933	13 12 25·48	−0·99	−0·42	+1·60	+0·03	25·70	13 12 12·93	− 12·77		
		„ 8	„	„	R.P.L. 99	U	5	−0·206	12 48 13·66	+0·12	+0·02	+1·60		15·40	12 48 31·38	+ 15·98	−29·7	8
					Polaris	L	3	+0·933	13 12 29·19	−0·53	−0·06	+1·60	+0·03	30·23	13 12 12·35	− 17·88		
	BOLARUM (Latitude 17° 30')	1876 Mar. 3	I.P.E.	W	R.P.L. 99	U	7	−0·201	12 48 38·14	−0·10	+0·41	−1·61		36·84	12 48 30·92	− 5·92	−11·8	13
					Polaris	L	5	+0·921	13 12 36·67	+0·44	−1·28	−1·61		34·22	13 12 15·05	− 19·17		
		„ 5	„	„	R.P.L. 99	U	9	−0·201	12 48 37·71	−0·14	−0·01	+1·60		39·16	12 48 31·10	− 8·06	− 1·8	14
					Polaris	L	6	+0·921	13 12 21·86	+0·64	+0·03	+1·60		24·13	13 12 14·07	− 10·06		
		„ 6	„	„	R.P.L. 99	U	7	−0·201	12 48 41·20	−0·01	+0·05	−1·60		39·64	12 48 31·19	− 8·45	+ 0·7	8
					Polaris	L	3	+0·921	13 12 22·86	+0·07	−0·16	−1·60		21·17	13 12 13·51	− 7·66		

* The letters R.P.L. indicate "Radcliffe Polar List."

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
									h m s	s	s	s	s	s	h m s	m s	d	
MADRAS (E) AND BOLARUM (W)	BOLARUM (Latitude 17° 30′)	1876 Mar. 7	*I.P.W.*	W	R.P.L. 99	U	7	−0·201	12 48 35·24	+0·27	−0·04	+1·61		37·08	12 48 31·28	− 0 5·80	−10·5	10
					Polaris	L	4	+0·921	13 12 30·01	−1·17	+0·11	+1·61		30·56	13 12 12·93	− 17·63		
		„ 8	„	„	R.P.L. 99	U	7	−0·201	12 48 39·38	+0·41	−0·10	−1·60		38·09	12 48 31·38	− 6·71	− 2·3	8
					Polaris	L	3	+0·921	13 12 24·68	−1·78	+0·30	−1·60		21·60	13 12 12·35	− 9·25		
		„ 12	„	„	R.P.L. 99	U	9	−0·201	12 48 38·56	−0·01	−0·15	+1·61		40·01	12 48 31·74	− 8·27	−10·0	11
					Polaris	L	4	+0·921	13 12 27·82	+0·04	+0·46	+1·61		29·93	13 12 10·49	− 19·44		
MADRAS (E) AND BELLARY (W)	MADRAS (Latitude 13° 4′)	1876 Mar. 22	*I.P.W.*	E	R.P.L. 99	U	3	−0·206	12 47 45·98	+0·11	−0·11	+1·39		47·37	12 48 32·31	+ 44·94	−79·7	6
					Polaris	L	3	+0·936	13 12 52·35	−0·44	+0·30	+1·39	+0·03	53·63	13 12 7·57	− 46·06		
		„ 24	„	„	R.P.L. 99	U	4	−0·206	12 47 41·99	+0·19	+0·04	+1·39		43·61	12 48 32·35	+ 48·74	−85·6	3
					η Virginis	U	14	+0·005	12 13 6·36	+0·02	+0·01	−1·39	−0·03	4·97	12 13 35·64	+ 30·67		
		„ 26	„	„	R.P.L. 99	U	4	−0·206	12 47 38·77	+0·11	+0·02	+1·38		40·28	12 48 32·38	+ 52·10	−88·9	8
					Polaris	L	4	+0·936	13 12 55·13	−0·47	−0·06	+1·38	+0·03	56·01	13 12 6·62	− 49·39		
		„ 29	*I.P.E.*	„	R.P.L. 99	U	5	−0·206	12 47 46·65	−0·85	−0·05	+1·38		47·13	12 48 32·44	+ 45·31	−30·0	8
					Polaris	L	3	+0·936	13 11 50·22	+3·69	+0·12	+1·38	+0·03	55·44	13 12 6·51	+ 11·07		
		„ 30	„	„	R.P.L. 99	U	1	−0·206	12 47 44·37	−0·93	−0·04	+1·38		44·78	12 48 32·45	+ 47·67	−34·1	3
					Polaris	L	2	+0·936	13 11 52·20	+4·05	+0·11	+1·38	+0·03	57·77	13 12 6·52	+ 8·75		
		„ 31	„	„	R.P.L. 99	U	3	−0·206	12 47 43·44	+0·18	+0·25	+1·38		45·25	12 48 32·47	+ 47·22	−27·3	6
					Polaris	L	3	+0·936	13 11 50·48	−0·79	−0·67	+1·38	+0·03	50·43	13 12 6·51	+ 16·08		
		Apr. 1	„	W	η Ursæ Majoris	U	7	−0·021	(13 28 20·41) 13 41 59·21	+0·06	+0·11	−1·36		58·02	13 42 42·42	+ 44·40	−29·5	3
				E	Polaris	L	3	+0·936	13 11 51·35	−1·58	−0·77	+1·36	−0·04	50·32	13 12 6·46	+ 16·14		
		„ 2	„	„	R.P.L. 99	U	5	−0·206	12 47 38·87	+0·05	+0·23	+1·37		40·52	12 48 32·51	+ 51·99	−33·9	10
					Polaris	L	5	+0·936	13 11 52·51	−0·22	−0·61	+1·37	+0·03	53·08	13 12 6·37	+ 13·29		
	BELLARY (Latitude 15° 9′)	1876 Mar. 22	*I.P.E.*	W	R.P.L. 99	U	5	−0·205	12 48 59·92	−1·02	−0·44	−1·60		56·86	12 48 32·31	− 24·55	+59·0	3
					Polaris	L	1	+0·932	13 11 20·77	+4·44	+1·28	−1·60	+0·11	25·00	13 12 7·57	+ 42·57		
		„ 24	„	„	Polaris	L	3	+0·932	13 12 5·32	+4·29	−0·77	+1·63		10·47	13 12 7·00	− 3·47	− 6·7	3
					η Ursæ Majoris	U	10	−0·020	13 42 40·93	−0·16	+0·10	−1·63	+0·16	39·40	13 42 42·29	+ 2·89		
		„ 26	*I.P.W.*	„	R.P.L. 99	U	6	−0·205	12 48 19·56	+0·82	+0·45	+1·62		22·45	12 48 32·38	+ 9·93	+30·6	6
					Polaris	L	2	+0·932	13 11 24·98	−3·54	−1·32	+1·62	+0·13	21·87	13 12 6·62	+ 44·75		

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
									h m s	s	s	s	s	s	h m s	m s	d	
MADRAS (E) AND BELLARY (W)	BELLARY (Latitude 15° 9′)	1876 Mar. 30	I.P.W.	W	Polaris	L	5	+0·932	13 9 58·59	−3·48	+0 68	−1·63		54·16	13 12 6·52	+2 12·36	+ 88·0	5
					η Ursæ Majoris	U	15	−0·020	13 41 51·96	+0·13	−0·09	+1·63	+0·17	53·80	13 42 42·39	+ 48·59		
		„ 31	„	„	R.P.L. 99	U	7	−0·205	12 47 54·72	+0·88	−0·25	+1·62		56·97	12 48 32·47	+ 35·50	+108·8	13
					Polaris	L	6	+0·932	13 9 28·69	−3·83	+0·73	+1·62	+0·12	27·33	13 12 6·51	+2 39·18		
		Apr. 1	I.P.E.	„	R.P.L. 99	U	10	−0·205	12 47 32·33	−1·07	+0·57	−1·63		30·20	12 48 32·49	+1 2·29	+ 18·2	16
					Polaris	L	7	+0·932	13 10 41·97	+4·66	−1·66	−1·63	+0·12	43·46	13 12 6·46	+1 23·00		
		„ 2	„	„	R.P.L. 99	U	5	−0·205	12 47 25·73	−1·08	+0·60	+1 62		26·87	13 48 32·51	+1 5·64	+ 40·5	12
					Polaris	L	7	+0·932	13 10 9·98	+4·71	−1·73	+1·62	+0·13	14·71	13 12 6·37	+1 51·66		
BANGALORE (E) AND BELLARY (W)	BANGALORE (Latitude 12° 58′)	1876 Apr. 11	I.P.E.	E	R.P.L. 99	U	5	−0·206	12 48 53·77	−0·64	0·00	+1·41		54·54	12 48 32·29	− 22·25	− 5·5	8
					Polaris	L	3	+0·933	13 12 30·93	+2·78	−0·01	+1·41	−0·06	35·05	13 12 6·59	− 28·46		
		„ 12	„	„	η Virginis	U	15	+0·005	12 14 1·58	−0·05	+0·02	+1·40		2·95	12 13 35·70	− 27·25	− 1·8	3
					R.P.L. 99	U	5	−0·206	12 48 58·27	−0·52	+0·05	+1·40	−0·09	59·11	12 48 32·24	− 26·87		
		„ 13	„	„	R.P.L. 99	U	5	−0·206	12 49 3·39	−0·22	+0·15	−1·41		1·91	12 48 32·18	− 29·73	− 2·1	8
					Polaris	L	3	+0·933	13 12 37·27	+0·98	−0·42	+1·41	−0·06	39·18	13 12 7·04	− 32·14		
		„ 17	I.P.W.	„	R.P.L. 99	U	5	−0·206	12 49 14·73	−0·16	−0·05	+1·41		15·93	12 48 31·97	− 43·96	− 7·7	6
					Polaris	L	2	+0·933	13 12 58·34	+0·68	+0·13	+1·41	−0·06	60·50	13 12 7·76	− 52·74		
		„ 18	„	„	R.P.L. 99	U	5	−0·206	12 49 18·39	−0·20	−0·05	+1·41		19·55	12 48 31·92	− 47·63	− 7·6	8
					Polaris	L	3	+0·933	13 13 1·87	+0·86	+0·13	+1·41	−0·06	4·21	13 12 7·89	− 56·32		
	BELLARY (Latitude 15° 9′)	1876 Apr. 11	I.P.E.	W	R.P.L. 99	U	8	−0·205	12 48 52·92	+0·46	0·00	+1·60		54·98	12 48 32·29	− 22·69	+13·9	12
					Polaris	L	5	+0·932	13 12 13·86	−1·99	+0·01	+1·60	+0·01	13·49	13 12 6·59	− 6·90		
		„ 12	„	„	R.P.L. 99	U	7	−0·205	12 48 57·45	+0·37	−0·02	−1·63		56·17	12 48 32·24	− 23·93	+25·4	10
					Polaris	L	4	+0·932	13 12 5·11	−1·64	+0·05	−1·63	+0·01	1·90	13 12 6·81	+ 4·91		
		„ 13	„	„	R.P.L. 99	U	7	−0·205	12 48 55·23	+0·23	−0·08	+1·62		57·00	12 48 32·18	− 24·82	+30·0	10
					Polaris	L	4	+0·932	13 11 56·89	−1·00	+0·22	+1·62	+0·01	57·74	13 12 7·04	+ 9·30		
		„ 14	I.P.W.	„	R.P.L. 99	U	5	−0·205	12 48 61·72	+0·25	−0·43	−1·62		59·92	12 48 32·13	− 27·79	+50·4	9
					Polaris	L	4	+0·932	13 11 39·26	−1·11	+1·25	−1·62	+0·01	37·79	13 12 7·25	+ 29·46		
		„ 16	„	„	R.P.L. 99	U	6	−0·205	12 48 46·65	+0·21	+0·01	+1·58		48·45	12 48 32·02	− 16·43	+ 5·0	8
					Polaris	L	3	+0·932	13 12 17·73	−0·93	−0·03	+1·58	+0·01	18·36	13 12 7·61	− 10·75		

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for: Collimation	Level	Pen Equation Q	Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation α_1	Weight of α_1
									h m s	s	s	s	s	s	h m s	m s	d	
BANGALORE (E) AND BELLARY (W)	BELLARY (Lat. 15° 9')	1876 Apr. 17	I.P.W.	W	R.P.L. 99	U	7	−0·205	12 48 49·01	+0·01	−0·14	+1·54		50·42	12 48 31·97	− 0 18·45	+16·4	10
					Polaris	L	4	+0·932	13 12 5·67	−0·02	+0·41	+1·54	+0·01	7·61	13 12 7·76	+ 0·15		
		" 18	"	"	R.P.L. 99	U	7	−0·205	12 48 54·53	+0·07	−0·06	−1·54		53·00	12 48 31·92	− 21·08	+32·3	10
					Polaris	L	4	+0·932	13 11 53·95	−0·29	+0·17	−1·54	+0·01	52·30	13 12 7·89	+ 15·59		
VIZAGAPATAM (E) AND MADRAS (W)	VIZAGAPATAM (Latitude 17° 41')	1877 Jan. 21	I.P.E.	E	δ Ursæ Minoris	L	3	+0·360	6 11 46·70	+1·66	+0·44	+1·70		50·50	6 11 36·84	− 13·66	−16·9	24
					51 Cephei	U	3	−0·435	6 42 51·04	−2·04	−0·62	+1·70	−0·09	49·99	6 42 49·74	− 0·25		
		" 22	"	W	ι Argûs	U	7	+0·042	9 1 44·29	−0·19	−0·05	+1·70		45·75	9 13 49·80	+12 4·05	−18·1	5
					θ Ursæ Majoris	U	10	−0·021	9 12 33·93	−0·16	−0·14	+1·70		35·33	9 24 40·52	+12 5·19		
		" 23	"	E	δ Ursæ Minoris	L	10	+0·360	6 11 57·14	+1·66	+0·61	+1·70		61·11	6 11 37·15	− 23·96	−22·4	83
					51 Cephei	U	11	−0·435	6 42 56·92	−2·04	−0·86	+1·70	−0·09	55·63	6 42 49·50	− 6·13		
		" 24	"	"	δ Ursæ Minoris	L	4	+0·360	6 12 4·09	+1·66	−0·26	+1·70		7·19	6 11 37·29	− 29·90	−26·0	31
					51 Cephei	U	4	−0·435	6 42 58·72	−2·04	+0·37	+1·70	−0·09	58·66	6 42 49·41	− 9·25		
		" 25	"	"	δ Ursæ Minoris	L	5	+0·360	6 12 10·29	+1·66	−0·09	+1·69		13·55	6 11 37·42	− 36·13	−30·9	43
					51 Cephei	U	6	−0·435	6 43 1·19	−2·04	+0·13	+1·69	−0·09	0·88	6 42 49·33	− 11·55		
		" 26	"	W	ι Argûs	U	10	+0·042	9 1 51·03	−0·19	+0·02	−1·69		49·17	9 13 49·84	+12 0·67	−29·2	8
					θ Ursæ Majoris	U	15	−0·021	9 12 39·90	−0·16	+0·05	−1·69		38·10	9 24 40·61	+12 2·51		
		" 27	I.P.W.	E	δ Ursæ Minoris	L	4	+0·360	6 12 25·53	−1·36	−0·13	+1·70		25·74	6 11 37·66	− 48·08	−39·6	34
					51 Cephei	U	5	−0·435	6 43 2·34	+1·67	+0·18	+1·70	−0·09	5·80	6 42 49·20	− 16·60		
		" "	"	W	ι Argûs	U	9	+0·042	9 1 51·69	+0·16	+0·01	−1·70		50·16	9 13 49·85	+11 59·69	−38·1	7
					θ Ursæ Majoris	U	14	−0·021	9 12 40·08	+0·13	+0·03	−1·70		38·54	9 24 40·63	+12 2·09		
																27th, Mean	−39·3	41
		" 29	"	"	ι Argûs	U	7	+0·042	9 1 53·16	+0·16	0·00	−1·69		51·63	9 13 49·87	+11 58·24	−40·3	6
					θ Ursæ Majoris	U	14	−0·021	9 12 41·44	+0·13	+0·01	−1·69		39·89	9 24 40·67	+12 0·78		
		" 31	"	E	51 Cephei	U	4	−0·435	6 43 18·78	+1·67	+0·15	+1·70		22·30	6 42 48·64	− 33·66	−41·6	3
					λ Ursæ Minoris	L	1	+1·152	7 47 26·43	−4·33	−0·31	−1·70	−0·19	19·90	7 45 40·19	− 1 39·71		
		" "	"	W	ι Argûs	U	7	+0·042	9 1 54·55	+0·16	+0·01	−1·70		53·02	9 13 49·89	+11 56·87	−43·3	5
					θ Ursæ Majoris	U	13	−0·021	9 12 42·66	+0·13	+0·03	−1·70		41·12	9 24 40·72	+11 59·60		
																31st, Mean	−42·7	8
	MADRAS (Lat. 13° 4')	1877 Jan. 20	I.P.E.	W	δ Ursæ Minoris	L	4	+0·374	6 12 40·58	+1·60	+0·64	+1·45		44·27	6 11 36·68	− 1 7·59	−174·1	27
					51 Cephei	U	5	−0·449	6 41 35·97	−1·96	−1·27	+1·45	−0·01	34·18	6 42 49·87	+ 1 15·69		

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation d_1	Weight of d_1
									h m s	s	s	s	s	s	h m s	m s	d	
VIZAGAPATAM (E) AND MADRAS (W)	MADRAS (Latitude 13° 4′)	1877 Jan. 23	*I.P.E.*	W	51 Cephei	U	5	−0·449	6 42 24·26	−1·96	−0·38	+1·47		23·39	6 42 49·50	+ 0 26·11	−70·9	8
					λ Ursæ Minoris	L	3	+1·183	7 47 2·27	+5·08	+0·75	+1·47	−0·03	9·54	7 45 40·15	− 1 29·39		
		„ 24	„	„	51 Cephei	U	8	−0·449	6 42 16·34	−1·96	−0·37	+1·48		15·49	6 42 49·41	+ 33·92	−89·7	29
					83 Cancri	U	15	−0·002	9 12 16·81	−0·10	−0·07	−1·48	−0·06	15·10	9 12 8·94	− 6·16		
		„ 25	„	„	λ Ursæ Minoris	L	3	+1·183	7 47 30·54	+5·08	+1·00	+1·49		38·11	7 45 40·13	− 1 57·98	−93·7	4
					83 Cancri	U	15	−0·002	9 12 17·63	−0·10	−0·09	−1·49	−0·04	15·91	9 12 8·96	− 6·95		
		„ 26	„	„	λ Ursæ Minoris	L	3	+1·183	7 47 38·43	+5·08	+0·80	+1·40		45·71	7 45 40·07	− 2 5·64	−99·6	4
					83 Cancri	U	15	−0·002	9 12 18·26	−0·10	−0·08	−1·40	−0·04	16·64	9 12 8·97	− 7·67		
		„ 27	*I.P.W.*	„	δ Ursæ Minoris	L	15	+0·374	6 11 53·96	−0·61	−0·26	+1·41		54·50	6 11 37·66	− 16·84	−24·8	58
					51 Cephei	U	7	−0·449	6 42 42·92	+0·75	+0·52	+1·41	−0·01	45·59	6 42 49·20	+ 3·61		
		„ 29	„	„	51 Cephei	U	14	−0·449	6 42 36·04	+0·75	+0·58	+1·41		38·78	6 42 49·00	+ 10·22	−42·8	13
					λ Ursæ Minoris	L	5	+1·183	7 46 41·18	−1·93	−1·15	+1·41	−0·03	39·48	7 45 39·93	− 59·55		
		„ 31	„	„	51 Cephei	U	10	−0·449	6 42 31·32	+0·75	+0·65	+1·42		34·14	6 42 48·64	+ 14·50	−60·0	10
					λ Ursæ Minoris	L	4	+1·183	7 47 5·46	−1·93	−1·28	+1·42	−0·03	3·64	7 45 40·19	− 1 23·45		
		Feb. 1	„	„	51 Cephei	U	8	−0·449	6 42 28·90	+0·75	+0·77	+1·40		31·82	6 42 48·42	+ 16·60	−62·9	10
					λ Ursæ Minoris	L	4	+1·183	7 47 8·58	−1·93	−1·53	+1·40	−0·03	6·49	7 45 40·45	− 1 26·04		
VIZAGAPATAM (E) AND BELLARY (W)	VIZAGAPATAM (Latitude 17° 41′)	1877 Feb. 14	*I.P.W.*	E	λ Ursæ Minoris	L	3	+1·151	7 46 31·43	−3·48	−1·20	+1·75		28·50	7 45 44·61	− 0 43·89	−23·4	6
					R.P.L. 49	U	13	−0·211	7 47 42·34	+0·67	+0·32	+1·75		45·08	7 47 33·00	− 12·08		
		„ „	„	„	ι Argûs	U	4	+0·042	9 14 10·15	+0·13	+0·03	−1·75		8·56	9 13 49·90	− 18·66	−22·2	3
					θ Ursæ Majoris	U	8	−0·021	9 24 59·67	+0·11	+0·11	−1·75		58·14	9 24 40·88	− 17·26		
																14th, Mean	−23·0	9
		„ 17	„	„	λ Ursæ Minoris	L	3	+1·151	7 46 42·26	−3·48	−1·00	+1·70		39·48	7 45 46·39	− 53·09	−29·7	4
					θ Ursæ Majoris	U	9	−0·021	9 24 60·65	+0·11	+0·09	−1·70	−0·01	59·14	9 24 40·90	− 18·24		
		„ 19	*I.P.E.*	„	λ Ursæ Minoris	L	1	+1·151	7 46 9·24	+4·56	−1·07	+1·70		14·43	7 45 47·72	− 26·71	− 7·2	2
					R.P.L. 49	U	4	−0·211	7 47 48·30	−0·88	+0·28	+1·70		49·40	7 47 32·46	− 16·94		
		„ 21	„	„	λ Ursæ Minoris	L	6	+1·151	7 46 11·13	+4·56	−0·89	+1·70		16·50	7 45 48·94	− 27·56	− 7·3	11
					R.P.L. 49	U	8	−0·211	7 47 48·79	−0·88	+0·24	+1·70		49·85	7 47 32·24	− 17·61		
		„ „	„	„	ι Argûs	U	8	+0·042	9 14 11·32	−0·16	+0·03	−1·70		9·49	9 13 49·85	− 19·64	− 3·8	5
					θ Ursæ Majoris	U	9	−0·021	9 25 2·08	−0·14	+0·08	−1·70		0·32	9 24 40·92	− 19·40		
																21st, Mean	− 6·2	16

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation d_1	Weight of d_1
									h m s	s	s	s	s	s	h m s	m s	d	
VIZAGAPATAM (E) AND BELLARY (W)	VIZAGAPATAM (Latitude 17° 41′)	1877 Feb. 22	I.P.E.	E	λ Ursæ Minoris	L	2	+1·151	7 46 14·35	+4·57	−1·00	+1·69		19·61	7 45 49·49	− 0 30·12	− 9·2	4
					R.P.L. 49	U	7	−0·211	7 47 48·60	−0·87	+0·26	+1·69		49·68	7 47 32·14	− 17·54		
		" "	"	"	ι Argûs	U	8	+0·042	9 14 11·58	−0·16	+0·03	−1·69		9·76	9 13 49·84	− 19·92	− 7·0	6
					θ Ursæ Majoris	U	11	−0·021	9 25 2·15	−0·14	+0·08	−1·69		0·40	9 24 40·92	− 19·48		
																22nd, Mean	− 7·9	10
		" 23	I.P.W.	"	λ Ursæ Minoris	L	4	+1·151	7 46 18·50	−1·56	−1·52	+1·70		17·12	7 45 50·02	− 27·10	− 7·0	7
					R.P.L. 49	U	5	−0·211	7 47 47·16	+0·30	+0·40	+1·70		49·56	7 47 32·03	− 17·53		
		" "	"	"	ι Argûs	U	3	+0·042	9 14 11·07	+0·06	+0·04	−1·70		9·47	9 13 49·82	− 19·65	− 1·0	3
					θ Ursæ Majoris	U	10	−0·021	9 25 2·02	+0·05	+0·13	−1·70		0·50	9 24 40 91	− 19·59		
																23rd, Mean	− 5·2	10
		" 24	"	"	λ Ursæ Minoris	L	5	+1·151	7 46 21·86	−1·56	−1·34	+1·70		20·66	7 45 50·53	− 30·13	− 9·2	9
					R.P.L. 49	U	12	−0·211	7 47 47·14	+0·30	+0·36	+1·70		49·50	7 47 31·92	− 17·58		
		" "	"	"	ι Argûs	U	4	+0·042	9 14 11·27	+0·06	+0·04	−1·70		9·67	9 13 49·81	− 19·86	− 5·2	4
					θ Ursæ Majoris	U	10	−0·021	9 25 1·97	+0·05	+0·12	−1·70		0·44	9 24 40·91	− 19·53		
																24th, Mean	− 8·0	13
		" 25	I.P.E.	"	λ Ursæ Minoris	L	4	+1·151	7 46 10·82	−1·68	−2·27	+1·70		8·57	7 45 51·08	− 17·49	+ 1·7	7
					R.P.L. 49	U	8	−0·211	7 47 49·03	+0·32	+0·60	+1·70		51·65	7 47 31·81	− 19·84		
	BELLARY (Latitude 15° 9′)	1877 Feb. 17	I.P.W.	W	λ Ursæ Minoris	L	4	+1·171	7 45 15·86	+2·05	+0·94	+1·40		20·25	7 45 46·39	+ 26·14	+ 1·6	8
					R.P.L. 49	U	9	−0·216	7 47 7·95	−0·39	−0·26	+1·40		8·70	7 47 32·68	+ 23·98		
		" 19	I.P.E.	"	λ Ursæ Minoris	L	4	+1·171	7 45 24·08	+1·81	+0·21	+1·39		27·49	7 45 47·72	+ 20·23	− 7·7	8
					R.P.L. 49	U	10	−0·216	7 47 0·57	−0·35	−0·06	+1·39		1·55	7 47 32·46	+ 30·91		
		" 20	"	"	λ Ursæ Minoris	L	5	+1·171	7 45 19·73	+1·81	+0·29	+1·40		23·23	7 45 48·35	+ 25·12	− 5·4	9
					R.P.L. 49	U	9	−0·216	7 46 58·72	−0·35	−0·08	+1·40		59·69	7 47 32·35	+ 32·66		
		" 21	"	"	λ Ursæ Minoris	L	4	+1·171	7 45 14·15	+1·81	+0·38	+1·41		17·75	7 45 48·94	+ 31·19	− 1·9	8
					R.P.L. 49	U	8	−0·216	7 46 57·50	−0·35	−0·11	+1·41		58·45	7 47 32·24	+ 33·79		
		" 22	"	"	λ Ursæ Minoris	L	3	+1·171	7 45 9·09	+1·81	+0·74	+1·41		13·05	7 45 49·49	+ 36·44	+ 0·7	6
					R.P.L. 49	U	8	−0·216	7 46 53·86	−0·35	−0·21	+1·41		54·71	7 47 32·14	+ 37·43		
		" 24	I.P.W.	"	λ Ursæ Minoris	L	3	+1·171	7 44 55·38	+2·05	+0·56	+1·41		59·40	7 45 50·53	+ 51·13	+10·6	5
					R.P.L. 49	U	2	−0·216	7 46 54·64	−0·39	−0·16	+1·41		55·50	7 47 31·92	+ 36·42		
		" 25	I.P.E.	"	λ Ursæ Minoris	L	4	+1·171	7 45 2·64	+1·81	+2·09	+1·40		7·94	7 45 51·08	+ 43·14	+ 2·4	8
					R.P.L. 49	U	7	−0·216	7 46 51·50	−0·35	−0·58	+1·40		51·97	7 47 31·81	+ 39·84		

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
									h m s	s	s	s	s	s	h m s	m s	d	
MANGALORE (E) AND BOMBAY (W)	MANGALORE (Latitude 12° 52′)	1877 Mar. 22	*I.P.E.*	E	R.P.L. 99	U	5	−0·205	12 47 20·36	−0·22	−0·42	+1·78		21·50	12 48 32·37	+ 1 10·87	−219·7	4
					Polaris	L	3	+0·936	13 15 28·37	+0·95	+1·16	+1·78	+0·02	32·28	13 12 32·48	− 2 59·80		
		" 24	"	"	R.P.L. 99	U	5	−0·205	12 48 1·86	−0·22	−0·09	+1·79		3·34	12 48 32·43	+ 29·09	− 6·1	1
					Polaris	L	1	+0·936	13 12 6·80	+0·95	+0·25	+1·79	+0·02	9·81	13 12 31·98	+ 22·17		
		" 25	"	"	R.P.L. 99	U	5	−0·205	12 48 0·58	−0·22	−0·08	+1·77		2·05	12 48 32·45	+ 30·40	− 5·7	5
					Polaris	L	4	+0·936	13 12 4·83	+0·95	+0·21	+1·77	+0·02	7·78	13 12 31·68	+ 23·90		
		" 26	*I.P.W.*	"	R.P.L. 99	U	5	−0·205	12 47 56·66	−1·91	−0·35	+1·76		56·16	12 48 32·48	+ 36·32	− 30·4	5
					Polaris	L	4	+0·936	13 12 18·60	+8·40	+0·95	+1·76	+0·02	29·73	13 12 31·40	+ 1·67		
	BOMBAY (Latitude 18° 54′)	1877 Mar. 22	*I.P.E.*	W	R.P.L. 99	U	6	−0·199	12 48 29·03	−0·64	−0·22	+1·40		29·57	12 48 32·37	+ 2·80	− 11·7	5
					Polaris	L	4	+0·915	13 12 40·66	+2·78	+0·70	−1·40	−0·01	42·73	13 12 32·48	− 10·25		
		" 24	"	"	R.P.L. 99	U	5	−0·199	12 48 26·77	−0·64	−0·33	+1·38		27·18	12 48 32·43	+ 5·25	− 25·1	4
					Polaris	L	3	+0·915	13 12 52·28	+2·78	+1·04	−1·38	−0·01	54·71	13 12 31·98	− 22·73		
		" 25	"	"	R.P.L. 99	U	6	−0·199	12 48 26·09	−0·64	−0·38	+1·39		26·46	12 48 32·45	+ 5·99	− 32·5	4
					Polaris	L	3	+0·915	13 12 59·33	+2·78	+1·19	−1·39	−0·01	61·90	13 12 31·68	− 30·22		
		" 26	*I.P.W.*	"	R.P.L. 99	U	6	−0·199	12 48 25·53	−0·20	+0·04	+1·38		26·75	12 48 32·48	+ 5·73	− 35·7	4
					Polaris	L	3	+0·915	13 13 6·09	+0·86	−0·12	−1·38	−0·01	5·44	13 12 31·40	− 34·04		

Arc	Station	B.A.C. Number of Star, and Data	Astronomical Date	Instrumental Position	Clock in use	No. of Wires Observed	Observed Time of Transit	Reduction of each Observation to that of the First Day: Instrumental Corrections: Collimation	Level	Q	Corrections for: Clock Rate	Change in R.A.	Reduced Observation: Daily	Mean	Comparison of each Reduced Observation with Mean of all: Difference = Δa_2	a_2	Weight	Computed Deviation by Circumpolar Star Observations $= a_1$: a_1	Mean a_1	δa_1	Weight	Deduced Deviation by the Combination of a_1 and a_2
							h m s	s	s	s	s	s	s	s	s	d		d	d	d		d
Bellary (E) and Bombay (W)	Bellary (Latitude 15° 9′)	2548 δ = +80° 11′	1876 Feb. 8	I.P.E.	E	3	7 39 20·45	+0·01	+0·27	−1·88	0·00	0·00	18·85		−0·51	+4·3	2	+19·1		+3·4	5	+19·4
		R.A. = 7h 39m	" 9	"	"	5	39 20·04	+0·16	+0·10	−1·88	+0·93	0·00	19·35		−1·01	+8·5	3	+26·3		+10·6	8	+25·7
		A = −0·119	" 10	I.P.W.	"	4	39 17 26	−0·44	+0·07	−1·89	+1·83	0·00	16·83	18·34	+1·51	−12·7	2	+1·6	+15·7	−14·1	8	+1·9
		3116	" 9	I.P.E.	W	9	8 47 17·59	+0·10	+0·08	−1·88	0·00	0·00	15·89		−0·68	+10·1	5	+26·3		+12·3	8	+25·5
		δ = +73° 27′	" 10	I.P.W.	"	7	47 16·29	−0·27	+0·05	−1·88	+0·34	−0·01	14·52	15·21	+0·69	−10·3	4	+1·6	+14·0	−12·4	8	+2·3
		R.A. = 9h 4m																				
		A = −0·067																				
	Bombay (Latitude 18° 54′)	828	1876 Jan. 28	I.P.E.	W	5	6 25 45·33	+0·06	+0·03	+1·64	0·00	0·00	47·06		+0·32	−2·9	3	+6·1		−5·4	9	+6·7
		δ = +79° 42′	" 29	I.P.W.	"	5	25 51·67	−0·04	+0·26	−1·68	−2·52	+0·01	47·70		−0·32	+2·9	3	+12·3		+0·8	8	+12·9
		R.A. = 6h 24m	" 30	"	"	8	25 51·67	0·00	+0·01	+1·64	−5·03	+0·01	48·30		−0·92	+8·4	4	+16·4		+4·9	6	+17·8
		A = −0·110	" 31	I.P.E.	"	8	25 56·62	−0·13	+0·21	−1·62	−7·87	+0·02	47·23		+0·15	−1·4	4	+9·4		−2·1	9	+9·6
			Feb. 1	"	"	10	25 58·94	−0·16	+0·27	−1·61	−10·43	+0·02	47·03		+0·35	−3·2	5	+10·2		−1·3	10	+9·6
			" 10	I.P.W.	"	10	25 23·61	−0·14	+0·14	−1·57	+24·86	+0·07	46·97	47·38	+0·41	−3·7	5	+14·6	+11·5	+3·1	9	+12·2
		3116	" 8	I.P.E.	W	10	9 3 40·45	−0·05	−0·07	+1·57	0·00	0·00	41·90		+0·16	−2·5	5	+7·7		−3·1	7	+8·0
		δ = +73° 27′	" 9	"	"	11	3 43·37	+0·03	−0·04	−1·59	+0·38	−0·01	42·14		−0·08	+1·3	6	+10·1		−0·7	8	+11·0
		R.A. = 9h 4m	" 10	I.P.W.	"	11	3 39·87	−0·09	+0·10	+1·57	+0·72	−0·02	42·15	42·06	−0·09	+1·4	6	+14·6	+10·8	+3·8	9	+13·6
		A = −0·065																				
		2548	" 8	I.P.E.	E	5	7 55 42·58	−0·08	−0·10	+1·57	0·00	0·00	43·97		+0·37	−3·2	3	+7·7		−3·1	7	+7·7
		δ = +80° 11′	" 9	"	"	8	55 45·15	+0·05	−0·05	−1·59	+0·93	0·00	44·49		−0·15	+1·3	4	+10·1		−0·7	8	+10·8
		R.A. = 7h 39m	" 10	I.P.W.	"	7	55 41·16	−0·14	+0·14	+1·57	+1·83	0·00	44·56	44·34	−0·22	+1·9	4	+14·6	+10·8	+3·8	9	+14·0
		A = −0·116																				
Bolarum (E) and Bellary (W)	Bolarum (Latitude 17° 30′)	3199	1876 Feb. 19	I.P.W.	E	7	9 19 15·67	−0·98	−0·36	+1·63	0·00	0·00	15·96		+1·78	−12·4	4	−30·4		−16·5	4	−28·4
		δ = +81° 52′	" 20	"	"	5	18 51·92	−1·05	−0·50	−1·61	+27·70	+0·02	16·48		+1·26	−8·8	3	−23·3		−9·4	8	−23·1
		R.A. = 9h 18m	" 21	"	"	4	18 21·29	−1·12	−0·11	+1·62	+55·42	+0·03	17·13		+0·61	−4·2	2	−21·3		−7·4	4	−20·2
		A = −0·144	" 22	I.P.E.	"	7	17 57·50	+0·43	−0·26	−1·61	+83·05	+0·05	19·16		−1·42	+9·9	4	−4·9		+9·0	4	−4·4
			" 23	"	"	10	17 26·05	+0·35	−0·19	+1·61	+111·01	+0·06	18·89		−1·15	+8·0	5	−2·2		+11·7	22	−2·9
			" 24	"	"	8	16 60·96	+0·56	−0·13	−1·61	+138·97	+0·08	18·83	17·74	−1·09	+7·6	4	−1·1	−13·9	+12·8	6	−3·2

Arc	Station	B.A.C. Number of Star, and Data	Astronomical Date	Instrumental Position	Clock in use	No. of Wires Observed	Observed Time of Transit	Reduction of each Observation to that of the First Day							Comparison of each Reduced Observation with Mean of all			Computed Deviation by Circumpolar Star Observations $= a_1$				Deduced Deviation by the Combination of a_1 and a_2
								Instrumental Corrections			Corrections for		Reduced Observation									
								Collimation	Level	Q	Clock Rate	Change in R.A.	Daily	Mean	Difference $= Aa_2$	a_2	Weight	a_1	Mean a_1	δa_1	Weight	
BOLARUM (E) AND BELLARY (W)	BOLARUM (Latitude 17° 30′)		1876				h m s	s	s	s	s	s	s	s	s	d		d	d	d		d
		3629	Feb. 19	*I.P.W.*	W	8	10 24 58·79	−0·89	−0·34	+1·63	0·00	0·00	59·19		+ 1·88	−14·5	4	− 30·4		− 16·5	4	− 29·4
		δ = +81° 4′	„ 20	„	„	15	25 2·59	−0·96	−0·47	−1·61	+ 0·74	− 0·03	60·26		+ 0·81	− 6·2	8	− 23·3		− 9·4	8	− 21·7
		R.A. = 10ʰ 31ᵐ	„ 21	„	„	10	24 58·14	−1·02	−0·13	+1·62	+ 1·79	− 0·06	60·34		+ 0·73	− 5·6	5	− 21·3		− 7·4	4	− 20·3
		A = −0·130	„ 22	*I.P.E.*	„	10	25 0·96	+0·39	−0·24	−1·62	+ 2·58	− 0·09	61·98		− 0·91	+ 7·0	5	− 4·9		+ 9·0	4	− 6·0
			„ 23	„	„	15	24 57·08	+0·32	−0·18	+1·61	+ 3·48	− 0·12	62·19		− 1·12	+ 8·6	8	− 2·2		+ 11·7	22	− 3·0
			„ 24	„	„	12	24 59·40	+0·51	−0·12	−1·61	+ 4·40	− 0·15	62·43	61·07	− 1·36	+10·5	6	− 1·1	−13·9	+ 12·8	6	− 2·2
		3906	„ 19	*I.P.W.*	W	14	11 16 55·17	−0·97	−0·36	−1·63	0·00	0·00	52·21		+ 1·44	−10·1	7	− 30·4		− 16·5	4	− 26·3
		δ = +81°48′	„ 20	„	„	10	16 52·08	−1·05	−0·50	+1·61	+ 0·74	− 0·06	52·82		+ 0·83	− 5·8	5	− 23·3		− 9·4	8	− 21·9
		R.A. = 11ʰ 23ᵐ	„ 21	„	„	9	16 53·64	−1·11	−0·14	−1·62	+ 1·79	− 0·13	52·43		+ 1·22	− 8·5	5	− 21·3		− 7·4	4	− 21·9
		A = −0·143	„ 22	*I.P.E.*	„	10	16 50·36	+0·43	−0·26	+1·62	+ 2·58	− 0·19	54·54		− 0·89	+ 6·2	5	− 4·9		+ 9·0	4	− 6·5
			„ 23	„	„	10	16 52·96	+0·35	−0·19	−1·61	+ 3·48	− 0·26	54·73		− 1·08	+ 7·6	5	− 2·2		+ 11·7	22	− 3·0
			„ 24	„	„	10	16 49·07	+0·55	−0·13	+1·61	+ 4·40	− 0·32	55·18	53·65	− 1·53	+10·7	5	− 1·1	−13·9	+ 12·8	6	− 2·1
	BELLARY (Latitude 15° 9′)		1876																			
		8199	Feb. 19	*I.P.W.*	E	8	9 25 48·54	−0·03	+0·04	+1·59	0·00	0·00	50·14		− 7·13	+ 48·9	4	+ 59·5		+ 51·1	15	+ 59·0
		δ = +81°52′	„ 20	„	„	5	25 10·82	+0·16	+0·04	+1·59	+ 27·70	+ 0·02	40·33		+ 2·68	− 18·4	3	− 15·4		− 23·8	2	− 12·2
		R.A. = 9ʰ 18ᵐ	„ 21	„	„	5	24 44·04	−0·23	+0·04	+1·60	+ 55·42	+ 0·03	40·90		+ 2·11	− 14·5	3	− 4·1		− 12·5	4	− 5·0
		A = −0·146	„ 22	*I.P.E.*	„	10	24 17·47	−0·22	−0·39	+1·60	+ 83·05	+ 0·05	41·56		+ 1·45	− 9·9	5	− 0·9		− 9·3	6	− 1·2
			„ 23	„	„	8	23 49·48	−0·09	+0·20	+1·60	+111·01	+ 0·06	42·26		+ 0·75	− 5·1	4	+ 3·7		− 4·7	5	+ 3·5
			„ 24	„	„	8	23 22·28	−0·24	+0·21	+1·59	+138·97	+ 0·08	42·89	43·01	+ 0·12	− 0·8	4	+ 7·5	+ 8·4	− 0·9	16	+ 7·5
		3629	„ 19	*I.P.W.*	W	5	10 31 30·97	+0·03	−0·01	+1·59	0·00	0·00	32·58		− 6·79	+ 51·4	3	+ 59·5		+ 51·1	15	+ 59·6
		δ = +81° 4′	„ 20	„	„	10	31 21·14	+0·14	+0·04	+1·59	+ 0·74	− 0·03	23·62		+ 2·17	− 16·4	5	− 15·4		− 23·8	2	− 10·1
		R.A. = 10ʰ 31ᵐ	„ 21	„	„	5	31 20·76	−0·21	+0·04	+1·60	+ 1·79	− 0·06	23·92		+ 1·87	− 14·2	3	− 4·1		− 12·5	4	− 4·8
		A = −0·132	„ 22	*I.P.E.*	„	9	31 20·53	−0·20	−0·36	+1·59	+ 2·58	− 0·09	24·05		+ 1·74	− 13·2	5	− 0·9		− 9·3	6	− 2·7
			„ 23	„	„	6	31 19·96	−0·09	+0·19	+1·60	+ 3·48	− 0·12	25·02		+ 0·77	− 5·8	3	+ 3·7		− 4·7	5	+ 3·3
			„ 24	„	„	5	31 19·74	−0·22	+0·20	+1·60	+ 4·40	− 0·15	25·57	25·79	+ 0·22	− 1·7	3	+ 7·5	+ 8·4	− 0·9	16	+ 7·4
		3906	„ 19	*I.P.W.*	W	5	11 23 27·70	+0·04	−0·01	−1·59	0·00	0·00	26·14		− 7·30	+ 50·3	3	+ 59·5		+ 51·1	15	+ 59·4
		δ = +81°48′	„ 20	„	„	9	23 16·64	+0·16	+0·04	−1·59	+ 0·74	− 0·06	15·93		+ 2·91	− 20·1	5	− 15·4		− 23·8	2	− 12·8
		R.A. = 11ʰ 23ᵐ	„ 21	„	„	9	23 16·60	−0·23	+0·04	−1·60	+ 1·79	− 0·13	16·47		+ 2·37	− 16·3	5	− 4·1		− 12·5	4	− 6·2
		A = −0·145	„ 22	*I.P.E.*	„	8	23 17·49	−0·22	−0·39	−1·59	+ 2·58	− 0·19	17·68		+ 1·16	− 8·0	4	− 0·9		− 9·3	6	− 0·4
			„ 23	„	„	7	23 16·59	−0·09	+0·20	−1·60	+ 3·48	− 0·26	18·32		+ 0·52	− 3·6	4	+ 3·7		− 4·7	5	+ 4·2
			„ 24	„	„	10	23 16·05	−0·23	+0·20	−1·60	+ 4·40	− 0·32	18·50	18·84	+ 0·34	− 2·4	5	+ 7·5	+ 8·4	− 0·9	16	+ 7·1

Arc	Station	B.A.C. Number of Star, and Data	Astronomical Date	Instrumental Position	Clock in use	No. of Wires Observed	Observed Time of Transit	Reduction of each Observation to that of the First Day: Instrumental Corrections			Corrections for		Reduced Observation		Comparison of each Reduced Observation with Mean of all			Computed Deviation by Circumpolar Star Observations $= a_1$				Deduced Deviation by the Combination of a_1 and a_2
								Collimation	Level	Q	Clock Rate	Change in R.A.	Daily	Mean	Difference $= \Delta a_2$	a_2	Weight	a_1	Mean a_1	δa_1	Weight	
MADRAS (E) AND BOLARUM (W)	MADRAS (Latitude 13° 4′)		1876				h m s	s	s	s	s	s	s	s	s	d		d	d	d		d
		3629†	Mar. 5	*I.P.E.*	E	5	10 31 11·15	−0·19	+0·01	+1·75	+ 3·57	+ 0·03	16·32		+ 0·04	− 0·3	3	− 31·2		+ 0·7	6	− 31·5
		δ = +81° 4′	" 6	"	"	5	31 8·49	−0·58	−0·14	+1·59	+ 5·32	+ 0·05	14·73		+ 1·63	− 12·2	3	− 44·0		− 12·1	7	− 44·0
		R.A. = 10h 31m	" 7	*I.P.W.*	"	5	31 8·51	+0·15	+0·12	+1·60	+ 7·01	+ 0·06	17·45		− 1·09	+ 8·1	3	− 22·7		+ 9·2	5	− 23·1
		A = −0·134	" 8	"	"	5	31 6·30	+0·08	+0·02	+1·60	+ 8·86	+ 0·08	16·94		− 0·58	+ 4·3	3	− 29·7		+ 2·2	8	− 29·1
			" 12	"	"	5	30 58·30	+0·11	−0·05	+1·58	+ 14·28	+ 0·14	14·36*	16·36	+ 2·00	− 14·9	3		−31·9			− 46·8
		3906	" 3	*I.P.E.*	E	5	11 23 6·48	−0·44	−0·28	−1·71	0·00	0·00	4·05		+ 4·40	− 30·0	3	− 69·2		− 29·8	3	− 69·3
		δ = +81° 48′	" 5	"	"	5	23 7·97	−0·20	+0·01	−1·75	+ 3·57	− 0·04	9·56		− 1·11	+ 7·6	3	− 31·2		+ 8·2	6	− 31·4
		R.A. = 11h 23m	" 6	"	"	5	23 4·94	−0·63	−0·14	−1·59	+ 5·32	− 0·06	7·84		+ 0·61	− 4·1	3	− 44·0		− 4·6	7	− 43·9
		A = −0·147	" 7	*I.P.W.*	"	5	23 5·36	+0·16	+0·12	−1·60	+ 7·01	− 0·08	10·97		− 2·52	+ 17·1	3	− 22·7		+ 16·7	5	− 22·5
			" 8	"	"	5	23 2·54	+0·09	+0·02	−1·60	+ 8·86	− 0·10	9·81		− 1·36	+ 9·3	3	− 29·7		+ 9·7	8	− 29·8
			" 12	"	"	4	22 53·77	+0·12	−0·05	−1·58	+ 14·28	− 0·17	6·37*	8·45	+ 2·08	− 14·1	2		−39·4			− 53·5
		4193	" 3	*I.P.E.*	W	3	12 13 17·68	−0·61	−0·36	−1·71	0·00	0·00	15·00		+ 5·67	− 27·4	2	− 69·2		− 27·8	3	− 69·0
		δ = +84° 7′	" 6	"	"	2	13 22·69	−0·88	−0·18	−1·60	+ 0·69	− 0·22	20·50		+ 0·17	− 0·8	1	− 44·0		− 2·6	7	− 43·8
		R.A. = 12h 20m	" 7	*I.P.W.*	"	2	13 24·75	+0·23	+0·15	−1·60	+ 1·04	− 0·29	24·28		− 3·61	+ 17·4	1	− 22·7		+ 18·7	5	− 22·9
		A = −0·207	" 8	"	"	3	13 23·25	+0·13	+0·02	−1·59	+ 1·44	− 0·37	22·88	20·67	− 2·21	+ 10·7	2	− 29·7	−41·4	+ 11·7	8	− 29·9
	BOLARUM (Latitude 17° 30′)		1876																			
		3629	Mar. 3	*I.P.E.*	E	10	10 38 11·81	−0·07	+0·31	+1·62	0·00	0·00	13·67		+ 1·44	− 11·1	5	− 11·8		− 5·8	13	− 13·3
		δ = +81° 4′	" 5	"	"	11	38 13·50	−0·10	−0·01	−1·60	+ 3·57	+ 0·03	15·39		− 0·28	+ 2·2	6	− 1·8		+ 4·2	14	− 2·4
		R.A. = 10h 31m	" 6	"	"	11	38 8·86	−0·01	+0·04	+1·60	+ 5·32	+ 0·05	15·86		− 0·75	+ 5·8	6	+ 0·7		+ 6·7	8	+ 0·3
		A = −0·130	" 7	*I.P.W.*	"	10	38 9·90	+0·18	−0·03	−1·61	+ 7·01	+ 0·06	15·51		− 0·40	+ 3·1	5	− 10·5		− 4·5	10	− 8·0
			" 8	"	"	9	38 4·15	+0·27	+0·02	+1·60	+ 8·86	+ 0·08	14·98		+ 0·13	− 1·0	5	− 2·3		+ 3·7	8	− 4·1
			" 12	"	"	9	38 2·56	−0·01	−0·11	−1·61	+ 14·28	+ 0·14	15·25	15·11	− 0·14	+ 1·1	5	− 10·0	− 6·0	− 4·0	11	− 8·4
		3906	" 3	*I.P.E.*	E	5	11 30 8·21	−0·07	+0·33	−1·62	0·00	0·00	6·85		+ 1·26	− 8·8	3	− 11·8		− 5·8	13	− 12·4
		δ = +81° 48′	" 5	"	"	5	30 3·28	−0·11	−0·01	+1·60	+ 3·57	− 0·04	8·29		− 0·18	+ 1·3	3	− 1·8		+ 4·2	14	− 2·3
		R.A. = 11h 23m	" 6	"	"	10	30 5·50	−0·01	+0·04	−1·60	+ 5·32	− 0·06	9·19		− 1·08	+ 7·6	5	+ 0·7		+ 6·7	8	+ 1·0
		A = −0·143	" 7	*I.P.W.*	"	8	29 59·12	+0·19	−0·03	+1·61	+ 7·01	− 0·08	7·82		+ 0·29	− 2·0	4	− 10·5		4·5	10	− 9·8
			" 8	"	"	10	30 0·63	+0·29	+0·02	−1·60	+ 8·86	− 0·10	8·10		+ 0·01	− 0·1	5	− 2·3		+ 3·7	8	− 3·8
			" 12	"	"	10	29 52·79	−0·01	−0·12	+1·61	+ 14·28	− 0·17	8·38	8·11	− 0·27	+ 1·9	5	− 10·0	− 6·0	− 4·0	11	− 8·2
		4193	" 3	*I.P.E.*	W	4	12 20 23·32	−0·10	+0·42	−1·61	0·00	0·00	22·03		+ 1·84	− 9·1	2	− 11·8		− 6·8	13	− 12·1
		δ = +84° 7′	" 5	"	"	5	20 22·60	−0·15	−0·01	+1·60	+ 0·47	− 0·15	24·36		− 0·49	+ 2·4	3	− 1·8		+ 3·2	14	− 1·9
		R.A. = 12h 20m	" 6	"	"	1	20 25·26	−0·01	+0·05	−1·60	+ 0·69	− 0·22	24·17		− 0·30	+ 1·5	1	+ 0·7		+ 5·7	8	+ 0·2
		A = −0·202	" 8	*I.P.W.*	"	4	20 24·49	+0·41	−0·10	−1·61	+ 1·44	− 0·37	24·26		− 0·39	+ 1·9	2	− 2·3		+ 2·7	8	− 2·5
			" 12	"	"	3	20 25·09	−0·01	−0·15	+1·61	− 1·33	− 0·66	24·55	23·87	− 0·68	+ 3·4	2	− 10·0	− 5·0	− 5·0	11	− 8·7

* Not included in taking out mean.

† It was convenient to reduce the observations of this star to the 3rd March, although it was not observed on that day.

Arc	Station	B.A.C. Number of Star, and Data	Astronomical Date	Instrumental Position	Clock in use	No. of Wires Observed	Observed Time of Transit	Reduction of each Observation to that of the First Day: Instrumental Corrections: Collimation	Level	Q	Corrections for: Clock Rate	Change in R.A.	Reduced Observation: Daily	Mean	Comparison of each Reduced Observation with Mean of all: Difference = Δa_2	a_2	Weight	Computed Deviation by Circumpolar Star Observations $= a_1$: a_1	Mean a_1	δa_1	Weight	Deduced Deviation by the Combination of a_1 and a_2
							h m s	s	s	s	s	s	s	s	s	d		d	d	d		d
MADRAS (E) AND BELLARY (W)	MADRAS (Latitude 13° 4′)	4050	1876 Mar. 22	*I.P.W.*	E	5	11 53 19·99	+0·07	−0·09	+1·39	0·00	0·00	21·36		+3·98	−28·1	3	−79·7		−25·5	6	−80·6
		δ = +81° 33′	„ 24	„	„	6	53 16·33	+0·14	+0·03	+1·39	+2·97	+0·04	20·90		+4·44	−31·3	3	−85·6		−31·4	3	−85·6
		R.A. = 11h 54m	„ 26	„	„	5	53 12·64	+0·08	+0·02	+1·38	+6·07	+0·08	20·27		+5·07	−35·7	3	−88·9		−34·7	8	−89·2
		A = −0·142	„ 29	*I.P.E.*	„	5	53 17·66	−0·59	−0·04	+1·38	+10·84	+0·14	29·39		−4·05	+28·5	3	−30·0		+24·2	8	−28·8
			„ 30	„	„	6	53 14·99	−0·65	−0·03	+1·38	+12·47	+0·16	28·32		−2·98	+20·9	3	−34·1		+20·1	3	−33·7
			„ 31	„	„	6	53 13·10	+0·12	+0·20	+1·38	+14·03	+0·18	29·01		−3·67	+25·8	3	−27·3		+26·9	6	−27·7
			Apr. 2	„	„	6	53 9·05	+0·04	+0·18	+1·37	+17·26	+0·22	28·12	25·34	−2·78	+19·6	3	−33·9	−54·2	+20·3	10	−34·1
		4659	Mar. 22	*I.P.W.*	W	4	13 37 25·54	+0·06	−0·08	−1·39	0·00	0·00	24·13		+3·46	−30·4	2	−79·7		−25·6	6	−80·9
		δ = +79° 36′	„ 24	„	„	4	37 9·97	+0·11	+0·03	−1·39	+15·24	−0·08	23·88		+3·71	−32·5	2	−85·6		−31·5	3	−86·0
		R.A. = 13h 51m	„ 26	„	„	4	36 53·62	+0·06	+0·01	−1·38	+31·43	−0·16	23·58		+4·01	−35·2	2	−88·9		−34·8	8	−89·0
		A = −0·114	„ 30	*I.P.E.*	„	5	36 29·54	−0·53	−0·03	−1·38	+62·71	−0·32	29·99		−2·40	+21·1	3	−34·1		+20·0	3	−33·5
			„ 31	„	„	7	36 21·95	+0·11	+0·17	−1·38	+70·47	−0·36	30·96		−3·37	+29·6	4	−27·3		+26·8	6	−26·2
			Apr. 1	„	„	5	36 13·61	+0·21	+0·20	−1·36	+78·40	−0·40	30·66		−3·07	+26·9	3	−29·5		+24·6	3	−28·3
			„ 2	„	„	5	36 5·06	+0·03	+0·16	−1·37	+86·52	−0·44	29·96	27·59	−2·37	+20·8	3	−33·9	−54·1	+20·2	10	−33·8
	BELLARY (Latitude 15° 9′)	4050	1876 Mar. 22	*I.P.E.*	E	5	12 6 60·56	−0·72	−0·51	−1·60	0·00	0·00	57·73		−1·94	+13·8	3	+59·0		+12·6	3	+59·6
		δ = +81° 33′	„ 24	„	„	7	6 44·86	−0·69	+0·11	+1·63	+2·97	+0·04	48·92		+6·87	−48·7	4	−6·7		−53·1	3	−4·2
		R.A. = 11h 54m	„ 26	*I.P.W.*	„	4	6 47·64	+0·57	+0·30	−1·62	+6·07	+0·08	53·04		+2·75	−19·5	2	+30·6		−15·8	6	+29·7
		A = −0·141	„ 29	„	„	7	6 46·26	+0·70	+0·19	+1·62	+10·84	+0·14	59·75*		−3·96	+28·1	4					+74·5
			„ 31	„	„	7	6 48·01	+0·62	−0·27	+1·62	+14·03	+0·18	64·19		−8·40	+59·6	4	+108·8		+62·4	13	+108·1
			Apr. 2	*I.P.E.*	„	7	6 36·28	−0·76	+0·46	+1·61	+17·26	+0·22	55·07	55·79	+0·72	−5·1	4	+40·5	+46·4	−5·9	12	+40·7
		4659	Mar. 22	*I.P.E.*	W	11	13 50 55·85	−0·58	−0·30	+1·60	0·00	0·00	56·57		−0·50	+4·4	6	+59·0		+7·7	3	+56·8
		δ = +79° 36′	„ 24	„	„	7	50 36·34	−0·56	+0·18	−1·63	+15·24	−0·08	49·49		+6·58	−58·2	4	−6·7		−58·0	3	−6·8
		R.A. = 13h 51m	„ 30	*I.P.W.*	„	14	49 55·81	+0·46	−0·16	+1·63	+62·71	−0·32	60·13		−4·06	+35·9	7	+88·0		+36·7	5	+87·5
		A = −0·113	„ 31	„	„	11	49 53·73	+0·50	−0·17	−1·62	+70·47	−0·36	62·55		−6·48	+57·3	6	+108·8		+57·5	13	+108·7
			Apr. 1	*I.P.E.*	„	10	49 33·50	−0·61	+0·39	+1·63	+78·40	−0·40	52·91		+3·16	−28·0	5	+18·2		−33·1	16	+19·4
			„ 2	„	„	11	49 30·52	−0·62	+0·41	−1·62	+86·52	−0·44	54·77	56·07	+1·30	−11·5	6	+40·5	+51·3	−10·8	12	+40·3
BANGALORE (E) AND BELLARY (W)	BANGALORE (Latitude 12° 58′)	4050	1876 Apr. 11	*I.P.E.*	E	5	11 54 21·81	−0·45	0·00	+1·41	0·00	0·00	22·77		+0·31	−2·2	3	−5·5		+0·2	8	−6·1
		δ = +81° 33′	„ 12	„	„	8	54 25·78	−0·36	+0·04	+1·40	−3·79	+0·06	23·13		−0·05	+0·4	4	−1·8		+3·9	3	−3·8
		R.A. = 11h 54m	„ 17	*I.P.W.*	„	5	54 43·25	−0·11	−0·04	+1·41	−21·76	+0·38	23·13		−0·05	+0·4	3	−7·7		−2·0	6	−6·9
		A = −0·142	„ 18	„	„	5	54 47·19	−0·14	−0·04	+1·41	−25·57	+0·45	23·30	23·08	−0·22	+1·5	3	−7·6	−5·7	−1·9	8	−6·7

* Not included in taking out mean.

Arc	Station	B.A.C. Number of Star, and Data	Astronomical Date	Instrumental Position	Clock in use	No. of Wires Observed	Observed Time of Transit	Reduction of each Observation to that of the First Day: Instrumental Corrections			Corrections for		Reduced Observation		Comparison of each Reduced Observation with Mean of all			Computed Deviation by Circumpolar Star Observations = a_1				Deduced Deviation by the Combination of a_1 and a_2
								Collimation	Level	Q	Clock Rate	Change in R.A.	Daily	Mean	Difference = Δa_2	a_2	Weight	a_1	Mean a_1	δa_1	Weight	
BANGALORE (E) AND BELLARY (W)	BANGALORE (Latitude 12° 58′)						h m s	s	s	s	s	s	s	s	s	d		d	d	d		d
		4223	1876 Apr. 11	I.P.E.	E	5	12 25 7·97	−0·19	0·00	+1·41	0·00	0·00	9·19		+ 0·06	− 1·1	2	− 5·5		− 0·6	8	− 5·6
		δ = +69° 53′	" 12	"	"	1	25 14·67	−0·16	+0·02	−1·40	− 3·79	+ 0·02	9·36		− 0·11	+ 2·0	1	− 1·8		+ 3·1	3	− 2·1
		R.A. = 12h 25m	" 13	"	"	5	25 18·53	−0·07	+0·08	−1·41	− 7·78	+ 0·03	9·38		− 0·13	+ 2·4	2	− 2·1		+ 2·8	8	− 2·2
		A = −0·055	" *17	I.P.W.	"	4	25 32·32	−0·05	−0·02	−1·41	− 21·76	+ 0·10	9·18		+ 0·07	− 1·3	1	− 7·7		− 2·8	6	− 7·5
			" 18	"	"	3	25 36·09	−0·06	−0·02	−1·41	− 25·57	+ 0·11	9·14	9·25	+ 0·11	− 2·0	1	− 7·6	− 4·9	− 2·7	8	− 7·5
		4659	" 11	I.P.E.	W	4	13 48 22·56	−0·36	0·00	−1·41	0·00	0·00	20·79		+ 0·14	− 1·2	2	− 5·5		+ 0·2	8	− 5·8
		δ = +79° 36′	" 12	"	"	5	48 21·98	−0·30	+0·03	−1·41	+ 1·08	0·00	21·38		− 0·45	+ 3·9	3	− 1·8		+ 3·9	3	− 1·8
		R.A. = 13h 51m	" 14	I.P.W.	"	5	48 18·73	−0·10	+0·13	−1·42	+ 2·51	− 0·01	19·84*		+ 1·09	− 9·6	3					− 15 3
		A = −0·114	" 17	"	"	5	48 17·42	−0·09	−0·03	−1·41	+ 5·05	− 0·02	20·92		+ 0·01	− 0·1	3	− 7·7		− 2·0	6	− 7·1
			" 18	"	"	5	48 16·87	−0·11	−0·03	−1·41	+ 5·34	− 0·03	20·63	20·93	+ 0·30	− 2·6	3	− 7·6	− 5·7	− 1·9	8	− 7·8
	BELLARY (Latitude 15° 9′)	4050	1876 Apr. 11	I.P.E.	E	10	11 57 1·00	+0·32	0·00	+1·62	0·00	0·00	2·94		+ 2·18	−15·5	5	+ 13·9		− 14·2	12	+ 13·5
		δ = +81° 33′	" 12	"	"	9	57 10·16	+0·26	−0·02	−1·64	− 3·79	+ 0·06	5·03		+ 0·09	− 0·6	5	+ 25·4		− 2·7	10	+ 26·1
		R.A. = 11h 54m	" 13	"	"	10	57 11·32	+0·16	−0·08	+1·62	− 7·78	+ 0·13	5·37		− 0·25	+ 1·8	5	+ 30·0		+ 1·9	10	+ 30·0
		A = −0·141	" 14	I.P.W.	"	9	57 20·93	+0·18	−0·34	−1·61	− 11·22	+ 0·19	8·13		− 3·01	+21·3	5	+ 50·4		+ 22·3	9	+ 50·0
			" 17	"	"	10	57 23·48	0·00	−0·07	+1·54	− 21·76	+ 0·38	3·57		+ 1·55	−11·0	5	+ 16·4		− 11·7	10	+ 16·6
			" 18	"	"	9	57 32·22	+0·05	+0·05	−1·54	− 25·57	+ 0·45	5·66	5·12	− 0·54	+ 3·8	5	+ 32·3	+ 28·1	+ 4·2	10	+ 32·2
		4222	" 11	I.P.E.	E	10	12 27 48·63	+0·14	0·00	−1·62	0·00	0·00	47·15		+ 0·90	−16·7	3	+ 13·9		− 14·2	12	+ 13·4
		δ = +69° 53′	" 12	"	"	9	27 49·80	+0·11	−0·01	+1·64	− 3·79	+ 0·02	47·77		+ 0·28	− 5·2	3	+ 25·4		− 2·7	10	+ 24·8
		R.A. = 12h 25m	" 13	"	"	9	27 57·49	+0·07	−0·05	−1·62	− 7·78	+ 0·03	48·14		− 0·09	+ 1·7	3	+ 30·0		+ 1·9	10	+ 30·0
		A = −0·054	" 14	I.P.W.	"	9	27 59·07	+0·08	−0·21	+1·61	− 11·22	+ 0·05	49·38		− 1·33	+24·6	3	+ 50·4		+ 22·3	9	+ 51·0
			" 17	"	"	9	28 10·63	0·00	−0·05	−1·54	− 21·76	+ 0·10	47·38		+ 0·67	−12·4	3	+ 16·4		− 11·7	10	+ 16·2
			" 18	"	"	9	28 12·33	+0·02	+0·03	+1·54	− 25·57	+ 0·11	48·46	48·05	− 0·41	+ 7·6	3	+ 32·3	+ 28·1	+ 4·2	10	+ 33·1
		4659	" 11	I.P.E.	W	4	13 50 61·51	+0·26	0·00	−1·60	0·00	0·00	60·17		+ 1·26	−11·2	2	+ 13·9		− 14·2	12	+ 14·3
		δ = +79° 36′	" 12	"	"	10	50 58·29	+0·21	−0·01	+1·63	+ 1·08	0·00	61·20		+ 0·23	− 2·0	5	+ 25·4		− 2·7	10	+ 25·6
		R.A. = 13h 51m	" 13	"	"	10	50 61·83	+0·13	−0·05	−1·62	+ 1·70	− 0·01	61·98		− 0·55	+ 4·9	5	+ 30·0		+ 1·9	10	+ 31·0
		A = −0·113	" 14	I.P.W.	"	10	50 59·67	+0·15	−0·30	+1·62	+ 2·51	− 0·01	63·64		− 2·21	+19·6	5	+ 50·4		+ 22·3	9	+ 49·4
			" 17	"	"	10	50 56·53	0·00	−0·10	−1·54	+ 5·05	− 0·02	59·92		+ 1·51	−13·4	5	+ 16·4		− 11·7	10	+ 15·8
			" 18	"	"	10	50 54·82	+0·04	−0·04	+1·54	+ 5·34	− 0·03	61·67	61·43	− 0·24	+ 2·1	5	+ 32·3	+ 28·1	+ 4·2	10	+ 31·6

* Not included in taking out mean.

Arc	Station	B.A.C. Number of Star, and Data	Astronomical Date	Instrumental Position	Clock in use	No. of Wires Observed	Observed Time of Transit	Reduction of each Observation to that of the First Day: Instrumental Corrections: Collimation	Level	Q	Corrections for: Clock Rate	Change in R.A.	Reduced Observation: Daily	Mean	Comparison of each Reduced Observation with Mean of all: Difference = Δa_2	a_2	Weight	Computed Deviation by Circumpolar Star Observations = a_1: a_1	Mean a_1	δa_1	Weight	Deduced Deviation by the Combination of a_1 and a_2
			1877				h m s	s	s	s	s	s	s *	s	s	d		d	d	d		d
VIZAGAPATAM (E) MADRAS (W)	VIZAGAPATAM (Latitude 17° 41′)	2930	Jan. 20	*I.P.E.*	E	5	8 37 36·98	−0·59	−0·18	−1·71	0·00	0·00	34·50		− 2·04	+ 16·9	1					− 14·1
		δ = +80° 29′	„ 21	„	„	14	37 41·05	−0·59	−0·24	−1·70	− 4·29	− 0·03	34·20		− 1·74	+ 14·4	1	− 16·9		+ 14·1	24	− 16·9
		R.A. = 8h 37m	„ 23	„	„	4	37 49·35	−0·59	−0·33	−1·70	− 13·13	− 0·08	33·52		− 1·06	+ 8·8	1	− 22·4		+ 8·6	83	− 22·4
		A = −0·121	„ 24	„	„	5	37 53·02	−0·59	+0·14	−1·70	− 17·55	− 0·11	33·21		− 0·75	+ 6·2	1	− 26·0		+ 5·0	31	− 26·0
			„ 25	„	„	6	37 56·85	−0·59	+0·05	−1·69	− 21·99	− 0·14	32·49		− 0·03	+ 0·2	1	− 30·9		+ 0·1	43	− 30·9
			„ 26	„	„	7	37 61·47	−0·59	+0·11	−1·69	− 26·58	− 0·17	32·55		− 0·09	+ 0·7	1	− 29·2		+ 1·8	8	− 29·3
			„ 27	*I.P.W.*	„	9	38 3·89	+0·49	+0·07	−1·70	− 30·91	− 0·20	31·64		+ 0·82	− 6·8	1	− 39·3		− 8·3	41	− 39·3
			„ 29	„	„	7	38 12·42	+0·49	+0·02	−1·69	− 39·80	− 0·25	31·19		+ 1·27	− 10·5	1	− 40·3		− 9·3	6	− 40·5
			„ 31	„	„	7	38 20·75	+0·49	+0·06	−1·70	− 48·43	− 0·31	30·86	32·46	+ 1·60	− 13·2	1	− 42·7	−31·0	− 11·7	8	− 42·9
		3199	„ 26	*I.P.E.*	W	5	9 7 33·74	−0·69	+0·12	−1·69	0·00	0·00	31·48		− 1·12	+ 7·8	1	− 29·2		+ 8·7	8	− 29·3
		δ = +81° 52′	„ 27	*I.P.W.*	„	7	7 31·72	+0·57	+0·08	−1·70	− 0·67	− 0·06	29·94		+ 0·42	− 2·9	1	− 39·3		− 1·4	41	− 39·3
		R.A. = 9h 19m	„ 29	„	„	7	7 33·52	+0·57	+0·03	−1·69	− 1·95	− 0·18	30·30		+ 0·06	− 0·4	1	− 40·3		− 2·4	6	− 40·0
		A = −0·143	„ 31	„	„	6	7 34·35	+0·57	+0·06	−1·70	− 3·27	− 0·30	29·71	30·36	+ 0·65	− 4·5	1	− 42·7	−37·9	− 4·8	8	− 42·7
		3495	„ 20	*I.P.E.*	E	9	10 11 49·16	−1·10	−0·28	+1·71	0·00	0·00	49·49*		− 2·51	+ 10·8	3					− 13·6
		δ = +84° 52′	„ 22	„	„	4	11 61·26	−1·10	−0·47	−1·70	− 8 66	− 0·31	49·02		− 2·04	+ 8·8	2	− 18·1		+ 6·3	5	− 17·4
		R.A. = 10h 12m	„ 23	„	„	12	12 3·19	−1·10	+0·07	−1·70	− 13·13	− 0·46	46·87		+ 0·11	− 0·5	3	− 22·4		+ 2·0	83	− 22·5
		A = −0·232	„ 24	„	„	6	12 3·70	−1·10	+0·22	+1·70	− 17·55	− 0·61	46·36		+ 0·62	− 2·7	3	− 26·0		− 1·6	31	− 26·1
			„ 25	„	„	3	12 11·14	−1·10	+0·08	−1·69	− 21·99	− 0·77	45·67	46·98	+ 1·31	− 5·6	2	− 30·9	−24·4	− 6·5	43	− 30·9
		51 Cephei	„ 31	*I.P.W.*	E	4	6 43 18·78	+1·67	+0·15	+1.70	0·00	0·00	22·30									
		A = −0·435	Feb. 1	„	„	2	43 19·87	+1·67	+0·29	+1·69	− 4·23	+ 0·22	19·51		+ 2·79	+ 6·4						
	MADRAS (Latitude 13° 4′)	2930	1877 Jan. 23	*I.P.E.*	W	4	8 37 28·42	−0·57	−0·16	+1·47	0·00	0·00	29·16		+ 0·20	− 1·6	1	− 70·9		− 1·7	8	− 70·9
		δ = +80° 29′	„ 24	„	„	11	37 27·29	−0·57	−0·15	+1·48	− 0·80	− 0·03	27·22		+ 2·14	− 17·0	1	− 89·7		− 20·5	29	− 89·6
		R.A. = 8h 37m	„ 25	„	„	16	37 26·84	−0·57	−0·21	+1·49	− 1·54	− 0·06	25·95		+ 3·41	− 27·1	1	− 93·7		− 24·5	4	− 94·2
		A = −0·126	„ 26	„	„	19	37 26·71	−0·57	−0·17	+1·40	− 2·27	− 0·08	25·02		+ 4·34	− 34·4	1	− 99·6		− 30·4	4	−100·4
			„ 27	*I.P.W.*	„	5	37 36·29	+0·22	+0·21	+1·41	− 2·94	− 0·11	35·08		− 5·72	+ 45·4	1	− 24·8		+ 44·4	58	− 24·8
			„ 29	„	„	13	37 35·48	+0·22	+0·24	+1·41	− 4·22	− 0·17	32·96		− 3·60	+ 28·6	1	− 42·8		+ 26·4	13	− 42·6
			Feb. 1	„	„	8	37 34·61	+0·22	+0·32	+1·40	− 6·19	− 0·25	30·11	29·36	− 0·75	+ 6·0	1	− 62·9	−69·2	+ 6·3	10	− 62·9
		3199	Jan. 26	*I.P.E.*	W	4	9 19 32·91	−0·67	−0·19	−1·40	0·00	0·00	30·65		+ 6·30	− 42·6	1	− 99·6		− 41·6	4	− 99·8
		δ = +81° 52′	„ 27	*I.P.W.*	„	6	19 43·35	+0·25	+0·24	−1·41	− 0·67	− 0·06	41·70		− 4·75	+ 32·1	1	− 24·8		+ 33·2	58	− 24·8
		R.A. = 9h 19m	„ 29	„	„	5	19 42·69	+0·25	+0·27	−1·41	− 1·95	− 0·18	39·67		− 2·72	+ 18·4	1	− 42·8		+ 15·2	13	− 42·6
		A = −0·148	„ 31	„	„	5	19 40·93	+0·25	+0·30	−1·42	− 3·27	− 0·30	36·49		+ 0·46	− 3·1	1	− 60·0		− 2·0	10	− 60·1
			Feb. 1	„	„	5	19 41·33	+0·25	+0·35	−1·40	− 3·92	− 0·35	36·26	36·95	+ 0·69	− 4·7	1	− 62·9	−58·0	− 4·9	10	− 62·9

* Not included in taking out mean.

Arc	Station	B.A.C. Number of Star, and Data	Astronomical Date	Instrumental Position	Clock in use	No. of Wires Observed	Observed Time of Transit	Reduction of each Observation to that of the First Day — Instrumental Corrections: Colli-mation	Level	Q	Corrections for: Clock Rate	Change in R.A.	Reduced Observation: Daily	Mean	Comparison of each Reduced Observation with Mean of all: Difference = Δa_2	a_2	Weight	Computed Deviation by Circumpolar Star Observations $= a_1$: a_1	Mean a_1	δa_1	Weight	Deduced Deviation by the Combination of a_1 and a_2
							h m s	s	s	s	s	s	s	s	s	d		d	d	d		d
VIZAGAPATAM (E) AND MADRAS (W)	MADRAS (Latitude 13° 4′)	3495	1877 Jan. 22	*I.P.E.*	W	13	10 11 39·87	−1·06	−0·24	+1·48	0·00	0·00	40·05*		− 9·26	+ 38·7	3					− 55·6
		δ = +84° 52′	" 24	"	"	12	11 34·84	−1·06	−0·23	+1·48	− 1·58	− 0·31	33·14		− 2·35	+ 9·8	3	− 89·7		+ 4·6	29	− 89·2
		R.A. = 10ʰ 12ᵐ	" 25	"	"	21	11 33·72	−1·06	−0·32	+1·49	− 2·32	− 0·46	31·05		− 0·26	+ 1·1	3	− 93·7		+ 0·6	4	− 93·5
		A = −0·239	" 26	"	"	19	11 31·76	−1·06	−0·25	+1·40	− 3·05	− 0·61	28·19	30·79	+ 2·60	− 10·9	3	− 99·6	−94·3	− 5·3	4	−102·0
VIZAGAPATAM (E) AND BELLARY (W)	VIZAGAPATAM (Latitude 17° 41′)	3199	1877 Feb. 14	*I.P.W.*	E	5	9 19 54·00	+0·46	+0·24	−1·75	0·00	0·00	52·95		+ 1·28	− 9·0	1	− 23·0		− 10·8	9	− 22·8
		δ = +81° 52′	" 17	"	"	6	19 54·10	+0·46	+0·20	−1·70	− 1·16	+ 0·02	51·92		+ 2·31	− 16·2	1	− 29·7		− 17·5	4	− 29·4
		R.A. = 9ʰ 19ᵐ	" 21	*I.P.E.*	"	7	19 59·22	−0·60	+0·18	−1·70	− 1·90	+ 0·04	55·24		− 1·01	+ 7·1	1	− 6·2		+ 6·0	16	− 6·1
		A = −0·143	" 22	"	"	8	19 59·01	−0·60	+0·20	−1·69	− 2·02	+ 0·04	54·94		− 0·71	+ 5·0	1	− 7·9		+ 4·3	10	− 7·8
			" 24	*I.P.W.*	"	8	19 57·82	+0·21	+0·27	−1·70	− 2·03	+ 0·05	54·62		− 0·39	+ 2·7	1	− 8·0		+ 4·2	13	− 8·1
			" 25	*I.P.E.*	"	6	19 58·63	+0·22	+0·46	−1·70	− 1·96	+ 0·06	55·71	54·23	− 1·48	+ 10·3	1	+ 1·7	−12·2	+ 13·9	7	+ 1·3
		3629	" 17	*I.P.W.*	W	8	10 5 34·38	+0·42	+0·19	−1·70	0·00	0·00	33·29		+ 2·80	− 21·7	1	− 29·7		− 19·9	4	− 30·1
		δ = +81° 4′	" 22	*I.P.E.*	"	12	5 27·90	−0·55	+0·19	−1·69	+ 10·80	− 0·19	36·46		− 0·37	+ 2·9	1	− 7·9		+ 1·9	10	− 7·8
		R.A. = 10ʰ 31ᵐ	" 23	*I.P.W.*	"	8	5 25·57	+0·19	+0·29	−1·70	+ 12·52	− 0·23	36·64		− 0·55	+ 4·3	1	− 5·2		+ 4·6	10	− 5·2
		A = −0·129	" 24	"	"	8	5 23·52	+0·19	+0·25	−1·70	+ 14·30	− 0·27	36·29		− 0·20	+ 1·6	1	− 8·0		+ 1·8	13	− 8·0
			" 25	*I.P.E.*	"	6	5 22·95	+0·20	+0·43	−1·70	+ 16·18	− 0·30	37·76	36·09	− 1·67	+ 12·9	1	+ 1·7	− 9·8	+ 11·5	7	+ 1·9
	BELLARY (Latitude 15° 9′)	3190	1877 Feb. 17	*I.P.W.*	E	5	9 45 25·97	−0·27	−0·20	−1·40	0·00	0·00	24·10		− 0·54	+ 3·7	1	+ 1·6		+ 2·6	8	+ 1·7
		δ = +81° 52′	" 19	*I.P.E.*	"	5	45 25·04	−0·24	−0·04	−1·39	− 0·37	+ 0·01	23·01		+ 0·55	− 3·8	1	− 7·7		− 6·7	8	− 7·4
		R.A. = 9ʰ 19ᵐ	" 21	"	"	5	45 25·43	−0·24	−0·08	−1·41	− 0·74	+ 0·02	22·98		+ 0·58	− 4·0	1	− 1·9		− 0·9	8	− 2·2
		A = −0·146	" 22	"	"	6	45 26·10	−0·24	−0·16	−1·41	− 0·86	+ 0·03	23·46		+ 0·10	− 0·7	1	+ 0·7		+ 1·7	6	+ 0·4
			" 23	"	"	5	45 30·75	−0·27	−0·01	−1·40	− 0·84	+ 0·03	28·26*		− 4·70	+ 32·2	1					+ 32·2
			" 25	"	"	6	45 27·09	−0·24	−0·45	−1·40	− 0·80	+ 0·04	24·24	23·56	− 0·68	+ 4·7	1	+ 2·4	− 1·0	+ 3·4	8	+ 2·5
		3629	" 17	*I.P.W.*	W	5	10 31 5·80	−0·25	−0·19	−1·40	0·00	0·00	3·96		+ 0·07	− 0·5	1	+ 1·6		− 1·1	8	+ 1·7
		δ = +81° 4′	" 21	*I.P.E.*	"	5	30 56·53	−0·22	−0·08	−1·41	+ 8·73	− 0·15	3·40		+ 0·63	− 4·8	1	− 1·9		− 4·6	8	− 1·9
		R.A. = 10ʰ 31ᵐ	" 22	"	"	6	30 54·62	−0·22	−0·15	−1·41	+ 10·80	− 0·19	3·45		+ 0·58	− 4·4	1	+ 0·7		− 2·0	6	+ 0·4
		A = −0·132	" 24	*I.P.W.*	"	9	30 53·06	−0·25	−0·11	−1·41	+ 14·30	− 0·27	5·32		− 1·29	+ 9·8	1	+ 10·6		+ 7·9	5	+ 10·9
			" 25	*I.P.E.*	"	6	30 50·20	−0·22	−0·42	−1·40	+ 16·18	− 0·30	4·04	4·03	− 0·01	+ 0·1	1	+ 2·4	+ 2·7	− 0·3	8	+ 2·4
MANGALORE (E) AND BOMBAY (W)	MANGALORE (Latitude 12° 52′)	4050	1877 Mar. 22	*I.P.E.*	E	8	11 53 6·15	−0·15	−0·34	+1·78	0·00	0·00	7·44		+20·28	−142·8	1	−219·7		−142·5	4	−219·8
		δ = +81° 32′	" 24	"	"	11	54 34 56	−0·15	−0·07	+1·79	+ 1·87	+ 0·03	38·03		−10·31	+ 72·6	1	− 6·1		+ 71·1	1	− 5·3
		R.A. = 11ʰ 54ᵐ	" 25	"	"	7	54 33·11	−0·15	−0·06	+1·77	+ 2·98	+ 0·04	37·69	27·72	− 9·97	+ 70·2	1	− 5·7	−77·2	+ 71·5	5	− 5·9
		A = −0·142																				

* Not included in taking out mean.

Arc	Station	B.A.C. Number of Star, and Data	Astronomical Date	Instrumental Position	Clock in use	No. of Wires Observed	Observed Time of Transit	Reduction of each Observation to that of the First Day: Instrumental Corrections: Colli-mation	Level	Q	Corrections for: Clock Rate	Change in R.A.	Reduced Observation: Daily	Mean	Comparison of each Reduced Observation with Mean of all: Difference = Aa_2	a_2	Weight	Computed Deviation by Circumpolar Star Observations = a_1: a_1	Mean a_1	δa_1	Weight	Deduced Deviation by the Combination of a_1 and a_2
MANGALORE (E) AND BOMBAY (W)	MANGALORE (Latitude 12° 52′)		1877				h m s	s	s	s	s	s	s	s	s	d		d	d	d		d
		4166	Mar. 22	*I.P.E.*	E	5	12 14 52·02	−0·22	−0·42	−1·78	0·00	0·00	49·60		+31·43	−154·1	2	−219·7		−154·2	4	−219·7
		δ = +84° 3′	„ 24	„	„	5	15 33·59	−0·22	−0·09	−1·79	+ 1·87	− 0·09	93·27		−12·24	+ 60·0	2	− 6·1		+ 59·4	1	− 5·7
		R.A. = 12h 16m	„ 25	„	„	7	15 32·25	−0·22	−0·08	−1·77	+ 2·98	− 0·14	93·02		−11·99	+ 58·8	2	− 5·7		+ 59·8	5	− 6·0
		A = −0·204	„ 26	*I.P.W.*	„	6	15 28·23	−1·90	−0·34	−1·78	+ 4·19	− 0·18	88·22	81·03	− 7·19	+ 35·2	2	− 30·4	−65·5	+ 35·1	5	− 30·4
	BOMBAY (Latitude 18° 54′)		1877																			
		4050	Mar. 25	*I.P.E.*	E	5	12 1 37·65	−0·44	−0·29	+1·39	0·00	0·00	38·31		− 0·05	+ 0·4	1	− 32·5		+ 1·6	4	− 32·7
		δ = +81° 32′	„ 26	*I.P.W.*	„	4	1 35·72	−0·14	+0·03	+1·38	+ 1·21	+ 0·01	38·21	38·26	+ 0·05	− 0·4	1	− 35·7	−34·1	− 1·6	4	− 35·5
		R.A. = 11h 54m																				
		A = −0·136																				
		4166	„ 22	*I.P.E.*	E	4	12 23 41·59	−0·63	−0·22	−1·40	0·00	0·00	39·34		− 3·28	+ 16·6	2	− 11·7		+ 14·6	5	− 11·1
		δ = +84° 3′	„ 24	„	„	4	23 36·60	−0·63	−0·33	−1·38	+ 1·87	− 0·09	36·04		+ 0·02	− 0·1	2	− 25·1		+ 1·2	4	− 25·5
		R.A. = 12h 16m	„ 25	„	„	4	23 34·29	−0·63	−0·37	−1·39	+ 2·98	− 0·14	34·74		+ 1·32	− 6·7	2	− 32·5		− 6·2	4	− 32·7
		A = −0·197	„ 26	*I.P.W.*	„	4	23 31·64	−0·20	+0·04	−1·38	+ 4·19	− 0·18	34·11	36·06	+ 1·95	− 9·9	2	− 35·7	−26·3	− 9·4	4	− 35·9

TABLE IV. DEDUCTION OF *a* THE FINAL VALUE OF DEVIATION ERROR.

Station	Astronomical Date	Deduced Deviation Error by the Combination of a_1 and a_2 from: Star	Weight	Star	Weight	Star	Weight	Mean of foregoing = *a*	Station	Astronomical Date	Deduced Deviation Error by the Combination of a_1 and a_2 from: Star	Weight	Star	Weight	Star	Weight	Mean of foregoing = *a*
BOLARUM	1876	d		d		d		d	BOMBAY	1876	d		d		d		d
	Jan. 11	...	...	...	...	...	...	+ 9·9		Jan. 11	...	...	...	...	...	...	− 3·4
	„ 12	...	...	...	...	...	...	+ 5·4		„ 12	...	...	...	...	...	...	+ 3·2
	„ 13	...	...	...	...	...	...	+ 5·9		„ 13	...	...	...	...	...	...	+ 5·3
	„ 14	...	...	...	...	...	...	− 0·1		„ 14	...	...	...	...	...	...	+ 1·2
	„ 16	...	...	...	...	...	...	− 4·1		„ 16	...	...	...	...	...	...	+ 9·8
	„ 17	...	...	...	...	...	...	+ 0·6		„ 17	...	...	...	...	...	...	+12·3
	„ 18	...	...	...	...	...	...	+ 0·5		„ 18	...	...	...	...	...	...	+22·4
	„ 19	...	...	...	...	...	...	− 2·2		„ 19	...	...	...	...	...	...	+21·3
	„ 20	...	...	...	...	...	...	− 1·0		„ 20	...	...	...	...	...	...	+21·0
	„ 21	...	...	...	...	...	...	− 8·2		„ 21	...	...	...	...	...	...	+22·9

Station	Astronomical Date	Deduced Deviation Error by the Combination of a_1 and a_2 from						Mean of foregoing = *a*	Station	Astronomical Date	Deduced Deviation Error by the Combination of a_1 and a_2 from						Mean of foregoing = *a*
		Star	Weight	Star	Weight	Star	Weight				Star	Weight	Star	Weight	Star	Weight	
BELLARY				2548		3116			BOMBAY		828		2548		3116		
	1876	*d*		*d*		*d*		*d*		1876	*d*		*d*		*d*		*d*
	Jan. 28	...	...	...	...	...	...	+19·3		Jan. 28	+ 6·7	...	...	...	...	...	+ 6·7
	„ 29	...	...	...	...	...	...	+22·7		„ 29	+12·9	...	...	...	...	...	+ 12·9
	„ 30	...	...	...	...	...	...	+21·7		„ 30	+17·8	...	...	...	...	...	+ 17·8
	„ 31	...	...	...	...	...	...	−11·5		„ 31	+ 9·6	...	...	...	...	...	+ 9·6
	Feb. 8	...	...	+19·4	...	...	...	+19·4		Feb. 8	...	...	+ 7·7	3	+ 8·0	5	+ 7·9
	„ 9	...	...	+25·7	3	+25·5	5	+25·6		„ 9	...	...	+ 10·8	4	+ 11·0	6	+ 10·9
	„ 10	...	...	+ 1·9	2	+ 2·3	4	+ 2·2		„ 10	+12·2	5	+ 14·0	4	+ 13·6	6	+ 13·2
BOLARUM		3199		3629		3906			BELLARY		3199		3629		3906		
	1876									1876							
	Feb. 19	−28·4	4	−29·4	4	−26·3	7	−27·7		Feb. 19	+59·0	4	+ 59·6	3	+ 59·4	3	+ 59·3
	„ 20	−23·1	3	−21·7	8	−21·9	5	−22·0		„ 20	−12·2	3	− 10·1	5	− 12·8	5	− 11·6
	„ 21	−20·2	2	−20·3	5	−21·9	5	−21·0		„ 21	− 5·0	3	− 4·8	3	− 6·2	5	− 5·5
	„ 22	− 4·4	4	− 6·0	5	− 6·5	5	− 5·7		„ 22	− 1·2	5	− 2·7	5	− 0·4	4	− 1·5
	„ 23	− 2·9	5	− 3·0	8	− 3·0	5	− 3·0		„ 23	+ 3·5	4	+ 3·3	3	+ 4·2	4	+ 3·7
	„ 24	− 3·2	4	− 2·2	6	− 2·1	5	− 2·4		„ 24	+ 7·5	4	+ 7·4	3	+ 7·1	5	+ 7·3
MADRAS		3629		3906		4193			BOLARUM		3629		3906		4193		
	1876									1876							
	Mar. 3	...	...	−69·3	3	−69·0	2	−69·2		Mar. 3	−13·3	5	− 12·4	3	− 12·1	2	− 12·8
	„ 5	−31·5	3	−31·4	3	...	...	−31·5		„ 5	− 2·4	6	− 2·3	3	− 1·9	3	− 2·3
	„ 6	−44·0	3	−43·9	3	−43·8	1	−43·9		„ 6	+ 0·3	6	+ 1·0	5	+ 0·2	1	+ 0·6
	„ 7	−23·1	3	−22·5	3	−22·9	1	−22·8		„ 7	− 8·0	5	− 9·8	4	...	...	− 8·8
	„ 8	−29·1	3	−29·8	3	−29·9	2	−29·6		„ 8	− 4·1	5	− 3·8	5	− 2·5	2	− 3·7
	„ 12	−46·8	3	−53·5	2	...	...	−49·5		„ 12	− 8·4	5	− 8·2	5	− 8·7	2	− 8·4
MADRAS				4050		4659			BELLARY				4050		4659		
	1876									1876							
	Mar. 22	...	...	−80·6	3	−80·9	2	−80·7		Mar. 22	...	...	+ 59·6	3	+ 56·8	6	+ 57·7
	„ 24	...	...	−85·6	3	−86·0	2	−85·8		„ 24	...	...	− 4·2	4	− 6·8	4	− 5·5
	„ 26	...	...	−89·2	3	−89·0	2	−89·1		„ 26	...	...	+ 29·7	...	...	...	+ 29·7
	„ 29	...	...	−28·8	...	...	...	−28·8		„ 29	...	...	+ 74·5	...	...	...	+ 74·5
	„ 30	...	...	−33·7	3	−33·5	3	−33·6		„ 30	...	...	...	...	+ 87·5	...	+ 87·5
	„ 31	...	...	−27·7	3	−26·2	4	−26·8		„ 31	...	...	+108·1	4	+108·7	6	+108·5
	Apr. 1	...	...	...	...	−28·3	...	−28·3		Apr. 1	...	...	...	...	+ 19·4	...	+ 19·4
	„ 2	...	...	−34·1	3	−33·8	3	−34·0		„ 2	...	...	+ 40·7	4	+ 40·3	6	+ 40·5

TABLE IV. DEDUCTION OF a THE FINAL VALUE OF DEVIATION ERROR.

Station	Astronomical Date	Deduced Deviation Error by the Combination of a_1 and a_2 from						Mean of foregoing = a	Station	Astronomical Date	Deduced Deviation Error by the Combination of a_1 and a_2 from						Mean of foregoing = a
		Star	Weight	Star	Weight	Star	Weight				Star	Weight	Star	Weight	Star	Weight	
BANGALORE		4050		4232		4659			BELLARY		4050		4222		4659		
	1876	d		d		d		d		1876	d		d		d		d
	Apr. 11	− 6·1	3	− 5·6	2	− 5·8	2	− 5·8		Apr. 11	+ 13·5	5	+ 13·4	3	+ 14·3	2	+ 13·6
	" 12	− 3·8	4	− 2·1	1	− 1·8	3	− 2·8		" 12	+ 26·1	5	+ 24·8	3	+ 25·6	5	+ 25·6
	" 13	...	...	− 2·2	...	...	...	− 2·2		" 13	+ 30·0	5	+ 30·0	3	+ 31·0	5	+ 30·4
	" 14	...	...	...	...	− 15·3	...	− 15·3		" 14	+ 50·0	5	+ 51·0	3	+ 49·4	5	+ 50·0
	" 17	− 6·9	3	− 7·5	1	− 7·1	3	− 7·1		" 17	+ 16·6	5	+ 16·2	3	+ 15·8	5	+ 16·2
	" 18	− 6·7	3	− 7·5	1	− 7·8	3	− 7·3		" 18	+ 32·2	5	+ 33·1	3	+ 31·6	5	+ 32·2
VIZAGAPATAM		2930		8199		8495			MADRAS		2930		3199		3495		
	1877 Jan. 22	...	...	...	...	− 17·4		− 17·4		1877 Jan. 22	...	...	...	...	− 55·6	...	− 55·6
	" 23	− 22·4	84	...	...	− 22·5	86	− 22·5		" 23	− 70·9	...	...	...	...	...	− 70·9
	" 24	− 26·0	32	...	...	− 26·1	34	− 26·1		" 24	− 89·6	30	...	...	− 89·2	32	− 89·4
	" 25	− 30·9	44	...	...	− 30·9	45	− 30·9		" 25	− 94·2	5	...	...	− 93·5	7	− 93·8
	" 26	− 29·3	9	− 29·3	9	...	...	− 29·3		" 26	− 100·4	5	− 99·8	5	− 102·0	7	− 100·9
	" 27	− 39·3	42	− 39·3	42	...	...	− 39·3		" 27	− 24·8	59	− 24·8	59	...	...	− 24·8
	" 29	− 40·5	7	− 40·0	7	...	...	− 40·3		" 29	− 42·6	14	− 42·6	14	...	...	− 42·6
	" 31	− 42·9	9	− 42·7	9	...	...	− 42·8		" 31	...	...	− 60·1	...	...	...	− 60·1
	Feb. 1	...	...	...	...	...	...	− 49·1*		Feb. 1	− 62·9	11	− 62·9	11	...	...	− 62·9
VIZAGAPATAM				8199		8629			BELLARY				8199		8629		
	1877 Feb. 17	...	...	− 29·4	5	− 30·1	5	− 29·8		1877 Feb. 17	...	...	+ 1·7	9	+ 1·7	9	+ 1·7
	" 19	...	...	...	...	...	...	− 7·2		" 19	...	...	− 7·4	...	...	...	− 7·4
	" 21	...	...	− 6·1	...	...	...	− 6·1		" 21	...	...	− 2·2	9	− 1·9	9	− 2·1
	" 22	...	...	− 7·8	11	− 7·8	11	− 7·8		" 22	...	...	+ 0·4	7	+ 0·4	7	+ 0·4
	" 23	...	...	...	...	− 5·2	...	− 5·2		" 23	...	...	+ 32·2	...	...	...	+ 32·2
	" 24	...	...	− 8·1	14	− 8·0	14	− 8·1		" 24	...	...	...	...	+ 10·9	...	+ 10·9
	" 25	...	...	+ 1·3	8	+ 1·9	8	+ 1·6		" 25	...	...	+ 2·5	9	+ 2·4	9	+ 2·5
MANGALORE				4050		4166			BOMBAY				4050		4166		
	1877 Mar. 22	...	...	− 219·8	5	− 219·7	6	− 219·7		1877 Mar. 22	...	...	...	...	− 11·1	...	− 11·1
	" 24	...	...	− 5·3	2	− 5·7	3	− 5·5		" 24	...	...	...	...	− 25·5	...	− 25·5
	" 25	...	...	− 5·9	6	− 6·0	7	− 6·0		" 25	...	...	− 32·7	5	− 32·7	6	− 32·7
	" 26	...	...	...	...	− 30·4	...	− 30·4		" 26	...	...	− 35·5	5	− 35·9	6	− 35·7

* Deduced by comparing the observations of 51 Cephei on January 31 and February 1 and applying the apparent change of azimuth to the value of deviation error a_1 obtained by observation on January 31. *vide TABLE III.*

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, Q, and Observed Times by each Clock.							
		E to W, Q +		W to E, Q +		E to W, Q −		W to E, Q −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 11	1	5 19 5·98	4 56 2·49	5 23 19·29	5 0 15·67	5 26 49·54	5 3 47·03	5 28 14·21	5 5 11·60
	2	7·20	3·70	22·30	18·70	52·27	49·79	15·25	12·65
	3	8·20	4·73	23·27	19·69	54·53	52·04	18·24	15·65
	4	9·71	6·20	26·08	22·48	57·10	54·62	19·27	16·68
	5	12·02	8·50	27·13	23·59	59·90	57·40	22·23	19·62
	6	...	...	30·12	26·57	63·09	60·60	23·30	20·73
	7	...	...	31·12	27·59	65·12	62·68	26·30	23·70
	8	18·06	14·53	34·16	30·53	67·25	64·74	27·27	24·78
	9	20·48	16·96	35·17	31·60	69·20	66·70	30·21	27·64
	10	22·41	18·92	38·08	34·50	71·01	68·56	31·22	28·66
	11	24·80	21·30	39·10	35·50	72·93	70·46	34·27	31·59
	12	27·07	23·56	42·10	38·50	74·87	72·40	35·20	32·60
	13	...	...	43·11	39·54	75·55	73·08	38·20	35·60
	14	...	...	46·18	42·60	76·34	73·86	39·22	36·68
	15	...	...	47·24	43·50	...	...	42·10	39·54
	16	...	...	50·26	46·69	...	...	43·21	40·66
	17	..	...	51·23	47·67	...	...	46·20	43·60
	18	...	...	54·15	50·51	...	...	47·29	44·70
	19	...	...	55·12	51·56	...	...	50·28	47·64
	20	...	...	58·20	54·60	...	...	51·37	48·70
	21	...	...	59·23	55·60	...	...	...	...
	22	...	...	60·20	56·65	...	...	...	...
	23	...	...	61·29	57·70	...	...	...	...
	Mean	5 19 15·593	4 56 12·089	5 23 41·484	5 0 37·893	5 27 4·907	5 4 2·426	5 28 32·742	5 5 30·151
	Q	+1·030	+1·528	+1·030	+1·528	−1·030	−1·528	−1·030	−1·528
Corrected Mean		5 19 16·623	4 56 13·617	5 23 42·514	5 0 39·421	5 27 3·877	5 4 0·898	5 28 31·712	5 5 28·623

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, *Q*, and Observed Times by each Clock.							
		E to W, *Q* +		W to E, *Q* +		E to W, *Q* −		W to E, *Q* −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 11	1	6 47 15·35	6 24 11·90	6 50 13·40	6 27 9·84	6 53 44·05	6 30 41·60	6 57 39·06	6 34 36·50
	2	16·60	13·23	14·30	10·70	46·71	44·30	40·08	37·48
	3	18·18	14·77	15·11	11·60	49·00	46·59	43·07	40·52
	4	20·47	17·03	17·25	13·70	51·88	49·44	44·06	41·50
	5	22·70	19·30	18·28	14·70	54·68	52·24	47·16	44·60
	6	27·22	23·89	21·17	17·62	56·60	54·20	48·04	45·50
	7	29·60	26·18	22·18	18·58	58·98	56·57	51·06	48·49
	8	31·40	27·99	25·09	21·55	61·15	58·74	52·09	49·50
	9	33·87	30·47	26·04	22·48	63·80	61·37	55·29	52·70
	10	36·55	33·16	85·09	81·58	66·76	64·31	56·19	53·62
	11	38·67	35·28	86·07	82·54	70·20	67·76	59·10	56·60
	12	40·60	37·19	89·10	85·59	72·48	70·05	60·07	57·49
	13	42·59	39·19	90·05	86·50	74·77	72·38	63·18	60·60
	14	44·93	41·53	93·00	89·49	76·88	74·50	64·19	61·59
	15	47·63	44·21	94·00	90·47	79·49	77·08	67·13	64·60
	16	51·91	48·50	97·28	93·70	81·92	79·51	68·20	65·62
	17	53·61	50·19	98·24	94·69	84·67	82·25	71·23	68·68
	18	55·34	51·95	101·20	97·60	87·51	85·10	72·21	69·60
	19	57·39	53·92	102·09	98·55	90·44	88·03	75·22	72·60
	20	59·28	55·85	105·10	101·58	92·29	89·86	76·20	73·61
	Mean	6 47 37·195	6 24 33·787	6 51 0·702	6 27 57·153	6 54 8·213	6 31 5·794	6 57 57·642	6 34 55·070
	Q	+1·033	+1·520	+1·033	+1·520	−1·033	−1·520	−1·033	−1·520
Corrected Mean		6 47 38·228	6 24 35·307	6 51 1·735	6 27 58·673	6 54 7·180	6 31 4·274	6 57 56·609	6 34 53·550

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, *Q*, and Observed Times by each Clock.							
		E to W, *Q* +		W to E, *Q* +		E to W, *Q* −		W to E, *Q* −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 11	1	8 18 8·80	7 55 5·39	8 20 47·20	7 57 43·70	8 23 51·00	8 0 48·66	8 27 57·08	8 4 54·58
	2	11·47	8·04	48·22	44·70	53·10	50·71	58·06	55·58
	3	13·62	10·28	51·26	47·78	55·21	52·88	61·03	58·57
	4	15·96	12·60	52·16	48·64	57·28	54·90	65·27	62·78
	5	18·50	15·10	55·09	51·59	64·62	62·20	66·21	63·70
	6	20·52	17·15	56·10	52·57	67·14	64·79	69·02	66·57
	7	23·03	19·70	59·10	55·60	69·77	67·39	70·09	67·58
	8	24·95	21·59	60·04	56·57	72·31	69·98	73·01	70·57
	9	27·50	24·10	63·20	59·70	74·79	72·41	73·98	71·50
	10	30·80	27·50	64·20	60·70	76·39	74·00	77·00	74·56
	11	33·00	29·69	67·23	63·60	78·00	75·64	78·07	75·59
	12	34·73	31·40	68·19	64·66	80·00	77·67	80·97	78·50
	13	36·70	33·35	70·97	67·48	82·10	79·70	82·00	79·50
	14	39·03	35·70	72·00	68·50	84·09	81·72	84·99	82·52
	15	41·27	37·92	75·07	71·58	86·16	83·79	86·00	83·53
	16	43·94	40·58	76·06	72·58	88·39	86·02	89·00	86·60
	17	46·60	43·22	79·06	75·59	90·50	88·13	90·01	87·57
	18	48·80	45·40	80·09	76·60	92·97	90·62	93·07	90·60
	19	50·70	47·30	83·04	79·54	95·40	93·08	94·05	91·56
	20	52·90	49·53	84·08	80·56	97·69	95·30	97·04	94·58
	Mean	8 18 31·141	7 55 27·777	8 21 5·618	7 58 2·112	8 24 15·846	8 1 13·480	8 28 17·298	8 5 14·827
	Q	+1·036	+1·521	+1·036	+1·521	−1·036	−1·521	−1·036	−1·521
Corrected Mean		8 18 32·177	7 55 29·298	8 21 6·654	7 58 3·633	8 24 14·810	8 1 11·959	8 28 16·262	8 5 13·306

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, *Q*, and Observed Times by each Clock.							
		E to W, *Q* +		W to E, *Q* +		E to W, *Q* −		W to E, *Q* −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 12	1	5 24 37·72	5 1 34·97	5 26 6·56	5 3 3·64	5 28 3·15	5 5 1·40	5 29 19·48	5 6 17·63
	2	39·90	37·17	7·55	4·66	5·03	3·32	20·52	18·66
	3	42·22	39·43	10·50	7·61	7·05	5·30	23·50	21·66
	4	44·70	41·92	11·57	8·66	8·68	6·96	24·58	22·70
	5	46·99	44·20	14·52	11·62	11·09	9·40	27·47	25·60
	6	49·04	46·23	15·56	12·60	13·08	11·36	28·54	26·69
	7	50·98	48·18	18·49	15·58	15·10	13·40	31·49	29·61
	8	70·98	68·20	19·57	16·61	17·17	15·43	32·55	30·69
	9	72·80	70·00	22·50	19·60	19·10	17·38	35·47	33·60
	10	74·82	72·02	23·49	20·61	21·00	19·30	36·49	34·60
	11	77·36	74·59	30·42	27·50	23·64	21·91	39·47	37·60
	12	79·74	76·92	31·41	28·52	25·32	23·66	40·47	38·60
	13	81·80	79·01	34·48	31·59	26·77	25·03	43·60	41·73
	14	84·15	81·37	35·50	32·60	28·80	27·11	44·73	42·81
	15	85·93	83·18	38·50	35·60	30·94	29·23	47·59	45·69
	16	88·07	85·29	39·52	36·67	32·86	31·12	48·57	46·68
	17	89·88	87·11	42·54	39·63	35·00	33·30	51·49	49·60
	18	91·91	89·17	43·59	40·70	36·19	34·44	52·57	50·67
	19	93·98	91·20	46·54	43·61	37·09	35·40	55·47	53·54
	20	94·82	92·08	47·61	44·72	38·10	36·40	56·49	54·60
Mean		5 25 9·890	5 2 7·112	5 26 27·021	5 3 24·117	5 28 21·758	5 5 20·043	5 29 38·027	5 6 36·148
Q		+1·037	+1·525	+1·037	+1·525	−1·037	−1·525	−1·037	−1·525
Corrected Mean		5 25 10·927	5 2 8·637	5 26 28·058	5 3 25·642	5 28 20·721	5 5 18·518	5 29 36·990	5 6 34·623

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, Q, and Observed Times by each Clock.							
		E to W, Q +		W to E, Q +		E to W, Q −		W to E, Q −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 12	1	6 52 18·18	6 29 15·41	6 53 29·48	6 30 26·60	6 55 6·74	6 32 5·10	6 56 38·63	6 33 36·80
	2	20·17	17·47	30·39	27·50	7·63	5·93	39·60	37·77
	3	22·28	19·56	31·39	28·50	8·99	7·35	42·46	40·60
	4	24·58	21·80	34·41	31·54	10·48	8·79	43·50	41·69
	5	26·90	24·17	35·40	32·54	12·30	10·60	46·50	44·69
	6	29·18	26·44	43·43	40·57	14·09	12·40	47·40	45·58
	7	31·10	28·40	46·41	43·52	15·98	14·29	50·47	48·58
	8	33·06	30·32	47·37	44·49	18·10	16·42	51·40	49·54
	9	35·16	32·44	51·40	48·52	20·30	18·61	54·48	52·61
	10	36·41	33·70	55·39	52·50	27·02	25·40	55·49	53·60
	11	38·72	35·99	74·48	71·60	29·98	28·28	58·40	56·54
	12	40·48	37·72	75·42	72·60	34·63	32·98	63·31	61·49
	13	42·05	39·30	78·37	75·52	36·17	34·49	66·40	64·60
	14	43·97	41·21	79·30	76·49	43·92	42·20	67·45	65·61
	15	47·30	44·57	82·39	79·54	46·69	45·00	70·42	68·60
	16	48·86	46·14	83·39	80·60	48·63	46·97	71·38	69·51
	17	50·68	47·89	86·46	83·60	50·28	48·58	74·46	72·60
	18	52·90	50·17	87·34	84·50	52·80	51·13	75·40	73·53
	19	54·91	52·19	90·40	87·58	54·84	53·19	78·50	76·69
	20	57·14	54·40	91·32	88·54	56·92	55·22	79·40	77·58
	Mean	6 52 37·702	6 29 34·965	6 54 1·697	6 30 58·843	6 55 29·825	6 32 28·147	6 56 58·753	6 33 56·911
	Q	+1·039	+1·540	+1·039	+1·540	−1·039	−1·540	−1·039	−1·540
Corrected Mean		6 52 38·741	6 29 36·505	6 54 2·736	6 31 0·383	6 55 28·786	6 32 26·607	6 56 57·714	6 33 55·371

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, Q, and Observed Times by each Clock.							
		E to W, Q +		W to E, Q +		E to W, Q −		W to E, Q −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 12	1	8 23 14·60	8 0 11·97	8 25 7·34	8 2 4·53	8 35 10·90	8 12 9·26	8 27 49·53	8 4 47·72
	2	15·30	12·68	8·37	5·57	11·70	10·04	50·48	48·68
	3	16·20	13·55	11·40	8·58	12·67	11·00	51·49	49·68
	4	17·70	15·00	12·34	9·53	14·06	12·40	54·57	52·72
	5	19·90	17·20	15·38	12·59	15·81	14·17	55·51	53·72
	6	22·08	19·37	16·34	13·53	17·91	16·26	58·50	56·70
	7	23·96	21·25	19·37	16·58	20·28	18·61	59·54	57·73
	8	25·87	23·20	20·35	17·54	50·56	48·91	74·52	72·71
	9	27·70	25·02	23·40	20·60	52·40	50·77	75·50	73·70
	10	29·59	26·90	24·34	21·56	53·97	52·28	78·48	76·66
	11	32·14	29·46	27·30	24·56	55·57	53·96	79·59	77·76
	12	33·70	31·06	28·30	25·50	58·08	56·47	82·50	80·71
	13	35·44	32·72	31·38	28·54	60·10	58·47	86·48	84·69
	14	37·44	34·69	32·31	29·50	61·89	60·21	87·50	85·70
	15	39·20	36·50	35·33	32·56	64·25	62·59	90·48	88·66
	16	41·52	38·81	36·37	33·56	66·60	65·00	91·40	89·63
	17	43·76	41·08	39·33	36·53	69·09	67·44	94·31	92·58
	18	45·86	43·18	40·30	37·50	70·90	69·21	95·32	93·62
	19	48·30	45·60	43·30	40·50	71·85	70·20	99·48	97·69
	20	50·19	47·47	44·26	41·49	72·80	71·18	102·38	100 56
	Mean	8 23 31·023	8 0 28·336	8 25 25·841	8 2 23·043	8 35 45·570	8 12 43·922	8 28 15·878	8 5 14·081
	Q	+1·044	+1·537	+1·044	+1·537	−1·044	−1·537	−1·044	−1·537
Corrected Mean		8 23 32·067	8 0 29·873	8 25 26·885	8 2 24·580	8 35 44·526	8 12 42·385	8 28 14·834	8 5 12·544

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, Q, and Observed Times by each Clock.							
		E to W, Q +		W to E, Q +		E to W, Q −		W to E, Q −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
1876		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
Jan. 13	1	5 26 19·09	5 3 17·76	5 27 30·15	5 4 28·68	5 29 8·60	5 6 6·93	5 30 32·51	5 7 30·74
	2	21·39	20·01	31·03	29·60	10·33	8·70	33·50	31·70
	3	23·41	22·08	32·10	30·60	12·49	10·80	34·50	32·73
	4	25·47	24·20	35·08	33·60	14·60	13·00	37·50	35·73
	5	27·08	25·72	36·10	34·66	16·70	15·09	38·59	36·80
	6	28·73	27·40	39·02	37·60	18·80	17·14	41·41	39·64
	7	30·40	29·05	40·09	38·60	20·68	19·06	42·47	40·69
	8	32·33	30·99	43·10	41·67	22·55	20·89	45·38	43·60
	9	34·39	33·02	44·10	42·63	24·53	22·87	46·45	44·65
	10	36·50	35·18	47·00	45·55	26·30	24·65	49·39	47·60
	11	38·46	37·10	48·05	46·57	28·26	26·64	50·40	48·62
	12	40·20	38·81	51·14	49·66	30·28	28·60	53·37	51·59
	13	42·29	40·90	52·09	50·57	32·52	30·90	54·37	52·59
	14	44·16	42·79	55·14	53·60	34·28	32·64	57·49	55·70
	15	46·36	44·99	56·10	54·60	35·85	34·24	58·40	56·63
	16	48·33	46·98	63·07	61·60	37·70	36·12	66·55	64·74
	17	50·40	49·04	64·09	62·59	39·55	37·93	67·50	65·70
	18	52·80	51·44	67·09	65·60	41·70	40·08	70·37	68·58
	19	54·40	53·02	68·08	66·60	43·30	41·64	71·30	69·50
	20	56·36	55·00	71·09	69·59	45·30	43·66	74·46	72·68
	Mean	5 26 37·628	5 3 36·274	5 27 48·686	5 4 47·209	5 29 27·216	5 6 25·579	5 30 51·296	5 7 49·511
	Q	+1·694	+1·527	+1·694	+1·527	−1·694	−1·527	−1·694	−1·527
Corrected Mean		5 26 39·322	5 3 37·801	5 27 50·380	5 4 48·736	5 29 25·522	5 6 24·052	5 30 49·602	5 7 47·984

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, *Q*, and Observed Times by each Clock.							
		E to W, *Q* +		W to E, *Q* +		E to W, *Q* −		W to E, *Q* −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 13	1	6 56 30·66	6 33 29·33	6 57 53·09	6 34 51·67	6 59 35·22	6 36 33·60	7 0 57·48	6 37 55·67
	2	32·86	31·54	54·09	52·64	37·07	35·44	58·40	56·60
	3	35·60	34·26	55·10	53·70	38·79	37·18	63·41	61·63
	4	37·40	36·10	58·01	56·59	40·30	38·67	66·40	64·63
	5	39·05	37·77	59·07	57·63	41·90	40·27	67·36	65·61
	6	40·70	39·40	63·12	61·70	43·67	42·04	70·37	68·60
	7	42·48	41·14	66·08	64·62	45·57	43·90	71·42	69·67
	8	44·36	43·01	67·05	65·60	47·51	45·90	74·45	72·68
	9	46·50	45·16	70·09	68·63	49·64	47·98	75·38	73·60
	10	48·46	47·10	71·11	69·70	51·68	50·01	78·38	76·60
	11	50·42	49·10	74·08	72·61	53·57	51·90	79·30	77·53
	12	51·87	50·54	75·04	73·62	55·68	54·00	82·47	80·70
	13	53·90	52·57	78·00	76·55	57·70	56·03	83·30	81·56
	14	...	...	79·00	77·59	63·69	62·04	86·37	84·60
	15	57·29	55·92	82·10	80·66	65·67	64·00	87·25	85·51
	16	63·20	61·82	83·09	81·69	67·49	65·88	90·40	88·69
	17	64·60	63·28	86·02	84·56	69·80	68·16	94·40	92·63
	18	66·19	64·80	86·98	85·56	71·49	69·86	95·30	93·56
	19	67·70	66·36	90·08	88·62	73·60	71·94	98·40	96·66
	20	69·30	67·91	91·00	89·58	75·71	74·10	99·36	97·60
	21	71·09	69·74	...	...	...	...	...	...
	Mean	6 56 50·682	6 33 49·343	6 58 12·110	6 35 10·676	6 59 54·288	6 36 52·645	7 1 18·980	6 38 17·217
	Q	+1·696	+1·517	+1·696	+1·517	−1·696	−1·517	−1·696	−1·517
Corrected Mean		6 56 52·378	6 33 50·860	6 58 13·806	6 35 12·193	6 59 52·592	6 36 51·128	7 1 17·284	6 38 15·700

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, Q, and Observed Times by each Clock.							
		E to W, Q +		W to E, Q +		E to W, Q −		W to E, Q −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 13	1	8 27 50·44	8 4 49·11	8 29 15·93	8 6 14·50	8 30 31·94	8 7 30·30	8 32 4·41	8 9 2·64
	2	52·40	51·10	18·91	17·52	32·63	31·06	5·39	3·61
	3	54·20	52·89	19·97	18·54	33·34	31·72	8·30	6·55
	4	56·45	55·11	23·00	21·60	35·04	33·48	9·42	7·66
	5	58·32	57·01	23·99	22·57	37·20	35·60	12·38	10·63
	6	62·39	61·05	31·02	29·61	38·86	37·27	13·41	11·69
	7	64·23	62·92	31·93	30·50	40 48	38·88	16·28	14·50
	8	66·34	65·01	34·90	33·52	43·00	41·41	17·25	15·50
	9	68·47	67·12	35·97	34·55	45·50	43·89	20·42	18·70
	10	71·30	70·00	38·98	37·58	47·78	46·17	21·40	19·67
	11	73·26	71·92	39·89	38·49	49·39	47·79	24·30	22·57
	12	75·16	73·90	43·00	41·57	51·15	49·55	25·30	23·59
	13	77·20	75·90	43·96	42·52	52·90	51·28	28·29	26·51
	14	79·26	77·96	46·94	45·53	54·61	52·99	29·34	27·60
	15	81·40	80·08	47·98	46·56	56·52	54·91	32·36	30·60
	16	83·39	82·09	50·93	49·50	58·50	56·90	33·38	31·61
	17	85·40	84·09	51·93	50·49	64·73	63·10	36·40	34·67
	18	87·10	85·80	54·94	53·50	66·60	64·98	37·34	35·60
	19	87·98	86·70	55·94	54·50	68·84	67·21	40·30	38·60
	20	88·80	87·55	56·93	55·50	70·57	68·94	41·31	39·60
	Mean	8 28 11·175	8 5 9·866	8 29 38·352	8 6 36·933	8 30 48·979	8 7 47·372	8 32 22·849	8 9 21·105
	Q	+1·699	+1·522	+1·699	+1·522	−1·699	−1·522	−1·699	−1·522
Corrected Mean		8 28 12·874	8 5 11·388	8 29 40·051	8 6 38·455	8 30 47·280	8 7 45·850	8 32 21·150	8 9 19·583

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, Q, and Observed Times by each Clock.							
		E to W, Q +		W to E, Q +		E to W, Q −		W to E, Q −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 18	1	5 48 2·28	5 24 31·48	5 49 24·51	5 25 53·59	5 51 1·90	5 27 30·88	5 52 23·89	5 28 52·76
	2	4·30	33·47	25·39	54·46	2·84	31·81	24·83	53·70
	3	6·47	35·62	26·37	55·40	3·59	32·53	25·86	54·70
	4	8·27	37·43	29·50	58·51	5·00	33·97	28·80	57·68
	5	10·27	39·40	33·45	62·50	6·86	35·83	29·83	58·69
	6	12·22	41·39	34·48	63·50	9·60	38·60	32·84	61·68
	7	15·13	44·30	37·49	66·50	11·49	40·42	33·91	62·79
	8	17·60	46·75	38·40	67·49	13·86	42·80	36·75	65·60
	9	19·90	49·04	41·50	70·58	16·15	45·10	37·70	66·58
	10	22·33	51·50	42·44	71·50	18·64	47·60	40·70	69·57
	11	24·69	53·84	45·40	74·49	20·85	49·80	41·72	70·60
	12	27·11	56·28	46·40	75·45	22·73	51·70	44·83	73·70
	13	29·67	58·81	49·40	78·49	25·40	54·38	45·82	74·70
	14	32·16	61·30	50·33	79·41	28·42	57·40	48·79	77·68
	15	34·69	63·84	53·40	82·50	34·60	63·57	49·78	78·62
	16	37·09	66·24	73·40	102·53	36·29	65·24	52·70	81·58
	17	39·59	68·74	74·39	103·50	38·38	67·34	53·70	82·59
	18	42·30	71·44	77·40	106·47	40·50	69·50	56·76	85·60
	19	44·49	73·65	78·40	107·48	42·65	71·60	57·70	86·55
	20	46·70	75·88	79·39	108·50	44·89	73·90	61·78	90·60
	Mean	5 48 23·863	5 24 53·020	5 49 48·072	5 26 17·143	5 51 21·232	5 27 50·199	5 52 41·435	5 29 10·299
	Q	+1·694	+1·571	+1·694	+1·571	−1·694	−1·571	−1·694	−1·571
Corrected Mean		5 48 25·557	5 24 54·591	5 49 49·766	5 26 18·714	5 51 19·538	5 27 48·628	5 52 39·741	5 29 8·728

Arc Bolarum (E) and Bombay (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, Q, and Observed Times by each Clock.							
		E to W, Q +		W to E, Q +		E to W, Q −		W to E, Q −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 18	1	7 16 3·40	6 52 32·46	7 17 43·50	6 54 12·48	7 19 7·92	6 55 36·80	7 20 32·91	6 57 1·69
	2	5·27	34·34	44·50	13·49	10·08	38·91	33·90	2·68
	3	7·39	36·49	47·50	16·49	12·38	41·28	34·88	3·63
	4	9·32	38·41	48·45	17·43	14·97	43·86	37·88	6·62
	5	11·23	40·33	51·44	20·42	17·49	46·33	38·90	7·67
	6	13·54	42·60	52·54	21·53	20·16	49·00	41·81	10·60
	7	16·07	45·10	55·54	24·51	22·62	51·50	42·81	11·60
	8	18·87	47·94	56·51	25·50	24·60	53·48	45·91	14·68
	9	21·50	50·60	63·59	32·53	26·80	55·66	46·97	15·75
	10	23·36	52·40	64·51	33·50	41·17	70·02	49·91	18·70
	11	43·51	72·59	67·50	36·50	43·36	72·20	50·87	19·61
	12	45·87	74·94	68·51	37·50	45·89	74·76	53·73	22·52
	13	48·19	77·27	71·50	40·50	48·00	76·90	54·78	23·58
	14	50·32	79·42	72·56	41·53	50·20	79·07	57·85	26·61
	15	52·29	81·35	75·51	44·47	52·60	81·50	58·77	27·56
	16	54·50	83·51	76·50	45·49	55·00	83·90	61·90	30·70
	17	56·50	85·61	84·56	53·51	57·20	86·11	62·90	31·69
	18	58·30	87·39	87·50	56·50	60·19	89·10	65·80	34·58
	19	59·20	88·29	88·56	57·54	62·05	90·94	66·83	35·60
	20	60·13	89·26	89·51	58·50	63·15	92·01	69·89	38·62
	Mean	7 16 32·938	6 53 2·015	7 18 5·515	6 54 34·496	7 19 36·792	6 56 5·667	7 20 50·460	6 57 19·235
	Q	+1·683	+1·574	+1·683	+1·574	−1·683	−1·574	−1·683	−1·574
Corrected Mean		7 16 34·621	6 53 3·589	7 18 7·198	6 54 36·070	7 19 35·109	6 56 4·093	7 20 48·777	6 57 17·661

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, Q, and Observed Times by each Clock.							
		E to W, Q +		W to E, Q +		E to W, Q −		W to E, Q −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 18	1	8 52 53·80	8 29 22·82	8 54 23·70	8 30 52·60	8 56 7·89	8 32 36·67	8 57 50·93	8 34 19·68
	2	54·30	23·37	24·70	53·60	9·20	38·00	52·01	20·70
	3	55·07	24·12	25·63	54·56	10·90	39·70	54·98	23·70
	4	56·57	25·60	28·65	57·57	12·69	41·48	56·00	24·70
	5	58·17	27·23	29·69	58·59	16·74	45·54	58·98	27·68
	6	60·50	29·56	32·60	61·50	19·56	48·33	62·99	31·70
	7	62·70	31·71	33·60	62·50	21·60	50·40	63·99	32·67
	8	82·60	51·60	36·60	65·53	23·83	52·60	66·97	35·69
	9	84·80	53·80	37·60	66·55	26·01	54·80	68·10	36·80
	10	91·00	60·07	40·66	69·58	27·90	56·68	71·07	39·77
	11	93·30	62·30	41·59	70·50	29·91	58·70	72·07	40·76
	12	95·31	64·36	44·65	73·59	32·18	60·97	74·97	43·68
	13	97·35	66·37	45·59	74·51	34·30	63·09	76·00	44·68
	14	99·41	68·46	48·57	77·50	36·57	65·38	78·99	47·70
	15	103·26	72·30	49·57	78·50	38·80	67·60	80·08	48·75
	16	105·70	74·71	52·69	81·60	41·38	70·18	82·96	51·64
	17	109·44	78·47	53·62	82·58	43·19	71·99	84·10	52·80
	18	111·50	80·54	56·57	85·51	45·66	74·42	86·90	55·60
	19	113·18	82·20	57·59	86·51	48·10	76·89	87·88	56·53
	20	114·10	83·15	61·61	90·54	49·78	78·60	88·90	57·60
	Mean	8 53 25·103	8 29 54·137	8 54 41·274	8 31 10·196	8 56 28·810	8 32 57·601	8 58 10·944	8 34 39·642
	Q	+1·686	+1·577	+1·686	+1·577	−1·686	−1·577	−1·686	−1·577
Corrected Mean		8 53 26·789	8 29 55·714	8 54 42·960	8 31 11·773	8 56 27·124	8 32 56·024	8 58 9·258	8 34 38·065

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, *Q*, and Observed Times by each Clock.							
		E to W, *Q* +		W to E, *Q* +		E to W, *Q* −		W to E, *Q* −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 19	1	5 57 1·09	5 33 29·48	5 58 42·18	5 35 10·39	5 53 1·49	5 29 29·75	5 54 50·58	5 31 18·76
	2	3·27	31·62	43·16	11·40	2·44	30·70	51·54	19·70
	3	5·40	33·72	44·17	12·38	3·48	31·79	54·59	22·76
	4	7·72	36·10	47·11	15·40	5·41	33·78	55·64	23·80
	5	10·17	38·50	48·19	16·43	7·61	35·90	58·58	26·80
	6	13·17	41·59	51·16	19·40	9·99	38·29	62·63	30·81
	7	16·19	44·50	52·10	20·37	12·67	40·99	63·57	31·71
	8	18·07	46·36	55·10	23·37	14·79	43·07	66·56	34·74
	9	20·31	48·67	56·18	24·40	17·26	45·53	67·56	35·72
	10	22·68	51·00	59·10	27·32	28·64	56·96	70·54	38·71
	11	25·16	53·47	64·15	32·40	34·61	62·90	71·53	39·72
	12	27·39	55·73	67·16	35·41	37·14	65·46	74·60	42·78
	13	34·30	62·64	68·19	36·41	39·30	67·65	75·65	43·78
	14	36·87	65·22	71·17	39·42	41·36	69·69	78·60	46·80
	15	39·19	67·51	72·20	40·48	43·65	71·95	79·60	47·80
	16	41·60	69·91	75·20	43·48	45·74	74·07	82·60	50·81
	17	43·73	72·10	76·23	44·47	47·93	76·23	83·60	51·82
	18	45·72	74·01	79·19	47·40	50·58	78·86	86·68	54·90
	19	52·40	80·77	80·24	48·43	54·51	82·86	87·63	55·83
	20	54·59	82·96	83·15	51·38	56·70	85·08	88·60	56·80
	Mean	5 57 25·951	5 33 54·293	5 59 1·767	5 35 30·007	5 53 27·765	5 29 56·076	5 55 10·544	5 31 38·728
	Q	+1·692	+1·662	+1·692	+1·662	−1·692	−1·662	−1·692	−1·662
Corrected Mean		5 57 27·643	5 33 55·955	5 59 3·459	5 35 31·669	5 53 26·073	5 29 54·414	5 55 8·852	5 31 37·066

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, Q, and Observed Times by each Clock.							
		E to W, Q +		W to E, Q +		E to W, Q –		W to E, Q –	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 19	1	7 22 27·63	6 58 55·95	7 24 1·32	7 0 29·56	7 25 32·40	7 2 0·69	7 27 8·70	7 3 36·88
	2	28·44	56·79	2·32	30·56	33·27	1·54	9·63	37·79
	3	29·20	57·56	9·32	37·55	34·19	2·41	12·70	40·90
	4	32·77	61·08	10·27	38·50	35·79	4·00	13·70	41·87
	5	35·50	63·80	13·28	41·50	37·84	6·10	16·68	44·86
	6	40·28	68·60	14·34	42·56	40·30	8·59	17·68	45·81
	7	42·39	70·70	17·17	45·40	44·89	13·18	20·68	48·84
	8	66·72	95·02	18·19	46·37	53·82	22·09	21·62	49·77
	9	68·49	96·79	21·23	49·47	55·82	24·09	24·67	52·80
	10	70·46	98·81	22·20	50·40	57·90	26·17	25·67	53·81
	11	72·45	100·71	25·27	53·49	59·94	28·22	28·65	56·80
	12	74·78	103·11	26·25	54·44	62·30	30·59	29·62	57·78
	13	78·27	106·60	29·30	57·49	64·87	33·14	33·67	61·83
	14	80·90	109·24	30·22	58·41	67·20	35·49	36·57	64·70
	15	82·67	111·00	33·20	61·40	69·71	38·00	37·62	65·80
	16	84·50	112·85	34·20	62·40	80·69	48·97	40·57	68·73
	17	86·41	114·72	37·20	65·47	86·79	55·08	41·61	69·77
	18	88·22	116.51	38·19	66·40	92·80	61·07	44·60	72·78
	19	89·16	117·51	41·20	69·41	93·76	62·07	45·60	73·79
	20	90·21	118·53	42·21	70·41	94·72	63·06	48·50	76·70
	Mean	7 23 3·473	6 59 31·794	7 24 23·344	7 0 51·560	7 25 59·950	7 2 28·228	7 27 27·937	7 3 56·101
	Q	+1·691	+1·661	+1·691	+1·661	–1·691	–1·661	–1·691	–1·661
Corrected Mean		7 23 5·164	6 59 33·455	7 24 25·035	7 0 53·221	7 25 58·259	7 2 26·567	7 27 26·246	7 3 54·440

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Signal No.	Direction of Transmission of Signals, Sign of Pen Equation, Q, and Observed Times by each Clock.							
		E to W, Q +		W to E, Q +		E to W, Q −		W to E, Q −	
		By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock	By East Clock	By West Clock
		h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s
1876 Jan. 19	1	8 50 59·36	8 27 27·66	8 52 30·30	8 28 58·50	8 54 17·80	8 30 46·01	8 55 33·60	8 32 1·72
	2	60·20	28·54	31·30	59·50	20·24	48·50	34·56	2·70
	3	61·12	29·46	32·30	60·48	22·50	50·70	35·57	3·70
	4	63·88	31·18	35·26	63·43	29·30	57·58	38·71	6·87
	5	65·24	33·55	36·24	64·40	33·61	61·88	39·74	7·89
	6	67·50	35·80	39·27	67·44	35·18	63·42	42·65	10·80
	7	69·90	38·17	40·26	68·44	50·68	78·91	43·67	11·80
	8	72·39	40·68	43·24	71·47	53·19	81·46	46·68	14·80
	9	74·55	42·89	44·26	72·43	55·17	83·43	47·64	15·80
	10	77·24	45·58	47·22	75·42	58·74	87·01	50·69	18·84
	11	79·64	47·90	48·20	76·39	60·91	89·20	51·70	19·82
	12	83·80	52·08	51·30	79·48	62·67	90·91	54·65	22·82
	13	85·90	54·20	52·30	80·44	63·60	91·85	55·68	23·83
	14	88·20	56·50	56·27	84·41	64·67	92·92	58·60	26·77
	15	90·44	58·73	59·30	87·49	...	...	62·60	30·76
	16	94·53	62·83	63·20	91·42	...	...	63·60	31·74
	17	96·72	65·01	64·22	92·40	...	...	66·62	34·77
	18	98·79	67·06	67·20	95·40	...	...	67·70	35·81
	19	101·18	69·44	68·20	96·40	...	...	70·67	38·81
	20	103·60	71·88	71·19	99·40	...	...	71·78	39·90
	Mean	8 51 19·709	8 27 47·957	8 52 49·052	8 29 17·237	8 54 44·876	8 31 13·127	8 55 51·856	8 32 19·998
	Q	+1·688	+1·681	+1·688	+1·681	−1·688	−1·681	−1·688	−1·681
Corrected Mean		8 51 21·397	8 27 49·638	8 52 50·740	8 29 18·918	8 54 43·188	8 31 11·446	8 55 50·168	8 32 18·317

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Station at which Comparison was made, and Sign of Pen Equation, *Q*							
	At W		At E		At W		At E	
	Q −	*Q* +	*Q* −	*Q* +	*Q* −	*Q* +	*Q* −	*Q* +
1876 January 14	s 0·28	s 0·36	s 0·50	s 0·96	s 0·26	s 0·30	s 0·62	s 0·97
	·26	·31	·54	·97	·27	·30	·60	·97
	·29	·36	·55	·95	·27	·29	·62	·97
	·29	·30	·58	·95	·23	·33	·60	·96
	·30	·34	·56	·96	·25	·30	·62	·96
	·29	·30	·58	·97	·23	·31	·60	·98
	·30	·35	·57	·98	·27	·30	·61	·97
	·29	·31	·57	·98	·26	·30	·60	·96
	·30	·36	·56	·98	·26	·29	·60	·96
	·29	·31	·58	·97	·24	·30	·60	·97
	·30	·35	·52	·94	·26	·29	·60	·98
	·30	·31	·57	·91	·25	·30	·60	·97
	·30	·36	·56	·90	·26	·30	·60	·98
	·30	·32	·57	·91	·24	·30	·59	·98
	·30	·33	·54	·92	·25	·30	·60	·99
	·29	·30	·56	·91	·21	·30	·60	·98
	·30	·36	·54	·91	·25	·30	·60	·99
	·30	·31	·57	·92	·23	·30	·60	·98
	·30	·35	·53	·94	·24	·30	·61	·99
	·30	·32	·57	·92	·23	·30	·60	·98
Corresponding Mean Observed Times at E	h m s 6 15 15	h m s 6 19 15	h m s 6 16 44 s + 0·5560	h m s 6 21 24 s + 0·9425	h m s 7 46 45	h m s 7 50 30	h m s 7 48 39 s + 0·6035	h m s 7 52 39 s + 0·9745
Corresponding Mean Observed Times at W	h m s 5 52 12 s + 0·2940	h m s 5 56 15 s + 0·3305	h m s 5 53 45	h m s 5 58 22	h m s 7 23 42 s + 0·2480	h m s 7 27 30 s + 0·3005	h m s 7 25 40	h m s 7 29 37
Difference	m s 22 62·7060	m s 22 59·6695	m s 22 59·5560	m s 22 62·9425	m s 22 62·7520	m s 22 59·6995	m s 22 59·6035	m s 22 62·9745

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Station at which Comparison was made, and Sign of Pen Equation, Q							
	At W		At E		At W		At E	
	Q −	Q +	Q −	Q +	Q −	Q +	Q −	Q +
1876 January 16	s 0·35	s 0·47	s 0·48	s 0·84	s 0·40	s 0·42	s 0·47	s 0·85
	·32	·44	·44	·87	·39	·45	·47	·81
	·39	·47	·48	·83	·40	·41	·47	·86
	·34	·44	·45	·88	·39	·45	·47	·83
	·38	·48	·49	·87	·40	·42	·46	·85
	·34	·45	·42	·88	·39	·47	·47	·83
	·39	·46	·45	·85	·39	·43	·47	·84
	·36	·45	·46	·88	·39	·47	·48	·83
	·40	·46	·48	·86	·40	·45	·46	·86
	·33	·45	·46	·88	·39	·46	·48	·83
	·39	·47	·47	·84	·40	·43	·47	·86
	·36	·44	·47	·87	·38	·48	·48	·83
	·38	·47	·49	·84	·40	·45	·47	·87
	·36	·45	·49	·89	·39	·47	·49	·83
	·39	·47	·50	·83	·40	·44	·45	·87
	·35	·45	·47	·86	·39	·46	·48	·83
	·39	·46	·50	·82	·40	·46	·46	·86
	·35	·45	·48	·87	·38	·48	·48	·81
	·39	·47	·50	·82	·40	·44	·46	·86
	·36	·45	·48	·85	·38	·47	·46	·83
Corresponding Mean Observed Times at E	h m s 6 27 15	h m s 6 31 31	h m s 6 29 40 s + 0·4730	h m s 6 33 18 s + 0·8565	h m s 7 47 35	h m s 7 51 12	h m s 7 49 11 s + 0·4700	h m s 7 53 23 s + 0·8420
Corresponding Mean Observed Times at W	h m s 6 4 11 s + 0·3660	h m s 6 8 30 s + 0·4575	h m s 6 6 40	h m s 6 10 15	h m s 7 24 31 s + 0·3930	h m s 7 28 11 s + 0·4505	h m s 7 26 11	h m s 7 30 20
Difference	m s 22 63·6340	m s 22 60·5425	m s 22 60·4730	m s 22 63·8565	m s 22 63·6070	m s 22 60·5495	m s 22 60·4700	m s 22 63·8420

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Station at which Comparison was made, and Sign of Pen Equation Q											
	At W		At E		At W		At E		At W		At E	
	$Q-$	$Q+$	$Q-$	$Q+$	$Q-$	$Q+$	$Q-$	$Q+$	$Q-$	$Q+$	$Q-$	$Q+$
1876 January 17	s 0·30	s 0·38	s 0·54	s 0·89	s 0·22	s 0·37	s 0·60	s 0·91	s 0·21	s 0·30	s 0·60	s 0·99
	·31	·39	·51	·90	·29	·39	·60	·95	·26	·30	·60	·94
	·30	·38	·55	·89	·27	·38	·60	·94	·22	·34	·60	1·00
	·30	·40	·51	·90	·30	·40	·60	·97	·25	·30	·62	·98
	·30	·39	·54	·89	·28	·36	·60	·94	·21	·31	·60	1·00
	·32	·40	·52	·90	·29	·39	·60	·97	·27	·30	·60	·96
	·30	·38	·56	·90	·27	·34	·59	·94	·23	·30	·60	1·00
	·32	·40	·51	·88	·30	·37	·60	·96	·27	·30	·60	·97
	·30	·39	·53	·88	·26	·34	·60	·93	·22	·30	·60	1·00
	·30	·40	·50	·91	·29	·35	·60	·97	·28	·30	·60	·98
	·30	·39	·55	·90	·26	·35	·59	·92	·24	·30	·58	1·02
	·32	·40	·51	·94	·29	·34	·60	·95	·28	·30	·60	·98
	·31	·39	·56	·88	·24	·36	·58	·91	·25	·30	·60	1·00
	·31	·40	·53	·91	·29	·35	·59	·95	·29	·30	·60	·98
	·30	·38	·57	·88	·24	·36	·58	·90	·24	·30	·60	1·02
	·30	·40	·54	·92	·30	·34	·60	·94	·28	·29	·60	·98
	·30	·39	·56	·90	...	·38	·60	·90	·24	·33	·60	1·00
	·32	·40	·53	·90	...	·38	...	·95	·29	·30	·60	·98
	·29	·40	·56	·89	...	·35	...	·90	·24	·30	·60	1·01
	·32	·40	·53	·95	...	·38	...	·94	·28	·30	·60	1·00
Corresponding Mean Observed Times at E	h m s 6 13 30	h m s 6 17 40	h m s 6 19 12 s +0·5355	h m s 6 22 2 s +0·9005	h m s 7 22 58	h m s 7 26 54	h m s 7 33 20 s +0·5959	h m s 7 25 42 s +0·9370	h m s 8 35 50	h m s 8 42 11	h m s 8 40 23 s +0·6000	h m s 8 43 21 s +0·9895
Corresponding Mean Observed Times at W	h m s 5 49 58 s +0·3060	h m s 5 54 11 s +0·3930	h m s 5 55 44	h m s 5 58 31	h m s 6 59 26 s +0·2744	h m s 7 3 25 s +0·3640	h m s 7 9 52	h m s 7 2 11	h m s 8 12 18 s +0·2525	h m s 8 18 42 s +0·3035	h m s 8 16 55	h m s 8 19 50
Difference	m s 23 31·6940	m s 23 28·6070	m s 23 28·5355	m s 23 31·9005	m s 23 31·7256	m s 23 28·6360	m s 23 28·5959	m s 23 31·9370	m s 23 31·7475	m s 23 28·6965	m s 23 28·6000	m s 23 31·9895

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Station at which Comparison was made, and Sign of Pen Equation, *Q*											
	At W		At E		At W		At E		At W		At E	
	Q −	*Q* +	*Q* −	*Q* +	*Q* −	*Q* +	*Q* −	*Q* +	*Q* −	*Q* +	*Q* −	*Q* +
1876 January 20	s 0·30	s 0·63	s 0·44	s 0·80	s 0·28	s 0·58	s 0·48	s 0·86	s 0·24	s 0·56	s 0·46	s 0·84
	·28	·58	·48	·78	·24	·55	·50	·88	·20	·53	·50	·89
	·30	·60	·46	·82	·28	·58	·47	·85	·22	·56	·48	·84
	·26	·58	·46	·80	·22	·56	·49	·88	·20	·51	·50	·88
	·30	·60	·41	·80	·27	·58	·46	·84	·24	·56	·47	·83
	·27	·59	·43	·78	·22	·57	·49	·88	·20	·53	·50	·89
	·30	·62	·41	·80	·26	·59	·49	·86	·23	·57	·48	·85
	·27	·59	·46	·77	·24	·56	·48	·88	·20	·55	·49	·86
	·30	·60	·44	·80	·27	·60	·46	·82	·24	·57	·49	·85
	·28	·58	·45	·78	·22	·58	·48	·87	·20	·54	·50	·86
	·30	·60	·43	·80	·27	·59	·49	·85	·26	·57	·49	·86
	·27	·58	·49	·80	·26	·57	·49	·88	·22	·54	·50	·88
	·30	·60	·43	·84	·29	·59	·47	·86	·26	·58	·49	·85
	·27	·58	·42	·80	·24	·57	·48	·88	·21	·56	·50	·88
	·30	·60	·41	·83	·28	·59	·46	·85	·27	·58	·49	·84
	·28	·58	·48	·79	·24	·55	·50	·87	·21	·54	·50	·86
	·30	·60	·46	·82	·29	·60	·46	·82	·27	·58	·48	·83
	·28	·59	·49	·80	·24	·57	·48	·85	·20	·53	·50	·86
	·30	·59	·45	·82	·29	·59	·46	·82	·27	·58	·47	·84
	·25	·58	·48	·78	·26	·57	·48	·85	·21	·55	·50	·87
Corresponding Mean Observed Times at E	h m s 6 5 11	h m s 6 8 11	h m s 6 6 41 s +0·4490	h m s 6 11 13 s +0·8005	h m s 7 40 45	h m s 7 44 45	h m s 7 42 41 s +0·4785	h m s 7 45 44 s +0·8575	h m s 8 48 45	h m s 8 52 45	h m s 8 51 15 s +0·4895	h m s 8 55 44 s +0·8580
Corresponding Mean Observed Times at W	h m s 5 41 37 s +0·2855	h m s 5 44 40 s +0·5935	h m s 5 43 11	h m s 5 47 40	h m s 7 17 11 s +0·2580	h m s 7 21 14 s +0·5770	h m s 7 19 11	h m s 7 22 11	h m s 8 26 11 s +0·2275	h m s 8 29 14 s +0·5545	h m s 8 27 45	h m s 8 32 11
Difference	m s 23 33·7145	m s 23 30·4065	m s 23 30·4490	m s 23 33·8005	m s 23 33·7420	m s 23 30·4230	m s 23 30·4785	m s 23 33·8575	m s 23 33·7725	m s 23 30·4455	m s 23 30·4895	m s 23 33·8580

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Station at which Comparison was made, and Sign of Pen Equation, Q											
	At W		At E		At W		At E		At W		At E	
	$Q-$	$Q+$	$Q-$	$Q+$	$Q-$	$Q+$	$Q-$	$Q+$	$Q-$	$Q+$	$Q-$	$Q+$
1876 January 21	s 0·84	s 0·11	s 0·90	s 0·25	s 0·71	s 0·09	s 0·99	s 0·40	s 0·70	s 0·00	s 0·98	s 0·39
	·82	·19	·90	·27	·70	·00	1·03	·40	·73	·09	1·00	·40
	·83	·11	·89	·27	·71	·08	·99	·40	·70	·00	·96	·39
	·81	·18	·90	·30	·70	·00	1·00	·40	·71	·08	1·01	·41
	·83	·11	·88	·26	·72	·10	·97	·40	·70	·01	·96	·40
	·80	·18	·90	·27	·70	·01	1·00	·40	·73	·10	·98	·41
	·84	·11	·87	·24	·70	·08	·98	·38	·70	·01	·95	·39
	·81	·19	·90	·26	·70	·00	1·00	·40	·72	·07	1·00	·40
	·83	·11	·87	·26	·72	·08	·99	·39	·70	·00	·97	·39
	·80	·18	·90	·25	·74	·00	1·01	·40	·71	·09	1·00	·40
	·82	·11	·83	·26	·76	·08	·98	·39	·70	·00	·96	·39
	·81	·18	·88	·26	·75	·00	1·00	·39	·70	·08	1·00	·40
	·85	·11	·85	·27	·75	·08	·98	·40	·68	·00	·94	·38
	·83	·19	·89	·28	·72	·01	1·00	·39	·70	·08	1·00	·39
	·83	·10	·86	·28	·74	·09	·98	·38	·68	·00	·95	·38
	·81	·15	·89	·28	·70	·01	1·00	·39	·70	·08	1·00	·39
	·82	·11	·86	·26	·70	·08	·97	·38	·67	·00	·96	·38
	·80	·18	·89	·29	·70	·00	1·01	·40	·70	·06	1·00	·39
	·85	·11	·86	·29	·71	·06	·98	·38	·69	·01	·96	·39
	·82	·15	·90	·28	·70	·00	1·00	·39	·70	·08	1·00	·40
Corresponding Mean Observed Times at E	h m s 6 2 11	h m s 6 5 18	h m s 6 3 46 s +0·8810	h m s 6 7 20 s +0·2690	h m s 7 23 11	h m s 7 27 11	h m s 7 25 42 s +0·9930	h m s 7 29 46 s +0·3930	h m s 8 47 20	h m s 8 43 12	h m s 8 45 42 s +0·9790	h m s 8 49 46 s +0·3935
Corresponding Mean Observed Times at W	h m s 5 38 35 s +0·8225	h m s 5 41 46 s +0·1430	h m s 5 40 15	h m s 5 43 45	h m s 6 59 35 s +0·7165	h m s 7 3 39 s +0·0425	h m s 7 2 11	h m s 7 6 11	h m s 8 23 44 s +0·7010	h m s 8 19 40 s +0·0420	h m s 8 22 11	h m s 8 26 11
Difference	m s 23 35·1775	m s 23 31·8570	m s 23 31·8810	m s 23 35·2690	m s 23 35·2835	m s 23 31·9575	m s 23 31·9930	m s 23 35·3930	m s 23 35·2990	m s 23 31·9580	m s 23 31·9790	m s 23 35·3935

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Corresponding Mean Times of Sets of Signals: by East Clock, Mean = t_E	by West Clock	Difference d	Signals Transmitted, from	Relative Hourly Clock Rate Correction at given Epochs by E Clock: Deduced R	Interpolated R_1	Reduction of d to t_E by Relative Rate Correction R_1: Reduced Clock Difference d_1		Retardation = $\frac{\beta+\delta}{4}$ minus $\frac{\alpha+\gamma}{4}$	Deduced Clock Differences D at Epochs by E Clock T_E
1876	h m s	h m s	m s				m s			
Jan. 11	5 19 16·623	4 56 13·617	23 3·006	E			23 3·003	α		
	23 42·514	5 0 39·421	3·093	W		s −0·036 at $5^h\ 24^m\ 39^s$	3·092	β	s +0·050	
	27 3·877	4 0·898	2·979	E			2·980	γ		
	28 31·712	5 28·623	3·089	W			3·091	δ		D = 23m 3·020s
	5 24 39	Mean ...	23 3·042		s −0·0375 at $6^h\ 9^m$					
"	6 47 38·228	6 24 35·307	23 2·921	E			23 2·918	α		T_E = 5h 59m 34s
	51 1·735	27 58·673	3·062	W		s −0·039 at $6^h\ 52^m\ 41^s$	3·061	β		
	54 7·180	31 4·274	2·906	E			2·907	γ	+0·075	
	57 56·609	34 53·550	3·059	W			3·062	δ		
	6 52 41	Mean ...	23 2·987		s −0·0398 at $7^h\ 38^m$					D = 23m 2·962s
"	8 18 32·177	7 55 29·298	23 2·879	E			23 2·876	α		T_E = 7h 30m 8s
	21 6·654	58 3·633	3·021	W		s −0·041 at $8^h\ 23^m\ 2^s$	3·020	β	+0·063	
	24 14·810	8 1 11·959	2·851	E			2·852	γ		
	28 16·262	5 13·306	2·956	W			2·960	δ		
	8 23 2	Mean ...	23 2·927							
Jan. 12	5 25 10·927	5 2 8·637	23 2·290	E			23 2·289	α		
	26 28·058	3 25·642	2·416	W		s −0·028 at $5^h\ 27^m\ 24^s$	2·416	β	+0·073	
	28 20·721	5 18·518	2·203	E			2·203	γ		
	29 36·990	6 34·623	2·367	W			2·368	δ		D = 23m 2·302s
	5 27 24	Mean ...	23 2·319		s −0·0282 at $6^h\ 11^m$					
"	6 52 38·741	6 29 36·505	23 2·236	E			23 2·235	α		T_E = 6h 4m 16s
	54 2·736	31 0·383	2·353	W		s −0·029 at $6^h\ 54^m\ 47^s$	2·353	β		
	55 28·786	32 26·607	2·179	E			2·179	γ	+0·071	
	56 57·714	33 55·371	2·343	W			2·344	δ		
	6 54 47	Mean ...	23 2·278		s −0·0289 at $7^h\ 42^m$					D = 23m 2·257s
"	8 23 32·067	8 0 29·873	23 2·194	E			23 2·192	α		T_E = 7h 37m 50s
	25 26·885	2 24·580	2·305	W		s −0·029 at $8^h\ 28^m\ 15^s$	2·304	β		
	35 44·526	12 42·385	2·141	E			2·145	γ	+0·064	
	28 14·834	5 12·544	2·290	W			2·290	δ		
	8 28 15	Mean ...	23 2·233							

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Corresponding Mean Times of Sets of Signals: by East Clock, Mean = t_E	Corresponding Mean Times of Sets of Signals: by West Clock	Difference d	Signal Transmitted, from	Relative Hourly Clock Rate Correction at given Epochs by E Clock: Deduced R	Relative Hourly Clock Rate Correction at given Epochs by E Clock: Interpolated R_1	Reduction of d to t_E by Relative Rate Correction R_1: Reduced Clock Difference d_1		Retardation $= \frac{\beta+\delta}{4}$ minus $\frac{\alpha+\gamma}{4}$	Deduced Clock Differences D at Epochs by E Clock T_E
1876	h m s	h m s	m s				m s			
Jan. 18	5 26 39·322	5 3 37·801	23 1·521	E			23 1·521	α		
	27 50·380	4 48·736	1·644	W		s − 0·010 at 5^h 28^m 41^s	1·644	β	s +0·068	
	29 25·522	6 24·052	1·470	E			1·470	γ		
	30 49·602	7 47·984	1·618	W			1·618	δ		D = 23m 1s·556
	5 28 41	Mean ...	23 1·563		s − 0·0119 at 6^h 14^m					T_E = 6h 3m 24s
„	6 56 52·378	6 33 50·860	23 1·518	E			23 1·517	α		
	58 13·806	35 12·193	1·613	W		s − 0·014 at 6^h 59^m 4^s	1·613	β	+0·054	
	59 52·592	36 51·128	1·464	E			1·464	γ		
	7 1 17·284	38 15·700	1·584	W			1·585	δ		D = 23m 1s·535
	6 59 4	Mean ...	23 1·545		s − 0·0164 at 7^h 45^m					T_E = 7h 34m 34s
„	8 28 12·874	8 5 11·388	23 1·486	E			23 1·485	α		
	29 40·051	6 38·455	1·596	W		s − 0·019 at 8^h 30^m 15^s	1·596	β	+0·062	
	30 47·280	7 45·850	1·430	E			1·430	γ		
	32 21·150	9 19·583	1·567	W			1·568	δ		
	8 30 15	Mean ...	23 1·520							
Jan. 18	5 48 25·557	5 24 54·591	23 30·966	E			23 30·967	α		
	49 49·766	26 18·714	31·052	W		s + 0·069 at 5^h 50^m 34^s	31·053	β	+0·047	
	51 19·538	27 48·628	30·910	E			30·909	γ		
	52 39·741	29 8·728	31·013	W			31·011	δ		D = 23m 31s·024
	5 50 34	Mean ...	23 30·985		s + 0·0599 at 6^h 35^m					T_E = 6h 29m 37s
„	7 16 34·621	6 53 3·589	23 31·032	E			23 31·034	α		
	18 7·198	54 36·070	31·128	W		s + 0·051 at 7^h 18^m 46^s	31·129	β	+0·049	
	19 35·109	56 4·093	31·016	E			31·015	γ		
	20 48·777	57 17·661	31·116	W			31·114	δ		D = 23m 31s·097
	7 18 46	Mean ...	23 31·073		s + 0·0409 at 8^h 7^m					T_E = 7h 54m 25s
„	8 53 26·789	8 29 55·714	23 31·075	E			23 31·076	α		
	54 42·960	31 11·773	31·187	W		s + 0·031 at 8^h 55^m 42^s	31·188	β	+0·051	
	56 27·124	32 56·024	31·100	E			31·100	γ		
	58 9·258	34 38·065	31·193	W			31·192	δ		
	8 55 42	Mean ...	23 31·139							

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Corresponding Mean Times of Sets of Signals: by East Clock, Mean = t_E	Corresponding Mean Times of Sets of Signals: by West Clock	Difference d	Signal Transmitted, from	Relative Hourly Clock Rate Correction at given Epochs by E Clock: Deduced R	Relative Hourly Clock Rate Correction at given Epochs by E Clock: Interpolated R_1	Reduction of d to t_E by Relative Rate Correction R_1: Reduced Clock Difference d_1		Retardation = $\frac{\beta+\delta}{4}$ minus $\frac{\alpha+\gamma}{4}$	Deduced Clock Differences D at Epochs by E Clock T_E
1876	h m s	h m s	m s				m s			
Jan. 19	5 57 27·643	5 33 55·955	23 31·688	E			23 31·688	γ		
	59 3·459	35 31·669	31·790	W		s + 0·011 at 5^h 56^m 17^s	31·789	δ	s +0·057	
	53 26·073	29 54·414	31·659	E			31·660	α		
	55 8·852	31 37·066	31·786	W			31·786	β		m s D = 23 31·741
	5 56 17	Mean ...	23 31·731		s +0·0162 at 6^h 41^m					h m s T_E = 6 34 51
„	7 23 5·164	6 59 33·455	23 31·709	E			23 31·710	α		
	24 25·035	7 0 53·221	31·814	W		s + 0·021 at 7^h 25^m 14^s	31·814	β	+0·054	
	25 58·259	2 26·567	31·692	E			31·692	γ		
	27 26·246	3 54·440	31·806	W			31·805	δ		m s D = 23 31·770
	7 25 14	Mean ...	23 31·755		s +0·0265 at 8^h 9^m					h m s T_E = 7 59 27
„	8 51 21·397	8 27 49·638	23 31·759	E			23 31·760	α		
	52 50·740	29 18·918	31·822	W		s + 0·032 at 8^h 53^m 41^s	31·822	β	+0·043	
	54 43·188	31 11·446	31·742	E			31·741	γ		
	55 50·168	32 18·317	31·851	W			31·850	δ		
	8 53 41	Mean ...	23 31·794							

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Observed Hour at E, Mean = t_E	Observed Clock Difference d and Mean	Signals transmitted, from	Relative Hourly Clock Rate Correction at given Epochs by E Clock: Deduced R	Interpolated R_1	Reduction of d to t_E by Relative Rate Correction R_1: Reduced Clock Difference d_1		Pen Equation, Q, at E, $Q = \frac{-\beta+\delta}{2}$ at W, $Q = \frac{\alpha-\gamma}{2}$	Retardation = $\frac{\beta+\delta}{4}$ minus $\frac{\alpha+\gamma}{4}$	Deduced Clock Differences D at Epochs by E Clock T_E
1876	h m s	m s				m s		s	s	
January 14	6 15 15	22 62·706	E			22 62·707	α	at E, Q = 1·692		
	16 44	59·556	W		s + 0·026 at $6^h 18^m 10^s$	59·557	β		+ 0·031	
	19 15	59·670	E			59·669	γ	at W, Q = 1·519		
	21 24	62·942	W			62·941	δ			
	6 18 10	23 1·219		s + 0·0256 at $7^h 3^m$						
”	7 46 45	22 62·752	E			22 62·753	α	at E, Q = 1·685		
	48 39	59·604	W		s + 0·026 at $7^h 49^m 38^s$	59·604	β		+ 0·031	
	50 30	59·699	E			59·699	γ	at W, Q = 1·527		
	52 39	62·975	W			62·973	δ			
	7 49 38	23 1·258								
January 16	6 27 15	23 3·634	E			23 3·634	α	at E, Q = 1·692		
	29 40	0·473	W		s − 0·008 at $6^h 30^m 26^s$	0·473	β		+ 0·038	
	31 31	0·543	E			0·543	γ	at W, Q = 1·546		
	33 18	3·856	W			3·857	δ			D = 23m 2s·123
	6 30 26	23 2·127		s −0·0075 at $7^h 10^m$						T_E = 7h 6m 1s
”	7 47 35	23 3·607	E			23 3·607	α	at E, Q = 1·686		
	49 11	0·470	W		s − 0·008 at $7^h 50^m 20^s$	0·470	β		+ 0·039	
	51 12	0·550	E			0·550	γ	at W, Q = 1·529		
	53 23	3·842	W			3·842	δ			
	7 50 20	23 2·117								
January 17	6 13 30	23 31·694	E			22 31·697	α	at E, Q = 1·682		
	17 40	28·607	E		s + 0·038 at $6^h 18^m 6^s$	28·607	γ		+ 0·032	
	19 12	28·536	W			28·535	β	at W, Q = 1·545		
	22 2	31·900	W			31·898	δ			
	6 18 6	23 30·184		s + 0·0347 at $6^h 53^m$						
”	7 22 58	23 31·726	E			22 31·728	α	at E, Q = 1·673		
	25 42	31·937	W		s + 0·032 at $7^h 27^m 14^s$	31·938	δ		+ 0·042	
	26 54	28·636	E			28·636	γ	at W, Q = 1·546		
	33 20	28·596	W			28·593	β			
	7 27 14	23 30·224		s + 0·0287 at $8^h 4^m$						
”	8 35 50	23 31·748	E			22 31·750	α	at E, Q = 1·694		
	40 23	28·600	W		s + 0·026 at $8^h 40^m 26^s$	28·600	β		+ 0·036	
	42 11	28·696	E			28·696	γ	at W, Q = 1·527		
	43 21	31·990	W			31·988	δ			
	8 40 26	23 30·259								

Arc Bolarum (E) *and Bombay* (W).

Astronomical Date	Observed Hour at E, Mean = t_E	Observed Clock Difference d and Mean	Signals transmitted, from	Relative Hourly Clock Rate Correction at given Epochs by E Clock: Deduced R	Interpolated R_1	Reduction of d to t_E by Relative Rate Correction R_1: Reduced Clock Difference d_1		Pen Equation, Q, at E, $Q = \frac{-\beta+\delta}{2}$; at W, $Q = \frac{\alpha-\gamma}{2}$	Retardation $= \frac{\beta+\delta}{4}$ minus $\frac{\alpha+\gamma}{4}$	Deduced Clock Differences D at Epochs by E Clock T_E
1876	h m s	m s				m s				
January 20	6 5 11	23 33·715	E			23 33·716	α	at E, Q = 1·675 s		
	6 41	30·449	W		s + 0·024 at $6^h\ 7^m\ 49^s$	30·449	β		s + 0·032	
	8 11	30·406	E			30·406	γ	at W, Q = 1·655		
	11 13	33·801	W			33·799	δ			
	6 7 49	23 32·093		s +0·0201 at $6^h\ 56^m$						
"	7 40 45	23 33·742	E			23 33·743	α	at E, Q = 1·689		
	42 41	30·478	W		s + 0·017 at $7^h\ 43^m\ 29^s$	30·479	β		+ 0·043	D = 23 32·122 m s
	44 45	30·423	E			30·423	γ	at W, Q = 1·660		T_E = 7 32 26 h m s
	45 44	33·858	W			33·857	δ			
	7 43 29	23 32·125		s +0·0140 at $8^h\ 18^m$						
"	8 48 45	23 33·772	E			23 33·773	α	at E, Q = 1·684		
	51 15	30·490	W		s + 0·011 at $8^h\ 52^m\ 7^s$	30·490	β		+ 0·032	
	52 45	30·445	E			30·445	γ	at W, Q = 1·664		
	55 44	33·858	W			33·857	δ			
	8 52 7	23 32·141								
January 21	6 2 11	23 35·178	E			23 35·183	α	at E, Q = 1·691		
	3 46	31·881	W		s + 0·123 at $6^h\ 4^m\ 39^s$	31·883	β		+ 0·027	
	5 18	31·857	E			31·856	γ	at W, Q = 1·664		
	7 20	35·269	W			35·264	δ			
	6 4 39	23 33·546		s +0·0814 at $6^h\ 46^m$						
"	7 23 11	23 35·283	E			23 35·286	α	at E, Q = 1·699		
	25 42	31·993	W		s + 0·040 at $7^h\ 26^m\ 28^s$	31·993	β		+ 0·035	
	27 11	31·958	E			31·957	γ	at W, Q = 1·665		
	29 46	35·393	W			35·391	δ			
	7 26 28	23 33·657		s 0·000 at $8^h\ 6^m$						
"	8 43 12	23 31·958	E			23 31·960	γ	at E, Q = 1·706		
	45 42	31·979	W		s − 0·041 at $8^h\ 46^m\ 30^s$	31·980	β		+ 0·028	
	47 20	35·299	E			35·298	α	at W, Q = 1·669		
	49 46	35·393	W			35·391	δ			
	8 46 30	23 33·657								

NOTE.—W Clock was wound up before observations on January 17th and lost 28s in the process, owing to a fault in the maintaining power.

TABLE IX. ABSTRACT OF OBSERVED VALUES OF PERSONAL EQUATION.

Between Captains Campbell and Heaviside.

Observed with Telescope No. 1.

By Stars of	At BOLARUM									At MADRAS						At BANGALORE		
	December 20, 1875			December 24, 1875			December 24, 1875			March 17, 1876			March 18, 1876			April 22, 1876		
	Star	Decl.	Equation C − H	Star	Decl.	Equation C − H	Star	Decl.	Equation C − H	Star	Decl.	Equation C − H	Star	Decl.	Equation C − H	Star	Decl.	Equation C − H
		°	s		°	s		°	s		°	s		°	s		°	s
North Aspect	1520	+33	+0·113	1520	+33	+0·124	1925	+22	+0·127	3735	+26	+0·111	3671	+24	+0·116	4438	+42	+0·083
	1530	+38	+ ·052	1530	+38	+ ·243	1937	+25	+ ·048	3757	+41	+ ·054	3735	+26	+ ·080	4526	+25	+ ·073
	1540	+44	+ ·008	1540	+44	+ ·125	1976	+23	+ ·157	3776	+21	+ ·067	3757	+41	+ ·162	4552	+37	+ ·049
	1551	+21	+ ·054	1551	+21	+ ·189	2002	+23	+ ·128	3824	+15	+ ·079	3776	+21	+ ·086	4615	+16	+ ·098
	1637	+22	+ ·040	1563	+20	+ ·150	2029	+23	+ ·041	3831	+21	+ ·021	3824	+15	+ ·097	4627	+35	+ ·069
	1726	+19	+ ·079	1637	+22	+ ·111	2039	+21	+ ·194	4031	+16	+ ·068	3831	+21	+ ·170	4632	+35	+ ·075
	1772	+29	+ ·056				2047	+23	+ ·116							4648	+19	+ ·125
							2080	+21	+ ·121							4706	+26	+ ·080
							2080	+21	+ ·099									
	Mean($C_N - H_N$)		+0·057			+0·157			+0·115			+0·067			+0·119			+0·082
			±0·008			±0·014			±0·011			±0·008			±0·011			±0·005
South Aspect	1508	+ 2	+0·030	1485	+16	+0·097	1907	+13	+0·070	3752	+ 1	+0·099	3621	+ 8	+0·019	4446	+ 6	−0·035
	1591	+15	+ ·027	1495	+ 5	+ ·141	1958	+15	− ·011	3788	+ 8	+ ·050	3663	− 1	+ ·112	4492	−12	− ·066
	1601	+16	+ ·086	1508	+ 2	+ ·054	2017	+12	+ ·061	3798	+ 3	+ ·016	3684	+ 3	+ ·016	4496	0	− ·017
	1611	+ 3	− ·026	1591	+15	+ ·060	2111	+16	+ ·039	3816	− 1	+ ·022	3696	+ 7	+ ·005	4516	− 6	− ·006
	1624	+11	− ·016	1611	+ 3	+ ·032				3863	+ 7	+ ·042	3708	+11	+ ·031	4565	− 8	+ ·010
	1678	− 1	+ ·047	1623	− 8	+ ·081				3871	+ 7	+ ·004	3718	− 8	+ ·000	4570	+ 4	+ ·038
	1737	+14	+ ·052							4006	− 5	− ·008	3726	+ 2	+ ·054	4578	− 7	+ ·081
	1805	+14	+ ·007							4039	+ 4	+ ·029	3752	+ 1	+ ·046	4591	− 9	+ ·036
	1816	+ 4	+ ·049							4049	+ 4	+ ·110	3768	+ 4	+ ·017	4672	+ 2	+ ·019
	1834	+14	− ·024							4055	+ 4	− ·029	3788	+ 8	+ ·064	4680	− 9	+ ·057
										4063	− 5	+ ·062	3795	+ 3	+ ·102	4690	− 9	+ ·058
										4072	+ 9	+ ·041	3816	− 1	+ ·056	4698	−10	+ ·080
										4079	+10	+ ·015	3857	+ 2	+ ·094			
										4094	+ 3	+ ·016						
	Mean($C_S - H_S$)		+0·023			+0·078			+0·040			+0·034			+0·047			+0·021
			±0·008			±0·011			±0·012			±0·007			±0·007			±0·009

Between Captains Campbell and Heaviside.

OBSERVED WITH TELESCOPE NO. 2.

By Stars of	At BOLARUM						At BOMBAY						At BANGALORE		
	December 21, 1875			December 28, 1875			February 6, 1876			February 6, 1876			April 23, 1876		
	Star	Decl.	Equation C − H	Star	Decl.	Equation C − H	Star	Decl.	Equation C − H	Star	Decl.	Equation C − H	Star	Decl.	Equation C − H
		°	s		°	s		°	s		°	s		°	s
North Aspect	1520	+ 33	+ 0·189	1925	+ 22	+ 0·085	1816	+ 21	+ 0·194	2734	+ 33	+ 0·218	4526	+ 25	+ 0·091
	1530	+ 38	+ ·099	1937	+ 25	+ ·061	1449	+ 23	+ ·144	2786	+ 28	+ ·229	4600	+ 39	+ ·233
	1540	+ 44	+ ·179	1975	+ 25	+ ·164				2793	+ 44	+ ·184	4615	+ 16	+ ·140
	1551	+ 21	+ ·110	2002	+ 23	+ ·102				2833	+ 25	+ ·168	4632	+ 35	+ ·209
	1637	+ 22	+ ·092	2047	+ 23	+ ·105				2850	+ 24	+ ·126	4648	+ 19	+ ·151
	1651	+ 20	+ ·153	2080	+ 21	+ ·141				2880	+ 20	+ ·102	4729	+ 20	+ ·152
	1726	+ 19	+ ·034	2097	+ 28	+ ·164				2913	+ 20	+ ·115	4737	+ 16	+ ·139
	1772	+ 29	+ ·153	2194	+ 25	+ ·109				2931	+ 20	+ ·131	4809	+ 27	+ ·129
				2239	+ 39	+ ·198				2999	+ 33	+ ·262	4847	+ 17	+ ·360
	Mean ($C_N - H_N$)		+ 0·126			+ 0·125			+ 0·169			+ 0·171			+ 0·178
			± 0·012			± 0·010			± 0·022*			± 0·013			± 0·018
South Aspect	1508	+ 2	+ 0·062	1907	+ 13	+ 0·043	1284	− 7	+ 0·101	2720	+ 14	+ 0·088	4492	− 12	+ 0·102
	1591	+ 15	+ ·035	1958	+ 15	− ·052	1290	− 7	+ ·096	2748	+ 14	+ ·006	4496	0	+ ·080
	1601	+ 16	+ ·059	2017	+ 12	+ ·003	1304	+ 9	+ ·044	2761	+ 13	+ ·094	4504	+ 11	− ·100
	1611	+ 3	+ ·030	2111	+ 16	+ ·065	1330	+ 14	− ·008	2778	+ 10	+ ·071	4516	− 6	− ·015
	1624	+ 11	+ ·065	2129	+ 14	+ ·036	1343	+ 14	+ ·039	2816	+ 17	+ ·016	4546	− 7	+ ·099
	1678	− 1	+ ·058	2206	+ 13	+ ·090	1357	+ 9	− ·011	2945	+ 4	+ ·049	4559	+ 11	+ ·015
	1737	+ 14	+ ·131	2255	+ 13	+ ·095	1370	+ 14	+ ·029	2971	+ 7	+ ·001	4565	− 8	+ ·127
	1805	+ 14	+ ·044				1392	+ 15	+ ·016	2987	− 13	− ·129	4570	+ 4	+ ·092
	1816	+ 4	+ ·048				1403	0	+ ·058	2897	+ 10	+ ·057	4672	+ 2	+ ·127
							1429	− 4	− ·053				4690	− 9	+ ·050
							1437	+ 16	+ ·042				4792	− 2	+ ·058
							1460	+ 11	+ ·088				4855	− 5	+ ·045
							1469	− 3	+ ·020						
							1485	+ 16	+ ·028						
							1495	+ 5	+ ·022						
							1508	+ 2	+ ·009						
	Mean ($C_S - H_S$)		+ 0·059			+ 0·040			+ 0·033			+ 0·028			+ 0·057
			± 0·007			± 0·013			± 0·007			± 0·015			± 0·013

* This probable error is assigned in accordance with the probable error of a single value of the equation, as deduced from a discussion of the probable errors of the mean values of the several days.

TABLE IX. ABSTRACT OF OBSERVED VALUES OF PERSONAL EQUATION.

Between Captains Campbell and Heaviside.

Observed with Telescope No. 1.												
By Stars of	At BANGALORE						At BOMBAY					
	December 15, 1876			December 18, 1876			April 7, 1877			April 9, 1877		
	Star	Declination	Equation C − H	Star	Declination	Equation C − H	Star	Declination	Equation C − H	Star	Declination	Equation C − H
		°	s		°	s		°	s		°	s
North Aspect	1370	+ 14	+0·056	1053	+ 20	+0·096	4594	+ 26	+0·014	4384	+ 36	−0·071
	1376	+ 19	+ ·103	1058	+ 20	+ ·113	4610	+ 32	+ ·074	4457	+ 36	+ ·041
	1392	+ 15	+ ·077	1087	+ 13	+ ·091	4628	+ 35	+ ·006	4594	+ 26	− ·067
	1420	+ 16	+ ·171	1139	+ 42	+ ·139	4652	+ 33	+ ·077	4628	+ 35	− ·031
	1449	+ 23	+ ·100	1161	+ 24	+ ·142	4758	+ 39	+ ·054	4652	+ 33	− ·006
	1485	+ 16	+ ·149	1192	+ 25	+ ·078	4810	+ 23	+ ·094			
	1530	+ 38	+ ·160	1420	+ 16	+ ·251	4820	+ 33	+ ·048			
	1540	+ 44	+ ·177	1485	+ 16	+ ·090						
				1520	+ 33	+ ·091						
				1551	+ 21	+ ·122						
				1563	+ 20	+ ·138						
				1591	+ 15	+ ·147						
	Means ($C_N - H_N$)		+0·124			+0·125			+0·052			−0·027
			±0·011			±0·009			±0·008			±0·014
South Aspect	1403	0	+0·039	1076	+ 11	+0·011	4570	+ 4	+0·048	4373	− 3	−0·014
	1435	− 3	+ ·089	1112	0	+ ·093	4662	+ 15	− ·148	4440	+ 10	− ·047
	1460	+ 11	+ ·027	1134	− 6	+ ·055	4672	+ 2	− ·009	4472	+ 6	− ·062
	1495	+ 5	+ ·073	1202	+ 6	+ ·032	4680	− 9	+ ·001	4492	− 12	− ·068
				1460	+ 11	+ ·018	4690	− 9	− ·079	4511	− 2	− ·075
				1495	+ 5	+ ·136	4698	− 10	− ·051	4523	− 2	− ·036
				1611	+ 3	+ ·103	4702	− 11	+ ·012	4532	0	− ·011
				1623	− 8	+ ·102	4721	+ 14	− ·003	4547	− 3	− ·036
							4766	+ 9	− ·051	4559	+ 11	− ·019
							4795	− 6	− ·037	4565	− 8	− ·041
							4837	− 10	+ ·038	4570	+ 4	− ·059
										4585	− 12	− ·055
										4645	− 1	− ·028
	Means ($C_S - H_S$)		+0·057			+0·069			−0·025			−0·042
			±0·010			±0·011			±0·011			±0·004

Between Captains Campbell and Heaviside.

Observed with Telescope No. 2.

By Stars of	At Bangalore			At Bombay					
	December 19th, 1876.			April 4th, 1877			April 5th, 1877		
	Star	Declination	Equation C − H	Star	Declination	Equation C − H	Star	Declination	Equation C − H
		°	s		°	s		°	s
North Aspect	1975	+ 23	+ 0·157	4107	+ 27	+ 0·141	4607	+ 50	+ 0·005
	2002	+ 23	+ ·130	4285	+ 40	+ ·052	4628	+ 35	+ ·041
	2028	+ 24	+ ·121	4364	+ 22	+ ·007	4652	+ 33	+ ·022
	2039	+ 21	+ ·201	4384	+ 36	+ ·140			
	2080	+ 21	+ ·119						
	2097	+ 28	+ ·105						
	2111	+ 16	+ ·215						
	2149	+ 17	+ ·144						
	2163	+ 16	+ ·131						
	2239	+ 39	+ ·213						
	2271	+ 18	+ ·109						
	Mean $(C_N - H_N)$		+ 0·150			+ 0·085			+ 0·023
			± 0·008			± 0·023			± 0·007
South Aspect	1945	+ 4	+ 0·019	4140	− 8	− 0·056	4423	+ 12	− 0·035
	1958	+ 15	+ ·158	4257	− 7	− ·135	4432	− 10	− ·023
	1990	+ 14	+ ·133	4277	− 1	− ·011	4440	+ 10	− ·009
	2057	+ 4	+ ·080	4292	+ 13	+ ·004	4472	+ 6	+ ·007
	2129	+ 14	+ ·047	4301	+ 15	− ·034	4492	− 12	·000
	2185	+ 10	+ ·006	4397	− 10	+ ·033	4499	+ 14	+ ·003
	2206	+ 13	+ ·053	4432	− 10	− ·070	4511	− 2	− ·029
	2216	+ 8	+ ·013	4440	+ 10	+ ·044	4523	− 2	+ ·016
	2255	+ 13	+ ·129				4532	0	− ·004
							4547	− 3	+ ·021
							4559	+ 11	− ·030
							4565	− 8	+ ·028
							4570	+ 4	− ·029
							4585	− 12	− ·010
							4672	+ 2	− ·027
							4680	− 9	+ ·065
	Mean $(C_S - H_S)$		+ 0·071			− 0·028			− 0·004
			± 0·013			± 0·014			± 0·005

TABLE X. DEDUCTION OF THE FINAL VALUES OF THE RELATIVE PERSONAL EQUATION

Between Captains Campbell and Heaviside.

Season	By Stars of North Aspect					By Stars of South Aspect				
	Astronomical Date	Telescope in use	Mean Value of Equation $C_N - H_N$	Combination Weight	General Mean $C_N - H_N$	Astronomical Date	Telescope in use	Mean Value of Equation $C_S - H_S$	Combination Weight	General Mean $C_S - H_S$
1875-76	1875 December 20	No. 1	+ $0^s{\cdot}057$	156		1875 December 20	No. 1	+ $0^s{\cdot}023$	156	
	„ 21	„ 2	·126	69		„ 21	„ 2	·059	204	
	„ 24*	„ 1	·157	51		„ 24*	„ 1	·078	83	
	„ 24*	„ 1	·115	83		„ 24*	„ 1	·040	69	
	„ 28	„ 2	·125	100		„ 28	„ 2	·040	59	
	1876 February 6*	No. 2	·169	21	+ $0^s{\cdot}099$	1876 February 6*	No. 2	·033	204	+ $0^s{\cdot}041$
	„ 6*	„ 2	·171	59		„ 6*	„ 2	·028	44	
	March 17	„ 1	·067	156		March 17	„ 1	·034	204	
	„ 18	„ 1	·119	83		„ 18	„ 1	·047	204	
	April 22	„ 1	·082	400		April 22	„ 1	·021	123	
	„ 23	„ 2	·178	31		„ 23	„ 2	·057	59	
1876-77	1876 December 15	No. 1	+ 0·124	38		1876 December 15	No. 1	+ 0·057	48	
	„ 18	„ 1	·125	56	+ 0·135	„ 18	„ 1	·069	38	+ 0·064
	„ 19	„ 2	·150	64		„ 19	„ 2	·071	28	
	1877 April 4	No. 2	+ 0·085	9		1877 April 4	No. 2	− 0·028	23	
	„ 5	„ 2	·023	93	+ 0·030	„ 5	„ 2	·004	222	− 0·026
	„ 7	„ 1	·052	65		„ 7	„ 1	·025	35	
	„ 9	„ 1	− ·027	23		„ 9	„ 1	·042	303	

* On these days two groups of observations were taken at different hours, the means of which are kept separate.

Final Values of the Equation adopted.

During the season 1875-76, the determinations were so fairly distributed over the whole period, that the means of all were accepted as the equations to be applied throughout the reductions of the observations: *viz.*,

$$C_N - H_N = + 0^s{\cdot}099, \text{ and } C_S - H_S = + 0^s{\cdot}041.$$

During the season 1876-77, all the land measurements were executed between the dates on which the equations were determined, and the arithmetical means were therefore adopted for the reductions: *viz.*,

$$C_N - H_N = + 0^s{\cdot}083, \text{ and } C_S - H_S = + 0^s{\cdot}019.$$

In these equations the general symbol, C — H, signifies a quantity which must be added to times observed by Captain Heaviside, before they are compared with those observed by Captain Campbell.

TABLE XI. ABSTRACT OF OBSERVED VALUES OF THE ABSOLUTE (N−S) EQUATIONS

Of Captains Campbell and Heaviside, Season 1876-77.

Arc Vizagapatam-Madras

Heaviside at Vizagapatam: Star	Equation N − S	Campbell at Madras: Star	Equation N − S
	s		s
2799	+0·009	2690	+0·033
	− ·010		+ ·094
	− ·010		+ ·026
	+ ·014		+ ·043
	+ ·055		+ ·127
	+ ·007		+ ·050
	+ ·018		+ ·123
2810	+ ·063		+ ·099
	− ·002	3062	+ ·188
	+ ·008		+ ·080
	− ·047		+ ·074
	+ ·018		+ ·084
	+ ·109		+ ·065
	+ ·059		+ ·049
3029	+ ·103		+ ·061
	+ ·038	3147	+ ·066
	+ ·048		+ ·063
	+ ·024		+ ·156
	− ·054		+ ·019
3062	− ·053		+ ·011
	+ ·015		+ ·096
	− ·010	General Mean	+0·077 ±0·007
	+ ·044		
	− ·042		
	− ·030		
3129	− ·029		
	+ ·074		
	− ·110		
	+ ·048		
	− ·055		
3147	+ ·018		
	− ·022		
	+ ·037		
	− ·067		
	+ ·001		
	+ ·002		
	+ ·080		
2639	+ ·064		
	+ ·023		
	+ ·054		
	+ ·039		
2664	+ ·036		
	− ·014		
	− ·033		
	+ ·032		
	+ ·051		
2816	+ ·017		
	+ ·034		
	− ·014		
	− ·008		
	+ ·072		
	·000		
2649	+ ·010		
	− ·020		
	+ ·050		
	+ ·080		
General Mean	+0·015 ±0·004		

Arc Vizagapatam-Bellary

Heaviside at Vizagapatam: Star	Equation N − S	Campbell at Bellary: Star	Equation N − S
	s		s
3062	−0·037	3029	+0·093
	+ ·038		+ ·063
	− ·038		+ ·071
	+ ·084		+ ·080
	− ·012	3147	+ ·090
3129	+ ·037		+ ·069
	− ·061		+ ·033
	+ ·034		+ ·144
	+ ·040		+ ·081
3147	+ ·069		− ·008
	+ ·074	3171	+ ·075
	+ ·111		+ ·078
	+ ·037		+ ·047
	+ ·047		+ ·014
	+ ·091		+ ·002
3443	+ ·031		− ·010
	− ·025	3404	+ ·022
	+ ·047		+ ·085
	+ ·058		+ ·025
	− ·023		+ ·042
3458	− ·019		+ ·067
	+ ·070	3443	+ ·044
	+ ·096		− ·032
	− ·043		+ ·066
	− ·055		+ ·061
3534	+ ·030		+ ·049
	+ ·050	3458	+ ·185
	+ ·074		+ ·072
	− ·008		+ ·061
3606	+ ·023		+ ·108
	− ·017		+ ·098
	+ ·035	3469	+ ·032
	+ ·112		+ ·005
3029	+ ·050		+ ·017
	+ ·095		+ ·006
	+ ·030		+ ·030
	+ ·003	3534	+ ·064
	+ ·009		+ ·042
3404	+ 123		+ ·060
	+ ·052		+ ·083
	+ ·003		+ ·015
	+ ·076	3606	+ ·047
	+ ·053		+ ·091
3469	− ·002		+ ·073
	+ ·035		+ ·037
	− ·065	3579	+ ·039
General Mean	+0·031 ±0·005		+ ·071
			+ ·055
		General Mean	+0·055 ±0·003

Arc Mangalore-Bombay

Heaviside at Mangalore: Star	Equation N − S	Campbell at Bombay: Star	Equation N − S
	s		s
4014	−0·012	3990	+0·053
	+ ·007		+ ·031
	+ ·012		+ ·053
4081	+ ·015	4241	+ ·036
	− ·025		+ ·093
	+ ·040	4242	+ ·010
	+ ·001		+ ·077
4351	− ·001	4248	+ ·029
	− ·022		+ ·083
	+ ·059		+ ·059
	− ·016		+ ·062
4423	+ ·069	4351	+ ·036
	+ ·087		+ ·052
	+ ·082		+ ·018
	+ ·100		+ ·051
4248	+ ·004	4081	+ ·065
	+ ·048		+ ·057
4301	+ ·013		+ ·050
General Mean	+0·026 ±0·006	4014	− ·045
		General Mean	+0·046 ±0·003

NOTE.—The symbol, N − S, signifies a quantity which must be added to the times observed for Stars of South Aspect, before they can be compared with those for Stars of North Aspect, by the same observer.

TABLE XII. OBSERVATIONS OF TRANSITS WITH LOCAL CLOCKS, AND DEDUCTION OF THE CORRECTED DIFFERENCE OF OBSERVED TIMES, M.

BOLARUM (E), *Lat.* 17° 30′, *Long.* 5h 14m 15s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 25s.

Astronomical Date	Star		Transits Observed at E — *By Campbell, with Telescope No.* 1					Transits Observed at W — *By Heaviside, with Telescope No.* 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$ $C_S - H_S = +0.041$	M
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	s				
Jan. 11	1907	+42 48	S	*I. P. E.*	5 52 13·73	+1·00	14·73	S	*I. P. E.*	5 51 58·88	+1·64	60·52	− 14·21				
	1925	+22 24	N	d c − 1·2	54 31·65	+0·96	32·61	N	d c − 0·8	54 16·66	+1·67	18·33	14·28				
	1937	+25 27	N	b − 1·1 a + 9·9	56 51·48	+0·95	52·43	N	b + 6·6 a − 3·4	56 36·42	+1·68	38·10	14·33	s −14·245	− 0·027	+ 0·060	−14·212
	1945	+ 4 10	S	s Q + 1·03	58 44·31	+1·03	45·34	S	s Q + 1·52	58 29·50	+1·63	31·13	14·21				
	1990	+14 14	S		6 5 12·52	+0·99	13·51	S		6 4 57·64	+1·65	59·29	14·22				
	2017	+12 18	S		9 48·00	+1·00	49·00	S		9 33·13	+1·65	34·78	14·22				
				Mean, T_E	5 59 34												
Jan. 11	2444	+11 55	S	*I. P. E.*	7 18 26·24	−1·07	25·17	S	*I. P. E.*	7 18 12·35	−1·40	10·95	− 14·22				
	2478	+12 16	S	d c − 1·2	23 14·92	−1·06	13·86	S	d c − 0·8	21 61·08	−1·40	59·68	14·18				
	2480	+ 2 11	S	b − 1·1 a + 9·9	24 60·65	−1·02	59·63	S	b + 6·6 a − 3·4	25 46·90	−1·42	45·48	14·15				
	2491	+ 3 38	S	s Q − 1·03	28 6·74	−1·03	5·71	S	s Q − 1·52	27 52·98	−1·42	51·56	14·15	s −14·203	− 0·027	+ 0·056	−14·174
	2503	+ 6 8	S		30 19·85	−1·04	18·81	S		30 6·01	−1·41	4·60	14·21				
	2537	+13 46	S		35 15·94	−1·08	14·86	S		35 2·14	−1·40	0·74	14·12				
	2555	+28 19	N		38 5·23	−1·14	4·09	N		37 51·19	−1·37	49·82	14·27				
	2586	+28 31	N		42 37·73	−1·14	36·59	N		42 23·64	−1·37	22·27	14·32				
				Mean, T_E	7 30 8												
Jan. 12	1945	+ 4 10	S	*I. P. W.*	5 58 45·20	+1·07	46·27	S	*I. P. W.*	5 58 34·36	−1·56	32·80	− 13·47				
	1958	+14 47	S	d c − 2·6	6 0 49·59	+1·05	50·64	S	d c − 1·5	6 0 38·69	−1·57	37·12	13·52				
	1975	+23 1	N	b + 2·6 a + 5·4	3 18·82	+1·03	19·85	N	b − 0·7 a + 3·2	3 7·87	−1·60	6·27	13·58	s −13·517	− 0·028	+ 0·060	−13·485
	1990	+14 14	S	s Q + 1·04	5 13·40	+1·05	14·45	S	s Q − 1·53	5 2·55	−1·57	0·98	13·47				
	2002	+22 33	N		7 43·80	+1·03	44·83	N		7 32·79	−1·58	31·21	13·62				
	2017	+12 18	S		9 48·89	+1·05	49·94	S		9 38·07	−1·57	36·50	13·44				
				Mean, T_E	6 4 16												
Jan. 12	2480	+ 2 11	S	*I. P. W.*	7 26 1·58	−1·01	0·57	S	*I. P. W.*	7 25 45·74	+1·51	47·25	− 13·32				
	2537	+13 46	S	d c − 2·6	35 16·89	−1·03	15·86	S	d c − 1·5	35 0·93	+1·50	2·43	13·43				
	2555	+28 19	N	b + 2·6 a + 5·4	38 6·20	−1·07	5·13	N	b − 0·7 a + 3·2	37 50·05	+1·48	51·53	13·60	s −13·472	− 0·028	+ 0·070	−13·430
	2564	+11 4	S	s Q − 1·04	39 48·90	−1·03	47·87	S	s Q + 1·54	39 33·00	+1·50	34·50	13·37				
	2586	+28 31	N		42 38·71	−1·07	37·64	N		42 22·58	+1·48	24·06	13·58				
	2605	+19 38	N		45 6·47	−1·04	5·43	N		44 50·41	+1·49	51·90	13·53				
				Mean, T_E	7 37 50												

Note. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

OF THE CORRECTED DIFFERENCE OF OBSERVED TIMES, M.

BOLARUM (E), *Lat.* 17° 30′, *Long.* 5h 14m 15s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 25s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	M
1876		° ′			h m s	s	s			h m s	s	s	s				
Jan. 13	1907	+12 48	S	*I. P. W.*	5 52 15·07	+1·74	16·81	S	*I. P. W.*	5 52 2·58	+1·57	4·15	− 12·66				
	1925	+22 24	N	d c − 1·4	54 32·99	+1·72	34·71	N	d c − 0·3	54 20·35	+1·55	21·90	12·81				
	1937	+25 27	N	b + 2·9 a + 5·9	56 52·80	+1·71	54·51	N	b + 1·8 a + 5·3	56 40·15	+1·55	41·70	12·81				
	1945	+ 4 10	S	s Q + 1·70	58 45·63	+1·76	47·39	S	s Q + 1·52	58 33·11	+1·59	34·70	12·69				
	1958	+14 47	S		6 0 50·02	+1·74	51·76	S		6 0 37·46	+1·57	39·03	12·73				
	1975	+23 1	N		3 19·31	+1·72	21·03	N		3 6·62	+1·55	8·17	12·86	s −12·768	− 0·030	+ 0·073	−12·725
	1990	+14 14	S		5 13·86	+1·74	15·60	S		5 1·32	+1·57	2·89	12·71				
	2002	+22 33	N		7 44·25	+1·72	45·97	N		7 31·56	+1·55	33·11	12·86				
	2017	+12 18	S		9 49·33	+1·74	51·07	S		9 36·82	+1·57	38·39	12·68				
	2029	+23 19	N		12 11·02	+1·72	12·74	N		11 58·33	+1·55	59·88	12·86				
	2047	+22 35	N		15 48·25	+1·72	49·97	N		15 35·64	+1·55	37·19	12·78				
				Mean, T_E	6 3 24												
Jan. 13	2460	+21 42	N	*I. P. W.*	7 20 46·96	−1·67	45·29	N	*I. P. W.*	7 20 33·94	−1·49	32·45	− 12·84				
	2473	+12 16	S	d c − 1·4	23 17·69	−1·65	16·04	S	d c − 0·3	23 4·82	−1·47	3·35	12·69				
	2480	+ 2 11	S	b + 2·9 a + 5·9	26 3·39	−1·64	1·75	S	b + 1·8 a + 5·3	25 50·60	−1·46	49·14	12·61				
	2491	+ 3 38	S	s Q − 1·70	28 9·48	−1·64	7·84	S	s Q − 1·52	27 56·67	−1·46	55·21	12·63				
	2555	+28 19	N		38 7·97	−1·69	6·28	N		37 54·98	−1·50	53·48	12·80	s −12·714	− 0·030	+ 0·067	−12·677
	2564	+11 4	S		39 50·69	−1·65	49·04	S		39 37·83	−1·47	36·36	12·68				
	2586	+28 31	N		42 40·43	−1·69	38·74	N		42 27·46	−1·50	25·96	12·78				
	2605	+19 38	N		45 8·26	−1·66	6·60	N		44 55·26	−1·48	53·78	12·82				
	2624	−14 32	S		46 60·26	−1·60	58·66	S		46 47·50	−1·42	46·08	12·58				
				Mean, T_E	7 34 34												
Jan. 16	2306	+11 8	S	*I. P. E.*	6 57 12·73	+1·62	14·35	S	*I. P. E.*	6 56 59·52	+1·60	61·12	− 13·23				
	2330	+16 8	S	d c − 4·2	7 1 42·28	+1·63	43·91	S	d c − 0·1	7 1 29·07	+1·58	30·65	13·26				
	2343	+27 4	N	b + 1·7 a − 4·1	4 12·13	−1·73	10·40	N	b + 1·5 a + 9·8	3 58·54	−1·54	57·00	13·40	s −13·288	− 0·030	+ 0·060	−13·258
	2373	+ 3 19	S	s Q ± 1·69*	8 20·44	−1·77	18·67	S	s Q ± 1·54*	8 6·93	−1·45	5·48	13·19				
	2398	+16 46	S		11 28·38	−1·75	26·63	S		11 14·82	−1·50	13·32	13·31				
	2410	+22 13	N		13 13·48	−1·74	11·74	N		12 59·91	−1·51	58·40	13·34				
				Mean, T_E	7 6 1												

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* The sign of *Q* was changed after the observation of star 2330.

TABLE XII. OBSERVATIONS OF TRANSITS WITH LOCAL CLOCKS, AND DEDUCTION OF THE CORRECTED DIFFERENCE OF OBSERVED TIMES, M.

BOLARUM (E), *Lat. 17° 30′, Long. 5h 14m 15s*: AND BOMBAY (W), *Lat. 18° 54′, Long. 4h 51m 25s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = + 0^s.099$, $C_S - H_S = + 0.041$	M
1876		° ′			h m s	s	s			h m s	s	s	s				
Jan. 18	2029	+ 23 19	N	*I. P. E.*	6 12 20·88	+ 1·83	22·71	N	*I. P. E.*	6 11 41·88	− 1·44	40·44	− 42·27				
	2080	+ 20 52	N	d c + 1·4	20 53·74	+ 1·83	55·57	N	d c + 0·5	20 14·71	− 1·42	13·29	42·28				
	2097	+ 28 17	N	b + 4·3 a + 0·5	23 3·27	+ 1·83	5·10	N	b + 6·5 a + 22·4	22 24·24	− 1·48	22·76	42·34				
	2111	+ 15 59	S	s Q + 1·69	24 59·99	+ 1·82	61·81	S	s Q − 1·57	24 21·01	− 1·38	19·63	42·18				
	2129	+ 14 15	S		27 4·13	+ 1·82	5·95	S		26 25·15	− 1·37	23·78	42·17				
	2163	+ 16 30	S		31 3·43	+ 1·82	5·25	S		30 24·39	− 1·39	23·00	42·25	s − 42·246	− 0·019	+ 0·070	− 42·195
	2170	+ 28 22	N		32 14·68	+ 1·83	16·51	N		31 35·73	− 1·49	34·24	42·27				
	2178	+ 28 19	N		34 2·79	+ 1·83	4·62	N		33 23·82	− 1·49	22·33	42·29				
	2185	+ 10 0	S		34 39·42	+ 1·82	41·24	S		33 60·42	− 1·33	59·09	42·15				
	2194	+ 25 15	N		36 48·90	+ 1·83	50·73	N		36 9·83	− 1·46	8·37	42·36				
	2206	+ 13 2	S		38 50·29	+ 1·82	52·11	S		38 11·24	− 1·36	9·88	42·23				
	2208	+ 12 49	S		39 26·85	+ 1·82	28·67	S		38 47·86	− 1·35	46·51	42·16				
				Mean, T_E	6 29 37												
Jan. 18	2564	+ 11 4	S	*I. P. E.*	7 39 60·74	− 1·56	59·18	S	*I. P. E.*	7 39 15·10	+ 1·81	16·91	− 42·27				
	2586	+ 28 31	N	d c + 1·4	42 50·46	− 1·54	48·92	N	d c + 0·5	42 4·99	+ 1·65	6·64	42·28				
	2605	+ 19 38	N	b + 4·3 a + 0·5	45 18·28	− 1·55	16·73	N	b + 6·5 a + 22·4	44 32·66	+ 1·73	34·39	42·34				
	2639	+ 16 7	S	s Q − 1·69	50 31·14	− 1·55	29·59	S	s Q + 1·58	49 45·59	+ 1·77	47·36	42·23				
	2664	+ 16 48	S		54 60·35	− 1·55	58·80	S		54 14·80	+ 1·76	16·56	42·24	s − 42·270	− 0·019	+ 0·058	− 42·231
	2672	+ 28 8	N		56 28·45	− 1·54	26·91	N		55 42·94	+ 1·66	44·60	42·31				
	2690	+ 13 28	S		58 44·12	− 1·55	42·57	S		57 58·51	+ 1·79	60·30	42·27				
	2720	+ 14 0	S		8 1 20·74	− 1·55	19·19	S		8 1 35·17	+ 1·78	36·95	42·24				
	2748	+ 14 22	S		5 60·02	− 1·55	58·47	S		5 14·43	+ 1·78	16·21	42·26				
	2761	+ 13 26	S		7 61·51	− 1·55	59·96	S		7 15·91	+ 1·79	17·70	42·26				
				Mean, T_E	7 54 25												
Jan. 19	2129	+ 14 15	S	*I. P. E.*	6 27 6·40	+ 1·78	8·18	S	*I. P. E.*	6 26 23·40	+ 1·92	25·32	− 42·86				
	2149	+ 16 54	S	d c + 0·4	29 24·07	+ 1·78	25·85	S	d c + 1·2	28 41·09	+ 1·91	43·00	42·85				
	2163	+ 16 30	S	b + 3·2 a − 2·2	31 5·65	+ 1·78	7·43	S	b + 8·3 a + 21·3	30 22·62	+ 1·91	24·53	42·90				
	2194	+ 25 15	N	s Q + 1·69	36 51·14	+ 1·79	52·93	N	s Q + 1·66	36 8·09	+ 1·84	9·93	43·00	s − 42·886	− 0·024	+ 0·049	− 42·861
	2206	+ 13 2	S		38 52·52	+ 1·77	54·29	S		38 9·45	+ 1·93	11·38	42·91				
	2208	+ 12 49	S		39 29·06	+ 1·78	30·84	S		38 46·06	+ 1·93	47·99	42·85				
	2216	+ 8 10	S		41 8·55	+ 1·76	10·31	S		40 25·52	+ 1·96	27·48	42·83				
				Mean, T_E	6 34 51												

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

OF THE CORRECTED DIFFERENCE OF OBSERVED TIMES, M.

BOLARUM (E), *Lat. 17° 30′, Long. 5h 14m 15s*: AND BOMBAY (W), *Lat. 18° 54′, Long. 4h 51m 25s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = + 0^s·099$, $C_S - H_S = + 0·041$	M
1876		° ′			h m s	s	s			h m s	s	s	s				
Jan. 19	2586	+ 28 31	N	*I. P. E.*	7 42 52·60	− 1·59	51·01	N	*I. P. E.*	7 42 9·60	− 1·52	8·08	− 42·93				
	2605	+ 19 38	N	d c + 0·4	45 20·42	− 1·60	18·82	N	d c + 1·2	44 37·29	− 1·46	35·83	42·99				
	2624	− 14 32	S	b + 3·2 a − 2·2	47 12·65	− 1·65	11·00	S	b + 8·3 a + 21·3	46 29·34	− 1·21	28·13	42·87				
	2639	+ 16 7	S	s Q − 1·69	50 33·34	− 1·61	31·73	S	s Q + 1·67	49 50·28	− 1·42	48·86	42·87				
	2664	+ 16 48	S		55 2·55	− 1·61	0·94	S		54 19·44	− 1·43	18·01	42·93				
	2672	+ 28 8	N		56 30·64	− 1·59	29·05	N		55 47·56	− 1·52	46·04	43·01				
	2690	+ 13 28	S		58 46·31	− 1·61	44·70	S		58 3·16	− 1·40	1·76	42·94	s − 42·916	− 0·024	+ 0·061	− 42·879
	2720	+ 14 0	S		8 2 22·91	− 1·61	21·30	S		8 1 39·85	− 1·41	38·44	42·86				
	2734	+ 32 51	N		4 28·78	− 1·58	27·20	N		3 45·85	− 1·56	44·29	42·91				
	2748	+ 14 22	S		6 2·18	− 1·61	0·57	S		5 19·11	− 1·41	17·70	42·87				
	2761	+ 13 26	S		8 3·67	− 1·61	2·06	S		7 20·61	− 1·40	19·21	42·85				
	2778	+ 9 34	S		10 23·68	− 1·62	22·06	S		9 40·53	− 1·38	39·15	42·91				
	2782	+ 9 15	S		11 25·03	− 1·62	23·41	S		10 41·85	− 1·38	40·47	42·94				
	2786	+ 27 37	N		13 8·39	− 1·59	6·80	N		12 25·36	− 1·51	23·85	42·95				
				Mean, T_E	7 59 27												
Jan. 20	2080	+ 20 52	N	*I. P. W.*	6 20 58·15	+ 1·64	59·79	N	*I. P. W.*	6 20 14·81	+ 1·64	16·45	− 43·34				
	2111	+ 15 59	S	d c − 7·3	25 4·34	+ 1·64	5·98	S	d c − 0·8	24 20·99	+ 1·69	22·68	43·30				
	2129	+ 14 15	S	b + 5·7 a − 1·0	27 8·51	+ 1·65	10·16	S	b + 0·9 a + 21·0	26 25·25	+ 1·70	26·95	43·21				
	2149	+ 16 54	S	s Q + 1·68	29 26·17	+ 1·64	27·81	S	s Q + 1·66	28 42·98	+ 1·68	44·66	43·15				
	2163	+ 16 30	S		31 7·78	+ 1·64	9·42	S		30 24·47	+ 1·68	26·15	43·27	s − 43·240	− 0·033	+ 0·064	− 43·209
	2170	+ 28 22	N		32 19·05	+ 1·64	20·69	N		31 35·78	+ 1·57	37·35	43·34				
	2178	+ 28 19	N		34 7·11	+ 1·64	8·75	N	'Q − 1·66	33 27·25	− 1·74	25·51	43·24				
	2194	+ 25 15	N		36 53·22	+ 1·64	54·86	N		36 13·38	− 1·71	11·67	43·19				
	2206	+ 13 2	S		38 54·62	+ 1·65	56·27	S		38 14·66	− 1·60	13·06	43·21				
	2255	+ 13 20	S	Q − 1·68	48 17·21	− 1·72	15·49	S		47 33·94	− 1·60	32·34	43·15				
				Mean, T_E	7 32 26												

NOTE. $1^d = 0^s·0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BOLARUM (E), *Lat.* 17° 30′, *Long.* 5ʰ 14ᵐ 15ˢ: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4ʰ 51ᵐ 25ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0.041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 16	2734	+32 51	N	I. P. E.	8 4 19·48	+1·65	21·13	N	I. P. E.	8 27 8·40	+1·51	9·91	22 48·78				
	2748	+14 22	S	d c − 4·2	5 52·88	+1·63	54·51	S	d c − 0·1	28 41·77	+1·58	43·35	48·84				
	2778	+ 9 34	S	b + 1·7 a − 4·1	10 14·37	+1·63	16·00	S	b + 1·5 a + 9·8	33 3·26	+1·60	4·86	48·86	m s 22 48·758	− 0·027	+ 0·076	22 48·807
	2786	+27 37	N	Q + 1ˢ·69	12 59·10	+1·64	60·74	N	Q + 1ˢ·53	35 47·90	+1·53	49·43	48·69				
	2793	+43 35	N		14 48·32	+1·67	49·99	N		37 37·17	+1·44	38·61	48·62				
Jan. 16	2833	+24 33	N	I. P. E.	8 21 46·14	−1·74	44·40	N	I. P. E.	8 44 34·68	−1·51	33·17	22 48·77				
	2862	+20 52	N	d c − 4·2	26 2·74	−1·74	1·00	N	d c − 0·1	48 51·30	−1·51	49·79	48·79	m s 22 48·800	− 0·027	+ 0·085	22 48·858
	2880	+20 1	N	b + 1·7 a − 4·1	28 42·22	−1·75	40·47	N	b + 1·5 a + 9·8	51 30·73	−1·49	29·24	48·77				
	2897	+10 5	S	Q − 1ˢ·69	30 52·74	−1·76	50·98	S	Q − 1ˢ·53	53 41·32	−1·47	39·85	48·87				
Jan. 17	2163	+16 30	S	I. P. E.	6 31 1·38	+1·58	2·96	S	I. P. E.	6 53 53·33	−1·45	51·88	22 48·92				
	2170	+28 22	N	d c − 5·4	32 12·68	+1·57	14·25	N	d c + 0·4	55 4·65	−1·50	3·15	48·90				
	2178	+28 18	N	b + 1·3 a + 0·6	34 0·74	+1·57	2·31	N	b + 3·1 a + 12·3	56 52·69	−1·51	51·18	48·87	m s 22 48·890	− 0·032	+ 0·064	22 48·922
	2206	+13 2	S	Q + 1ˢ·68	38 48·27	+1·58	49·85	S	Q − 1ˢ·55	7 1 40·15	−1·43	38·72	48·87				
	2216	+ 8 10	S		41 4·31	+1·58	5·89	S		3 56·20	−1·42	54·78	48·89				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BOLARUM (E), *Lat. 17° 30′, Long. 5h 14m 15s*: **AND BOMBAY (W),** *Lat. 18° 54′, Long. 4h 51m 25s.*

Astronomical Date	Star		Transits Observed at E — *By Campbell, with Telescope No. 1*					Transits Observed at W — *By Heaviside, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0.041$	$\Delta L - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 17	2239	+38 35	N	*I. P. E.*	6 45 12·19	+1·55	13·74	N	*I. P. E.*	7 8 1·08	+1·51	2·59	22 48·85				
	2280	+16 7	S	d: c − 5·4	53 15·31	−1·77	13·54	S	d: c + 0·4	16 0·74	+1·64	2·38	48·84	m s 22 48·848	− 0·032	+ 0·070	22 48·886
	2285	+16 15	S	b + 1·3, a + 0·6	53 40·23	−1·78	38·45	S	b + 3·1, a + 12·3	16 25·73	+1·64	27·37	48·92				
	2299	+24 23	N	Q ± 1·68 s †	55 23·59	−1·78	21·81	N	Q + 1·55 s	18 8·98	+1·61	10·59	48·78				
Jan. 21	2039	+21 15	N	*I. P. W.*	6 14 35·33	+1·73	37·06	N	*I. P. W.*	6 37 27·38	−1·61	25·77	22 48·71				
	2047	+22 35	N	d: c − 1·6	16 5·97	+1·74	7·71	N	d: c − 0·2	38 58·00	−1·62	56·38	48·67				
	2080	+20 52	N	b + 2·5, a − 8·2	21 1·59	+1·73	3·32	N	b + 3·2, a + 22·9	43 53·59	−1·61	51·98	48·66	m s 22 48·750	− 0·060	+ 0·080	22 48·770
	2090	+20 17	N	Q + 1·70 s	22 14·47	+1·73	16·20	N	Q − 1·66 s	45 6·54	−1·60	4·94	48·74				
	2111	+15 59	S		25 7·82	+1·72	9·54	S		47 59·93	−1·56	58·37	48·83				
	2129	+14 15	S		27 11·98	+1·71	13·69	S		50 4·14	−1·56	2·58	48·89				
Jan. 21	2163	+16 30	S	*I. P. W.*	6 31 11·24	+1·71	12·95	S	*I. P. W.*	6 54 0·06	+1·76	1·82	22 48·87				
	2170	+28 22	N	d: c − 1·6	32 22·53	+1·76	24·29	N	d: c − 0·2	55 11·39	+1·64	13·03	48·74				
	2178	+28 19	N	b + 2·5, a − 8·2	34 10·58	+1·76	12·34	N	b + 3·2, a + 22·9	56 59·40	+1·64	61·04	48·70				
	2185	+10 0	S	Q + 1·70 s	34 47·27	+1·70	48·97	S	Q + 1·66 s	57 36·05	+1·81	37·86	48·89	m s 22 48·771	− 0·060	+ 0·074	22 48·785
	2194	+25 15	N		36 56·74	+1·75	58·49	N		59 45·50	+1·68	47·18	48·69				
	2216	+ 8 10	S	Q − 1·70	41 17·64	−1·70	15·94	S		7 4 3·00	+1·83	4·83	48·89				
	2239	+38 35	N		45 25·36	−1·59	23·77	N		8 10·87	+1·52	12·39	48·62				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of *Q* was changed at E after the observation of star 2239.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BOLARUM (E), *Lat. 17° 30′, Long. 5h 14m 15s*: AND BOMBAY (W), *Lat. 18° 54′, Long. 4h 51m 25s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Campbell, with Telescope No. 1: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W, By Heaviside, with Telescope No. 2: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = + 0^s{\cdot}099$, $C_S - H_S = + 0{\cdot}041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 14	2306	+ 11 8	S	*I. P. E.*	6 34 6·83	+ 1·65	8·48	S	*I. P. E.*	6 56 55·74	+ 1·62	57·36	22 48·88	m s 22 48·838	− 0·024	+ 0·056	22 48·870
	2319	− 15 27	S	*d* c − 2·7	35 29·81	+ 1·66	31·47	S	*d* c − 0·7	58 18·66	+ 1·62	20·28	48·81				
	2330	+ 16 8	S	b + 1·3 *a* − 0·1	38 36·36	+ 1·66	38·02	S	b + 4·8 *a* + 1·2	7 1 25·28	+ 1·62	26·90	48·88				
	2343	+ 27 4	N	*s* Q + 1·69	41 2·83	+ 1·65	4·48	N	*s* Q + 1·52	3 51·64	+ 1·62	53·26	48·78				
Jan. 14	2359	+ 15 23	S	*I. P. E.*	6 43 5·01	+ 1·66	6·67	S	*I. P. E.*	7 5 56·81	− 1·42	55·39	22 48·72	m s 22 48·755	− 0·024	+ 0·056	22 48·787
	2398	+ 16 46	S	*d* c − 2·7	48 22·40	− 1·72	20·68	S	*d* c − 0·7	11 10·93	− 1·42	9·51	48·83				
	2410	+ 22 13	N	b + 1·3 *a* − 0·1	50 7·54	− 1·72	5·82	N	b + 4·8 *a* + 1·2	12 55·97	− 1·42	54·55	48·73				
	2444	+ 11 55	S	*s* Q ± 1·69†	55 29·27	− 1·72	27·55	S	*s* Q − 1·52	18 17·72	− 1·43	16·29	48·74				
Jan. 17	2555	+ 28 19	N	*I. P. E.*	7 14 45·64	− 1·79	43·85	N	*I. P. E.*	7 37 31·14	+ 1·58	32·72	22 48·87	m s 22 48·852	− 0·020	+ 0·070	22 48·902
	2564	+ 11 4	S	*d* c − 5·4	16 28·40	− 1·78	26·62	S	*d* c + 0·4	39 13·89	+ 1·65	15·54	48·92				
	2586	+ 28 31	N	b + 1·3 *a* + 0·6	19 18·22	− 1·78	16·44	N	b + 3·1 *a* + 12·3	42 3·71	+ 1·57	5·28	48·84				
	2605	+ 19 38	N	*s* Q − 1·68	21 45·96	− 1·78	44·18	N	*s* Q + 1·54	44 31·40	+ 1·62	33·02	48·84				
	2624	− 14 32	S		23 38·15	− 1·77	36·38	S		46 23·42	+ 1·77	25·19	48·81				
	2639	+ 16 7	S		26 58·85	− 1·77	57·08	S		49 44·28	+ 1·63	45·91	48·83				
Jan. 17	2664	+ 16 48	S	*I. P. E.*	7 31 24·70	+ 1·58	26·28	S	*I. P. E.*	7 54 16·61	− 1·44	15·17	22 48·89	m s 22 48·885	− 0·020	+ 0·060	22 48·925
	2672	+ 28 8	N	*d* c − 5·4	32 52·81	+ 1·57	54·38	N	*d* c + 0·4	55 44·73	− 1·49	43·24	48·86				
	2690	+ 13 28	S	b + 1·3 *a* + 0·6	35 8·44	+ 1·58	10·02	S	b + 3·1 *a* + 12·3	57 60·32	− 1·42	58·90	48·88				
	2720	+ 14 0	S	*s* Q + 1·68	38 45·08	+ 1·58	46·66	S	*s* Q − 1·54	8 1 37·01	− 1·44	35·57	48·91				
	2734	+ 32 51	N		40 51·04	+ 1·57	52·61	N		3 42·97	− 1·52	41·45	48·84				
	2761	+ 13 26	S		44 25·84	+ 1·58	27·42	S		7 17·78	− 1·43	16·35	48·93				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

† The sign of Q was changed at E after the observation of star 2359.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BOLARUM (E), *Lat.* 17° 30′, *Long.* $5^h\ 14^m\ 15^s$: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* $4^h\ 51^m\ 25^s$.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Campbell, with Telescope No. 1: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W, By Heaviside, with Telescope No. 2: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 20	2690	+13 28	S	I. P. W.	7 35 12·97	+1·65	14·62	S	I. P. W.	7 58 1·83	+1·72	3·55	22 48·93				
	2698	+13 51	S	d c − 7·3	35 40·38	+1·65	42·03	S	d c − 0·8	58 29·22	+1·70	30·92	48·89				
	2720	+14 0	S	b + 5·7 a − 1·0	38 49·55	+1·65	51·20	S	b + 0·9 a + 21·0	8 1 38·43	+1·70	40·13	48·93	m s 22 48·887	− 0·033	+ 0·051	22 48·905
	2734	+32 51	N	s Q + 1·69	40 55·50	+1·65	57·15	N	s Q + 1·66	3 44·43	+1·54	45·97	48·82				
	2748	+14 22	S		42 28·90	+1·65	30·55	S		5 17·67	+1·71	19·38	48·83				
	2761	+13 26	S		44 30·34	+1·65	31·99	S		7 19·20	+1·71	20·91	48·92				
Jan. 20	2778	+ 9 34	S	I. P. W.	7 46 50·34	+1·65	51·99	S	I. P. W.	8 9 42·42	−1·58	40·84	22 48·85				
	2786	+27 37	N	d c − 7·3	49 35·07	+1·64	36·71	N	d c − 0·8	12 27·32	−1·74	25·58	48·87	m s 22 48·830	− 0·033	+ 0·085	22 48·882
	2793	+43 35	N	b + 5·7 a − 1·0	51 24·31	+1·63	25·94	N	b + 0·9 a + 21·0	14 16·67	−1·93	14·74	48·80				
	2833	+24 33	N	s Q ± 1·69†	58 22·16	−1·73	20·43	N	s Q − 1·66	21 10·94	−1·71	9·23	48·80				
Jan. 21	2564	+11 4	S	I. P. W.	7 16 31·60	+1·70	33·30	S	I. P. W.	7 39 20·36	+1·80	22·16	22 48·86				
	2586	+28 31	N	d c − 1·6	19 21·31	+1·75	23·06	N	d c − 0·2	42 10·15	+1·64	11·79	48·73				
	2605	+19 38	N	b + 2·5 a − 8·2	21 49·12	+1·73	50·85	N	b + 3·2 a + 22·9	44 37·90	+1·73	39·63	48·78				
	2624	−14 32	S	s Q + 1·70	23 41·41	+1·61	43·02	S	s Q + 1·67	46 29·89	+2·02	31·91	48·89				
	2639	+16 7	S		27 2·01	+1·72	3·73	S		49 50·75	+1·77	52·52	48·79	m s 22 48·832	− 0·045	+ 0·060	22 48·847
	2649	+16 51	S		28 31·95	+1·72	33·67	S		51 20·83	+1·76	22·59	48·92				
	2664	+16 48	S		31 31·22	+1·72	32·94	S		54 20·08	+1·76	21·84	48·90				
	2672	+28 8	N		32 59·29	+1·76	61·05	N	Q − 1·67	55 51·48	−1·69	49·79	48·74				
	2690	+13 28	S		35 14·98	+1·71	16·69	S		58 7·12	−1·55	5·57	48·88				
Jan. 21	2720	+14 0	S	I. P. W.	7 38 54·96	−1·69	53·27	S	I. P. W.	8 1 43·74	−1·54	42·20	22 48·93				
	2734	+32 51	N	d c − 1·6	40 60·85	−1·62	59·23	N	d c − 0·2	3 49·78	−1·74	48·04	48·81				
	2748	+14 22	S	b + 2·5 a − 8·2	42 34·26	−1·69	32·57	S	b + 3·2 a + 22·9	5 22·98	−1·56	21·42	48·85	m s 22 48·852	− 0·045	+ 0·060	22 48·867
	2761	+13 26	S	s Q − 1·70	44 35·74	−1·69	34·05	S	s Q − 1·67	7 24·49	−1·54	22·95	48·90				
	2778	+ 9 34	S		46 55·77	−1·71	54·06	S		9 44·45	−1·52	42·93	48·87				
	2793	+43 35	N		51 29·63	−1·57	28·06	N		14 18·69	−1·88	16·81	48·75				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at E after the observation of star 2793.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, ΔL—ρ.*

BELLARY (E), *Lat. 15° 9′, Long. 5h 7m 52s*: AND BOMBAY (W), *Lat. 18° 54′, Long. 4h 51m 25s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Peral. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	ΔL − ρ
1876		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 28	2343	+27 4	N	I. P. E.	7 3 34·56	+1·77	36·33	N	I. P. E.	7 20 4·91	−1·65	3·26	16 26·93				
	2358	− 0 17	S	d c − 0·6	5 24·29	+1·97	26·26	S	d c + 0·5	21 54·85	−1·58	53·27	27·01				
	2382	− 0 3	S	b + 0·9 a + 19·3	8 51·05	+1·97	53·02	S	b + 0·4 a + 6·7	25 21·55	−1·58	19·97	26·95				
	2410	+22 13	N	s Q + 1·86	12 35·90	+1·81	37·71	N	s Q − 1·65	29 6·20	−1·64	4·56	26·85	m s 16 26·876	− 0·003	+ 0·085	16 26·958
	2416	+37 0	N		13 38·84	+1·67	40·51	N		30 9·02	−1·69	7·33	26·82				
	2440	+27 53	N		16 43·59	+1·76	45·35	N		33 13·78	−1·66	12·12	26·77				
	2455	+21 47	N		19 23·45	+1·81	25·26	N		35 53·72	−1·64	52·08	26·82				
	2460	+21 42	N		20 15·62	+1·81	17·43	N		36 45·93	−1·64	44·29	26·86				
Jan. 28	2473	+12 16	S	I. P. E.	7 22 46·30	+1·88	48·18	S	I. P. E.	7 39 13·37	+1·69	15·06	16 26·88				
	2480	+ 2 11	S	d c − 0·6	25 35·64	−1·76	33·88	S	d c + 0·5	41 59·15	+1·71	60·86	26·98				
	2487	+ 3 33	S	b + 0·9 a + 19·3	26 37·81	−1·77	36·04	S	b + 0·4 a + 6·7	43 1·27	+1·71	2·98	26·94				
	2491	+ 3 38	S	s Q ± 1·86†	27 41·73	−1·77	39·96	S	s Q + 1·65	44 5·22	+1·71	6·93	26·97				
	2506	+24 38	N		30 40·85	−1·92	38·93	N		47 4·15	+1·65	5·80	26·87				
	2514	+24 30	N		31 39·17	−1·92	37·25	N		48 2·43	+1·66	4·09	26·84	m s 16 26·915	− 0·003	+ 0·057	16 26·969
	2522	+ 5 33	S		32 44·77	−1·78	42·99	S		49 8·22	+1·70	9·92	26·93				
	2526	+ 5 31	S		33 28·04	−1·78	26·26	S		49 51·50	+1·70	53·20	26·94				
	2537	+13 46	S		34 51·05	−1·84	49·21	S		51 14·48	+1·68	16·16	26·95				
	2555	+28 19	N		37 40·44	−1·96	38·48	N		54 3·66	+1·65	5·31	26·83				
	2564	+11 4	S		39 23·02	−1·82	21·20	S		55 46·45	+1·69	48·14	26·94				
Jan. 29	2833	+24 33	N	I. P. W.	8 21 9·25	+1·61	10·86	N	I. P. W.	8 37 35·93	+1·74	37·67	16 26·81				
	2840	+24 45	N	d c − 4·0	22 12·12	+1·61	13·73	N	d c − 0·4	38 38·79	+1·74	40·53	26·80				
	2850	+24 30	N	b − 2·6 a + 22·7	24 4·16	+1·61	5·77	N	b + 4·2 a + 12·9	40 30·91	+1·74	32·65	26·88				
	2862	+20 52	N	s Q + 1·86	25 25·72	+1·65	27·37	N	s Q + 1·68	41 52·49	+1·76	54·25	26·88				
	2880	+20 1	N		28 5·22	+1·65	6·87	N		44 31·96	+1·76	33·72	26·85				
	2897	+10 5	S		30 15·61	+1·76	17·37	S		46 42·49	+1·81	44·30	26·93	m s 16 26·883	− 0·003	+ 0·083	16 26·963
	2931	+20 19	N		34 36·21	+1·65	37·86	N		51 2·93	+1·76	4·69	26·83				
	2945	+ 3 51	S		36 37·67	+1·81	39·48	S		53 4·58	+1·84	6·42	26·94				
	2965	+29 13	N		39 3·48	+1·55	5·03	N		55 30·21	+1·72	31·93	26·90				
	2965	+29 13	N		39 5·29	+1·55	6·84	N		55 32·07	+1·71	33·78	26·94				
	2971	+ 6 52	S		40 5·61	+1·78	7·39	S		56 32·52	+1·82	34·34	26·95				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of *Q* was changed at E after the observation of star 2473.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BELLARY (E), *Lat.* 15° 9′, *Long.* 5h 7m 52s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 25s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 29	2987	− 2 59	S	*I. P. W.*	8 43 4·49	−1·84	2·65	S	*I. P. W.*	8 59 31·11	−1·49	29·62	16 26·97				
	3062	+13 33	S	d c − 4·0	52 34·81	−1·99	32·82	S	d c − 0·4	9 8 61·30	−1·56	59·74	26·92	m s 16 26·893	− 0·003	+ 0·060	16 26·950
	3088	+28 23	N	b − 2·6 a + 22·7	56 43·86	−2·16	41·70	N	b + 4·2 a + 12·9	13 10·12	−1·63	8·49	26·79				
				s Q − 1·86					s Q − 1·68								
Jan. 30	2358	− 0 17	S	*I. P. W.*	7 5 24·98	+1·82	26·80	S	*I. P. W.*	7 21 52·07	+1·76	53·83	16 27·03				
	2366	− 0 3	S	d c − 5·2	6 50·91	+1·82	52·73	S	d c 0·0	23 18 00	+1·76	19·76	27·03				
	2382	− 0 3	S	b − 2·9 a + 21·7	8 51·70	+1·82	53·52	S	b + 0·2 a + 17·8	25 18·83	+1·76	20·59	27·07				
	2410	+22 13	N	s Q + 1·87	12 36·54	+1·60	38·14	N	s Q + 1·63	29 3·48	+1·61	5·09	26·95				
	2416	+37 0	N		13 39·46	+1·42	40·88	N		30 6·31	+1·47	7·78	26·90	m s 16 26·969	+ 0·003	+ 0·080	16 27·052
	2440	+27 53	N		16 44·17	+1·55	45·72	N		33 11·09	+1·56	12·65	26·93				
	2442	+28 3	N		17 55·15	+1·54	56·69	N		34 22·07	+1·56	23·63	26·94				
	2455	+21 47	N		19 24·11	+1·61	25·72	N		35 51·02	+1·61	52·63	26·91				
	2460	+21 42	N		20 16·22	+1·61	17·83	N		36 43·18	+1·61	44·79	26·96				
Jan. 30	2473	+12 16	S	*I. P. W.*	7 22 46·91	+1·71	48·62	S	*I. P. W.*	7 39 17·14	−1·57	15·57	16 26·95				
	2480	+ 2 11	S	d c − 5·2	25 36·30	−1·94	34·36	S	d c 0·0	42 2·94	−1·51	1·43	27·07				
	2487	+ 3 33	S	b − 2·9 a + 21·7	26 38·47	−1·95	36·52	S	b + 0·2 a + 17·8	43 5·11	−1·51	3·60	27·08				
	2491	+ 3 38	S	s Q ± 1·87†	27 42·37	−1·95	40·42	S	s Q − 1·63	44 9·02	−1·51	7·51	27·09				
	2506	+24 38	N		30 41·50	−2·15	39·35	N		47 7·92	−1·66	6·26	26·91				
	2514	+24 30	N		31 39·80	−2·15	37·65	N		48 6·25	−1·66	4·59	26·94	m s 16 27·004	+ 0·003	+ 0·057	16 27·064
	2522	+ 5 33	S		32 45·39	−1·97	43·42	S		49 11·99	−1·53	10·46	27·04				
	2526	+ 5 31	S		33 28·71	−1·97	26·74	S		49 55·29	−1·53	53·76	27·02				
	2537	+13 46	S		34 51·69	−2·04	49·65	S		51 18·24	−1·58	16·66	27·01				
	2555	+28 19	N		37 41·13	−2·20	38·93	N		54 7·50	−1·69	5·81	26·88				
	2564	+11 4	S		39 23·65	−2·01	21·64	S		55 50·25	−1·56	48·69	27·05				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at E after the observation of star 2473.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BELLARY (E), *Lat.* 15° 9′, *Long.* $5^h\ 7^m\ 52^s$: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* $4^h\ 51^m\ 25^s$.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = + 0^s{\cdot}099$, $C_S - H_S = + 0{\cdot}041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 8	2487	+ 3 33	S	*I. P. E.*	7 26 27·76	+ 2·08	29·84	S	*I. P. E.*	7 42 55·12	+ 1·58	56·70	16 26·86				
	2491	+ 3 38	S	d c + 0·1	27 31·71	+ 2·08	33·79	S	d c − 0·6	43 59·06	+ 1·58	60·64	26·85				
	2506	+ 24 38	N	b + 4·9 a + 19·4	30 30·74	+ 1·92	32·66	N	b − 1·5 a + 7·9	46 58·00	+ 1·50	59·50	26·84				
	2514	+ 24 30	N	s Q + 1·88	31 29·09	+ 1·92	31·01	N	s Q + 1·57	47 56·28	+ 1·50	57·78	26·77	m s 16 26·811	+ 0·010	+ 0·066	16 26·887
	2522	+ 5 33	S		32 34·75	+ 2·06	36·81	S		49 2·00	+ 1·57	3·57	26·76				
	2526	+ 5 31	S		33 18·02	+ 2·06	20·08	S		49 45·35	+ 1·57	46·92	26·84				
	2555	+ 28 19	N	Q − 1·88	37 34·12	− 1·87	32·25	N		53 57·52	+ 1·49	59·01	26·76				
Feb. 9	2343	+ 27 4	N	*I. P. E.*	7 3 27·29	+ 1·83	29·12	N	*I. P. E.*	7 19 54·40	+ 1·54	55·94	16 26·82				
	2358	− 0 17	S	d c + 1·2	5 17·01	+ 2·10	19·11	S	d c + 0·4	21 44·20	+ 1·66	45·86	26·75				
	2366	− 0 3	S	b + 1·9 a + 25·6	6 42·92	+ 2·10	45·02	S	b − 0·9 a + 10·9	23 10·11	+ 1·66	11·77	26·75				
	2382	− 0 3	S	s Q + 1·88	8 43·73	+ 2·10	45·83	S	s Q + 1·59	25 10·99	+ 1·66	12·65	26·82				
	2410	+ 22 13	N		12 28·63	+ 1·87	30·50	N		28 55·65	+ 1·56	57·21	26·71	m s 16 26·743	+ 0·011	+ 0·082	16 26·836
	2416	+ 37 0	N		13 31·53	+ 1·69	33·22	N		29 58·45	+ 1·48	59·93	26·71				
	2440	+ 27 53	N		16 36·26	+ 1·82	38·08	N		33 3·29	+ 1·54	4·83	26·75				
	2442	+ 28 3	N		17 47·28	+ 1·80	49·08	N		34 14·23	+ 1·54	15·77	26·69				
	2455	+ 21 47	N		19 16·14	+ 1·88	18·02	N		35 43·16	+ 1·56	44·72	26·70				
	2460	+ 21 42	N		20 8·32	+ 1·88	10·20	N		36 35·36	+ 1·57	36·93	26·73				
Feb. 9	2473	+ 12 16	S	*I. P. E.*	7 22 39·01	+ 1·98	40·99	S	*I. P. E.*	7 39 9·32	− 1·57	7·75	16 26·76				
	2480	+ 2 11	S	d c + 1·2	25 28·43	− 1·68	26·75	S	d c + 0·4	41 55·05	− 1·53	53·52	26·77				
	2487	+ 3 33	S	b + 1·9 a + 25·6	26 30·58	− 1·69	28·89	S	b − 0·9 a + 10·9	42 57·18	− 1·53	55·65	26·76				
	2491	+ 3 38	S	s Q ± 1·88†	27 34·51	− 1·69	32·82	S	s Q − 1·59	43 61·12	− 1·53	59·59	26·77				
	2506	+ 24 38	N		30 33·61	− 1·90	31·71	N		46 59·99	− 1·63	58·36	26·65	m s 16 26·726	+ 0·011	+ 0·060	16 26·797
	2514	+ 24 30	N		31 31·92	− 1·90	30·02	N		47 58·31	− 1·63	56·68	26·66				
	2526	+ 5 31	S		33 20·82	− 1·71	19·11	S		49 47·45	− 1·54	45·91	26·80				
	2537	+ 13 46	S		34 43·78	− 1·79	41·99	S		51 10·35	− 1·58	8·77	26·78				
	2555	+ 28 19	N		37 53·25	− 1·95	31·30	N		53 59·53	− 1·65	57·88	26·58				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at E after the observation of star 2473.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BELLARY (E), *Lat. 15° 9′, Long.* $5^h\ 7^m\ 52^s$: AND BOMBAY (W), *Lat. 18° 54′, Long.* $4^h\ 51^m\ 25^s$.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Campbell, with Telescope No. 1: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W, By Heaviside, with Telescope No. 2: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s·099$, $C_S - H_S = +0·041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 10	2410	+22 13	N	*I. P. W.*	7 11 43·99	+1·82	45·81	N	*I. P. W.*	7 28 14·10	−1·56	12·54	16 26·73				
	2410½†	+22 13	N	d c − 3·4 b + 1·3 a + 2·2	12 27·79	+1·83	29·62	N	d c − 1·1 b + 2·2 a + 13·2	28 57·94	−1·56	56·38	26·76				
	2416	+37 0	N		13 30·59	+1·81	32·40	N		29 60·76	−1·65	59·11	26·71				
	2440	+27 53	N	s Q + 1·89	16 35·39	+1·82	37·21	N	s Q − 1·57	33 5·52	−1·59	3·93	26·72	m s 16 26·752	+ 0·009	+ 0·099	16 26·860
	2442	+28 3	N		17 46·36	+1·82	48·18	N		34 16·57	−1·59	14·98	26·80				
	2460	+21 42	N		20 7·51	+1·82	9·33	N		36 37·68	−1·56	36·12	26·79				
Feb. 10	2473	+12 16	S	*I. P. W.*	7 22 38·20	+1·84	40·04	S	*I. P. W.*	7 39 5·31	+1·62	6·93	16 26·89				
	2480	+ 2 11	S	d c − 3·4 b + 1·3 a + 2·2	25 27·72	−1·93	25·79	S	d c − 1·1 b + 2·2 a + 13·2	41 51·08	+1·67	52·75	26·96				
	2487	+ 3 33	S		26 29·89	−1·92	27·97	S		42 53·25	+1·67	54·92	26·95				
	2491	+ 3 38	S	s Q ± 1·89‡	27 33·82	−1·93	31·89	S	s Q + 1·57	43 57·18	+1·67	58·85	26·96				
	2506	+24 38	N		30 32·77	−1·95	30·82	N		46 56·02	+1·56	57·58	26·76	m s 16 26·866	+ 0·009	+ 0·060	16 26·935
	2514	+24 30	N		31 31·08	−1·95	29·13	N		47 54·32	+1·56	55·88	26·75				
	2526	+ 5 31	S		33 20·12	−1·92	18·20	S		49 43·44	+1·66	45·10	26·90				
	2537	+13 46	S		34 43·04	−1·93	41·11	S		51 6·35	+1·62	7·97	26·86				
	2555	+28 19	N		37 32·35	−1·95	30·40	N		53 55·62	+1·54	57·16	26·76				

NOTE. $1^d = 0^s·0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue. ‡ The sign of *Q* was changed at E after the observation of star 2473.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BELLARY (E), *Lat.* 15° 9′, *Long.* 5h 7m 52s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 25s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Peral. Equations $C_N - H_N = + 0^s.099$, $C_S - H_S = + 0.041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 28	2833	+24 33	N	I. P. E.	8 5 25·42	+1·81	27·23	N	I. P. E.	8 21 52·36	+1·66	54·02	16 26·79				
	2862	+20 52	N	d c − 0·6	9 41·96	+1·84	43·80	N	d c + 0·5	26 8·97	+1·67	10·64	26·84				
	2880	+20 1	N	b + 1·8	12 21·40	+1·85	23·25	N	b + 0·4	28 48·46	+1·68	50·14	26·89				
	2897	+10 5	S	a + 19·3	14 31·82	+1·93	33·75	S	a + 6·7	30 58·99	+1·70	60·69	26·94				
	2913	+20 13	N	s Q + 1·86	16 44·84	+1·84	46·68	N	s Q + 1·66	33 11·93	+1·68	13·61	26·93	m s 16 26·892	− 0·029	+ 0·080	16 26·943
	2945	+ 3 51	S		20 53·88	+1·96	55·84	S		37 21·07	+1·72	22·79	26·95				
	2965	+29 13	N		23 19·69	+1·78	21·47	N		39 46·75	+1·65	48·40	26·93				
	2965½†	+29 13	N		23 21·54	+1·78	23·32	N		39 48·49	+1·65	50·14	26·82				
	2971	+ 6 52	S		24 21·86	+1·94	23·80	S		40 49·03	+1·71	50·74	26·94				
Jan. 28	2987	− 2 59	S	I. P. E.	8 27 20·64	−1·70	18·94	S	I. P. E.	8 43 47·59	−1·58	46·01	16 27·07				
	3062	+13 33	S	d c − 0·6	36 50·98	−1·82	49·16	S	d c + 0·5	53 17·83	−1·63	16·20	27·04				
	3088	+28 23	N	b + 1·8, a + 19·3	40 60·08	−1·94	58·14	N	b + 0·4, a + 6·7	57 26·66	−1·66	25·00	26·86	m s 16 26·970	− 0·029	+ 0·070	16 27·011
	3100	+38 46	N	s Q − 1·86	43 9·77	−2·04	7·73	N	s Q − 1·66	59 36·34	−1·70	34·64	26·91				
Jan. 29	2343	+27 4	N	I. P. W.	6 47 53·96	+1·58	55·54	N	I. P. W.	7 4 24·11	−1·63	22·48	16 26·94				
	2358	− 0 17	S	d c − 4·0	49 43·66	+1·86	45·52	S	d c − 0·4	6 13·94	−1·50	12·44	26·92				
	2366	− 0 3	S	b − 2·0	51 9·59	+1·86	11·45	S	b + 4·2	7 39·92	−1·51	38·41	26·96				
	2382	− 0 3	S	a + 22·7	53 10·40	+1·86	12·26	S	a + 12·9	9 40·71	−1·51	39·20	26·94	m s 16 26·907	− 0·029	+ 0·074	16 26·952
	2410	+22 13	N	s Q + 1·86	56 55·28	+1·64	56·92	N	s Q − 1·68	13 25·41	−1·61	23·80	26·88				
	2416	+37 0	N		57 58·19	+1·45	59·64	N		14 28·15	−1·69	26·46	26·82				
	2442	+28 3	N		7 2 13·92	+1·57	15·49	N		18 44·01	−1·63	42·38	26·89				
Jan. 29	2473	+12 16	S	I. P. W.	7 7 9·36	−1·96	7·40	S	I. P. W.	7 23 35·81	−1·56	34·25	16 26·85				
	2480	+ 2 11	S	d c − 4·0	9 55·06	−1·88	53·18	S	d c − 0·4	26 18·31	+1·84	20·15	26·97				
	2487	+ 3 33	S	b − 2·0, a + 22·7	10 57·24	−1·89	55·35	S	b + 4·2, a + 12·9	27 20·43	+1·85	22·28	26·93				
	2491	+ 3 38	S	s Q − 1·86	11 61·12	−1·89	59·23	S	s Q ∓ 1·68‡	28 24·33	+1·84	26·17	26·94				
	2506	+24 38	N		14 60·25	−2·09	58·16	N		31 23·20	+1·75	24·95	26·79				
	2514	+24 30	N		15 58·56	−2·09	56·47	N		32 21·56	+1·74	23·30	26·83	m s 16 26·889	− 0·029	+ 0·057	16 26·917
	2522	+ 5 33	S		17 4·11	−1·90	2·21	S		33 27·22	+1·83	29·05	26·84				
	2526	+ 5 31	S		17 47·40	−1·90	45·50	S		34 10·63	+1·83	12·46	26·96				
	2537	+13 46	S		19 10·43	−1·99	8·44	S		35 33·56	+1·80	35·36	26·92				
	2555	+28 19	N		21 59·84	−2·14	57·70	N		38 22·80	+1·73	24·53	26·83				
	2564	+11 4	S		23 42·39	−1·95	40·44	S		40 5·55	+1·81	7·36	26·92				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person. * ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue. ‡ The sign of Q was changed at W after the observation of star 2473.

BELLARY (E), *Lat.* 15° 9′, *Long.* 5ʰ 7ᵐ 52ˢ: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4ʰ 51ᵐ 25ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Peral. Equations $C_N - H_N = + 0^s{\cdot}099$, $C_S - H_S = + 0^s{\cdot}041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 30	2833	+ 24 33	N	*I. P. W.*	8 5 30·62	+ 1·60	32·22	N	*I. P. W.*	8 21 57·63	+ 1·58	59·21	16 26·99				
	2840	+ 24 45	N	d; c − 5·2	6 33·48	+ 1·60	35·08	N	d; c 0·0	23 0·53	+ 1·57	2·10	27·02				
	2850	+ 24 30	N	b − 2·4; a + 21·7	8 25·58	+ 1·60	27·18	N	b + 0·2; a + 17·8	24 52·65	+ 1·57	54·22	27·04				
	2862	+ 20 52	N	s; Q + 1·88	9 47·13	+ 1·65	48·78	N	s; Q + 1·61	26 14·24	+ 1·61	15·85	27·07				
	2897	+ 10 5	S		14 37·03	+ 1·75	38·78	S		31 4·23	+ 1·67	5·90	27·12				
	2918	+ 20 13	N		16 50·07	+ 1·65	51·72	N		33 17·09	+ 1·61	18·70	26·98	m s 16 27·046	− 0·029	+ 0·084	16 27·101
	2919	+ 20 6	N		17 29·88	+ 1·66	31·54	N		33 56·90	+ 1·61	58·51	26·97				
	2925	+ 20 1	N		18 4·41	+ 1·66	6·07	N		34 31·50	+ 1·60	33·10	27·03				
	2945	+ 3 51	S		20 59·07	+ 1·81	60·88	S		37 26·32	+ 1·72	28·04	27·16				
	2965	+ 29 13	N		23 24·86	+ 1·54	26·40	N		39 51·93	+ 1·54	53·47	27·07				
	2965½†	+ 29 13	N		23 26·70	+ 1·54	28·24	N		39 53·74	+ 1·53	55·27	27·03				
	2971	+ 6 52	S		24 27·05	+ 1·78	28·83	S		40 54·19	+ 1·71	55·90	27·07				
Jan. 30	2987	− 2 59	S	*I. P. W.*	8 27 25·96	− 1·90	24·06	S	*I. P. W.*	8 43 52·73	− 1·46	51·27	16 27·21				
	3062	+ 13 33	S	d; c − 5·2	36 56·27	− 2·03	54·24	S	d; c 0·0	53 22·93	− 1·57	21·36	27·12	m s 16 27·085	− 0·029	+ 0·070	16 27·126
	3088	+ 28 23	N	b − 2·4; a + 21·7	41 5·28	− 2·20	3·08	N	b + 0·2; a + 17·8	57 31·81	− 1·67	30·14	27·06				
	3100	+ 38 46	N	s; Q − 1·88	43 15·04	− 2·34	12·70	N	s; Q − 1·61	59 41·42	− 1·77	39·65	26·95				
Feb. 9	2833	+ 24 33	N	*I. P. E.*	8 5 0·57	+ 1·85	2·42	N	*I. P. E.*	8 21 27·87	+ 1·55	29·42	16 27·00				
	2840	+ 24 45	N	d; c + 1·2	6 3·45	+ 1·85	5·30	N	d; c + 0·4	22 30·70	+ 1·55	32·25	26·95				
	2850	+ 24 30	N	b + 1·8; a + 25·6	7 55·58	+ 1·85	57·43	N	b − 0·9; a + 10·9	24 22·73	+ 1·54	24·27	26·84				
	2862	+ 20 52	N	s; Q + 1·88	9 17·17	+ 1·89	19·06	N	s; Q + 1·59	25 44·42	+ 1·56	45·98	26·92				
	2880	+ 20 1	N		11 56·65	+ 1·90	58·55	N		28 23·86	+ 1·57	25·43	26·88				
	2897	+ 10 5	S		14 7·04	+ 1·99	9·03	S		30 34·36	+ 1·61	35·97	26·94	m s 16 26·896	+ 0·004	+ 0·087	16 26·987
	2913	+ 20 13	N		16 20·09	+ 1·90	21·99	N		32 47·31	+ 1·57	48 88	26·89				
	2919	+ 20 6	N		16 59·88	+ 1·90	61·78	N		33 27·08	+ 1·57	28·65	26·87				
	2931	+ 20 19	N		18 27·65	+ 1·90	29·55	N		34 54·79	+ 1·57	56·36	26·81				
	2945	+ 3 51	S		20 29·08	+ 2·05	31·13	S		36 56·34	+ 1·65	57·99	26·86				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BELLARY (E), *Lat.* 15° 9′, *Long.* $5^h\ 7^m\ 52^s$: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* $4^h\ 51^m\ 25^s$.

Astronomical Date	Star		Transits Observed at E, By Campbell, with Telescope No. 1					Transits Observed at W, By Heaviside, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 9	2965	+29 13	N	*I. P. E.*	8 22 58·67	−1·96	56·71	N	*I. P. E.*	8 39 25·20	−1·65	23·55	16 26·84				
	2965½†	+29 13	N	d c + 1·2	22 60·49	−1·96	58·53	N	d c + 0·4	39 27·07	−1·65	25·42	26·89				
	2971	+ 6 52	S	b + 1·8 a + 25·6	23 60·87	−1·73	59·14	S	b − 0·9 a + 10·9	40 27·59	−1·55	26·04	26·90				
	2978	+ 6 17	S	s Q − 1·88	25 40·19	−1·71	38·48	S	s Q − 1·59	42 6·96	−1·54	5·42	26·94				
	2987	− 2 59	S		26 56·01	−1·63	54·38	S		43 22·72	−1·51	21·21	26·83				
	2999	+32 56	N		28 43·98	−1·88	42·10	N		45 10·57	−1·67	8·90	26·80				
	3016	+31 3	N		30 29·69	−1·98	27·71	N		46 56·20	−1·66	54·54	26·83				
	3062	+13 33	S		36 26·28	−1·79	24·49	S		52 53·04	−1·58	51·46	26·97	m s 16 26·890	+ 0·004	+ 0·068	16 26·962
	3076	+ 6 8	S		38 46·78	−1·72	45·06	S		55 13·56	−1·54	12·02	26·96				
	3078	+ 6 9	S		39 4·69	−1·72	2·97	S		55 31·43	−1·54	29·89	26·92				
	3088	+28 23	N		40 35·31	−1·95	33·36	N		57 1·93	−1·65	0·28	26·92				
	3100	+38 46	N		42 45·02	−2·09	42·93	N		59 11·50	−1·71	9·79	26·86				
	3111	+11 10	S		44 50·27	−1·77	48·50	S		9 1 16·98	−1·57	15·41	26·91				
Feb. 10	2862	+20 52	N	*I. P. W.*	8 9 16·94	+1·82	18·76	N	*I. P. W.*	8 25 47·12	−1·55	45·57	16 26·81				
	2880	+20 1	N	d c − 3·4	11 56·48	+1·83	58·31	N	d c − 1·1	28 26·57	−1·55	25·02	26·71				
	2897	+10 5	S	b + 1·3 a + 2·2	14 6·94	+1·83	8·77	S	b + 2·2 a + 13·2	30 37·22	−1·49	35·73	26·96				
	2918	+20 13	N	s Q + 1·88	16 19·89	+1·83	21·72	N	s Q − 1·57	32 50·04	−1·55	48·49	26·77	m s 16 26·828	+ 0·004	+ 0·083	16 26·915
	2919	+20 6	N		16 59·68	+1·83	61·51	N		33 29·81	−1·55	28·26	26·75				
	2931	+20 19	N		18 27·40	+1·83	29·23	N		34 57·61	−1·55	56·06	26·83				
	2945	+ 3 51	S		20 28·99	+1·85	30·84	S		36 59·27	−1·46	57·81	26·97				

Note. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BELLARY (E), *Lat.* 15° 9′, *Long.* 5ʰ 7ᵐ 52ˢ: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4ʰ 51ᵐ 25ˢ.

Astronomical Date	Star		Transits Observed at E — *By Campbell, with Telescope No. 1*					Transits Observed at W — *By Heaviside, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = + 0^s{\cdot}099$, $C_S - H_S = + 0{\cdot}041$	$\Delta L + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 10	2965	+ 29 13	N	*I. P. W.*	8 22 58·35	− 1·95	56·40	N	*I. P. W.*	8 39 21·68	+ 1·54	23·22	16 26·82				
	2965½†	+ 29 13	N	d c − 3·4	22 60·21	− 1·95	58·26	N	d c − 1·1	39 23·51	+ 1·53	25·04	26·78				
	2971	+ 6 52	S	b + 1·3 *a* + 2·2	23 60·75	− 1·92	58·83	S	b + 2·2 *a* + 13·2	40 24·07	+ 1·65	25·72	26·89				
	2978	+ 6 17	S	s Q − 1·88	25 40·07	− 1·92	38·15	S	s Q + 1·57	42 3·42	+ 1·65	5·07	26·92				
	2987	− 2 59	S		26 55·90	− 1·91	53·99	S		43 19·28	+ 1·70	20·98	26·99				
	2999	+ 32 56	N		28 43·64	− 1·95	41·69	N		45 6·95	+ 1·52	8·47	26·78				
	3016	+ 31 3	N		30 29·36	− 1·96	27·40	N		46 52·66	+ 1·53	54·19	26·79	m s 16 26·859	+ 0·004	+ 0·068	16 26·931
	3062	+ 13 33	S		36 26·11	− 1·93	24·18	S		52 49·46	+ 1·62	51·08	26·90				
	3076	+ 6 8	S		38 46·64	− 1·92	44·72	S		55 10·02	+ 1·65	11·67	26·95				
	3078	+ 6 9	S		39 4·53	− 1·92	2·61	S		55 27·92	+ 1·65	29·57	26·96				
	3088	+ 28 23	N		40 35·03	− 1·95	33·08	N		56 58·34	+ 1·54	59·88	26·80				
	3100	+ 38 46	N		42 44·70	− 1·98	42·72	N		59 7·98	+ 1·46	9·44	26·72				
	3111	+ 11 10	S		44 50·10	− 1·93	48·17	S		9 1 13·41	+ 1·63	15·04	26·87				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BOLARUM (E), *Lat.* 17° 30′, *Long.* $5^h\ 14^m\ 15^s$: AND BELLARY (W), *Lat.* 15° 9′, *Long.* $5^h\ 7^m\ 52^s$.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No.* 2					Transits Observed at W — *By Campbell, with Telescope No* 1.					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Peral. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 19	3255	+28 55	N	*I. P. W.*	9 25 54·53	+1·49	56·02	N	*I. P. W.*	9 32 16·68	+1·22	17·90	6 21·88				
	3270	+13 12	S	d c − 6·1	28 7·71	+1·32	9·03	S	d c + 0·2	34 29·21	+1·63	30·84	21·81				
	3278	+17 0	N	b − 5·2 a − 27·7	30 3·94	+1·36	5·30	N	b − 0·5 a + 59·3	36 25·56	+1·53	27·09	21·79				
	3290	+35 48	N	s Q + 1·63	31 50·20	+1·56	51·76	N	s Q + 1·59	38 12·61	+1·00	13·61	21·85	m s 6 21·843	+ 0·122	− 0·092	6 21·873
	3297	+35 54	N		32 19·91	+1·56	21·47	N		38 42·31	+1·00	43·31	21·84				
	3314	+30 41	N		35 19·80	+1·50	21·30	N		41 42·00	+1·17	43·17	21·87				
	3317	+30 33	N		36 8·89	+1·50	10·39	N		42 31·06	+1·17	32·23	21·84				
	3331	+24 21	N		38 40·44	+1·43	41·87	N		45 2·38	+1·35	3·73	21·86				
Feb. 19	3344	+12 9	S	*I. P. W.*	9 40 40·83	−1·95	38·88	S	*I. P. W.*	9 47 2·15	−1·52	0·63	6 21·75				
	3355	+21 45	N	d c − 6·1	42 48·58	−1·86	46·72	N	d c + 0·2	49 10·28	−1·76	8·52	21·80				
	3363	− 6 48	S	b − 5·2 a − 27·7	44 26·06	−2·13	23·93	S	b − 0·5 a + 59·3	50 46·78	−1·09	45·69	21·76				
	3378	− 7 31	S	s Q − 1·63	46 16·91	−2·14	14·77	S	s Q − 1·59	52 37·62	−1·07	36·55	21·78				
	3386	+ 5 32	S		47 32·53	−2·02	30·51	S		53 53·68	−1·37	52·31	21·80				
	3398	+ 9 31	S		49 46·26	−1·97	44·29	S		56 7·53	−1·46	6·07	21·78	m s 6 21·795	+ 0·122	− 0·062	6 21·855
	3406	+13 2	S		51 27·85	−1·94	25·91	S		57 49·21	−1·54	47·67	21·76				
	3415	+ 8 38	S		53 34·27	−1·98	32·29	S		59 55·49	−1·44	54·05	21·76				
	3423	+22 33	N		55 48·71	−1·84	46·87	N		10 2 10·47	−1·77	8·70	21·83				
	3439	+35 36	N		58 25·20	−1·70	23·50	N		4 47·58	−2·17	45·41	21·91				
	3446	+35 51	N		59 61·59	−1·69	59·90	N		6 23·89	−2·17	21·72	21·82				
Feb. 20	3255	+28 55	N	*I. P. W.*	9 25 30·30	−1·85	28·45	N	*I. P. W.*	9 31 48·47	+1·70	50·17	6 21·72				
	3270	+13 12	S	d c − 6·6	27 43·38	−1·96	41·42	S	d c + 1·0	34 1·51	+1·62	3·13	21·71				
	3278	+17 0	N	b − 7·3 a − 22·0	29 39·64	−1·94	37·70	N	b + 0·7 a − 11·6	35 57·76	+1·64	59·40	21·70				
	3290	+35 48	N	s Q − 1·61	31 25·93	−1·79	24·14	N	s Q + 1·59	37 44·17	+1·74	45·91	21·77	m s 6 21·707	+ 0·123	− 0·092	6 21·738
	3297	+35 54	N		31 55·69	−1·79	53·90	N		38 13·86	+1·74	15·60	21·70				
	3314	+30 41	N		34 55·59	−1·83	53·76	N		41 13·74	+1·71	15·45	21·69				
	3317	+30 33	N		35 44·66	−1·83	42·83	N		42 2·83	+1·71	4·54	21·71				
	3331	+24 21	N		38 16·22	−1·88	14·34	N		44 34·33	+1·67	36·00	21·66				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BOLARUM (E), *Lat.* 17° 30′, *Long.* 5ʰ 14ᵐ 15ˢ: **AND BELLARY (W),** *Lat.* 15° 9′, *Long.* 5ʰ 7ᵐ 52ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0.041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 20	3344	+12 9	S	*I. P. W.*	9 40 10·04	+1·24	11·28	S	*I. P. W.*	9 46 34·49	−1·56	32·93	6 21·65				
	3345	+12 0	S	d: c − 6·6	40 17·35	+1·24	18·59	S	d: c + 1·0	46 41·90	−1·56	40·34	21·75				
	3355	+21 45	N	b − 7·3	42 17·80	+1·31	19·11	N	b + 0·7	48 42·33	−1·51	40·82	21·71				
	3363	− 6 48	S	a − 22·0	43 55·21	+1·10	56·31	S	a − 11·6	50 19·62	−1·64	17·98	21·67				
	3378	− 7 31	S	s: Q + 1·61	45 46·07	+1·10	47·17	S	s: Q − 1·59	52 10·48	−1·65	8·83	21·66				
	3386	+ 5 32	S		47 1·75	+1·19	2·94	S		53 26·21	−1·59	24·62	21·68				
	3393	+ 9 31	S		49 15·48	+1·22	16·70	S		55 39·93	−1·57	38·36	21·66	m s 6 21·697	+ 0·123	− 0·060	6 21·760
	3406	+13 2	S		50 57·08	+1·24	58·32	S		57 21·51	−1·56	19·95	21·63				
	3415	+ 8 38	S		53 3·44	+1·21	4·65	S		59 27·93	−1·58	26·35	21·70				
	3423	+22 33	N		55 17·96	+1·31	19·27	N		10 1 42·49	−1·51	40·98	21·71				
	3439	+35 36	N		57 54·51	+1·42	55·93	N		4 19·14	−1·43	17·71	21·78				
	3446	+35 51	N		59 30·83	+1·42	32·25	N		5 55·44	−1·43	54·01	21·76				
Feb. 21	3255	+28 55	N	*I. P. W.*	9 24 59·19	+1·51	60·70	N	*I. P. W.*	9 31 20·84	+1·61	22·45	6 21·75				
	3270	+13 12	S	d: c − 7·0	27 12·25	+1·39	13·64	S	d: c − 1·5	33 33·83	+1·57	35·40	21·76				
	3278	+17 0	N	b − 1·6	29 8·47	+1·42	9·89	N	b + 0·6	35 30·12	+1·58	31·70	21·81				
	3290	+35 48	N	a − 21·0	30 54·86	+1·57	56·43	N	a − 5·5	37 16·54	+1·63	18·17	21·74				
	3297	+35 54	N	s: Q + 1·62	31 24·53	+1·57	26·10	N	s: Q + 1·60	37 46·23	+1·63	47·86	21·76	m s 6 21·767	+ 0·122	− 0·092	6 21·797
	3314	+30 41	N		34 24·43	+1·52	25·95	N		40 46·08	+1·61	47·69	21·74				
	3317	+30 33	N		35 13·45	+1·52	14·97	N		41 35·14	+1·61	36·75	21·78				
	3331	+24 21	N		37 45·01	+1·47	46·48	N		44 6·68	+1·60	8·28	21·80				
Feb. 21	3344	+12 9	S	*I. P. W.*	9 39 45·32	−1·87	43·45	S	*I. P. W.*	9 46 6·83	−1·62	5·21	6 21·76				
	3355	+21 45	N	d: c − 7·0	41 53·09	−1·79	51·30	N	d: c − 1·5	48 14·65	−1·59	13·06	21·76				
	3363	− 6 48	S	b − 1·6	43 30·50	−2·01	28·49	S	b + 0·6	49 51·90	−1·66	50·24	21·75				
	3378	− 7 31	S	a − 21·0	45 21·40	−2·02	19·38	S	a − 5·5	51 42·75	−1·66	41·09	21·71				
	3386	+ 5 32	S	s: Q − 1·62	46 36·99	−1·92	35·07	S	s: Q − 1·60	52 58·47	−1·63	56·84	21·77				
	3406	+13 2	S		50 32·35	−1·86	30·49	S		56 53·84	−1·61	52·23	21·74	m s 6 21·749	+ 0·122	− 0·067	6 21·804
	3415	+ 8 38	S		52 38·75	−1·89	36·86	S		58 60·23	−1·63	58·60	21·74				
	3423	+22 33	N		54 53·30	−1·79	51·51	N		10 1 14·82	−1·60	13·22	21·71				
	3431	+33 3	N		56 1·71	−1·70	0·01	N		2 23·35	−1·57	21·78	21·77				
	3439	+35 36	N		57 29·87	−1·67	28·20	N		3 51·51	−1·56	49·95	21·75				
	3446	+35 51	N		59 6·15	−1·68	4·47	N		5 27·82	−1·57	26·25	21·78				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BOLARUM (E), *Lat.* 17° 30′, *Long.* 5h 14m 15s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No. 2*					Transits Observed at W — *By Campbell, with Telescope No. 1*					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb.22	3255	+28 55	N	I. P. E.	9 24 34·65	−1·61	33·04	N	I. P. E.	9 30 53·46	+1·42	54·88	6 21·84				
	3270	+13 12	S	d c + 2·7	26 47·63	−1·64	45·99	S	d c − 1·4	33 6·36	+1·42	7·78	21·79				
	3278	+17 0	N	b − 3·8 a − 5·7	28 43·89	−1·64	42·25	N	b − 6·2 a − 1·5	35 2·66	+1·42	4·08	21·83				
	3290	+35 48	N	s Q − 1·61	30 30·39	−1·59	28·80	N	s Q + 1·60	36 49·21	+1·41	50·62	21·82	m s 6 21·828	+ 0·123	− 0·089	6 21·862
	3297	+35 54	N		30 60·07	−1·59	58·48	N		37 18·90	+1·41	20·31	21·83				
	3331	+24 21	N		37 20·46	−1·62	18·84	N		43 39·28	+1·42	40·70	21·86				
Feb.22	3344	+12 9	S	I. P. E.	9 39 14·28	+1·58	15·86	S	I. P. E.	9 45 39·40	−1·78	37·62	6 21·76				
	3355	+21 45	N	d c + 2·7	41 22·08	+1·60	23·68	N	d c − 1·4	47 47·30	−1·78	45·52	21·84				
	3363	− 6 48	S	b − 3·8 a − 5·7	42 59·35	+1·54	60·89	S	b − 6·2 a − 1·5	49 24·47	−1·78	22·69	21·80				
	3378	− 7 31	S	s Q + 1·61	44 50·22	+1·53	51·75	S	s Q − 1·60	51 15·34	−1·78	13·56	21·81				
	3386	+ 5 32	S		46 5·97	+1·56	7·53	S		52 31·08	−1·77	29·31	21·78				
	3398	+ 9 31	S		48 19·69	+1·57	21·26	S		54 44·84	−1·78	43·06	21·80				
	3406	+13 2	S		50 1·29	+1·58	2·87	S		56 26·44	−1·77	24·67	21·80	m s 6 21·814	+ 0·123	− 0·065	6 21·872
	3415	+ 8 38	S		52 7·66	+1·57	9·23	S		58 32·80	−1·77	31·03	21·80				
	3423	+22 33	N		54 22·28	+1·60	23·88	N		10 0 47·50	−1·78	45·72	21·84				
	3431	+33 3	N		55 30·79	+1·63	32·42	N		1 56·04	−1·78	54·26	21·84				
	3439	+35 36	N		56 58·93	+1·64	60·57	N		3 24·18	−1·78	22·40	21·83				
	3446	+35 51	N		58 35·21	+1·63	36·84	N		4 60·49	−1·78	58·71	21·87				
Feb.23	3222	− 8 41	S	I. P. E.	9 19 10·55	+1·57	12·12	S	I. P. E.	9 25 32·39	+1·68	34·07	6 21·95				
	3223	− 8 7	S	d c + 2·2	19 29·89	+1·58	31·47	S	d c − 0·6	25 51·85	+1·68	53·53	22·06				
	3255	+28 55	N	b − 2·8 a − 3·0	24 3·31	+1·61	4·92	N	b + 3·2 a + 3·7	30 25·28	+1·64	26·92	22·00				
	3270	+13 12	S	s Q + 1·61	26 16·29	+1·60	17·89	S	s Q + 1·60	32 38·17	+1·66	39·83	21·94				
	3278	+17 0	N		28 12·52	+1·60	14·12	N		34 34·44	+1·66	36·10	21·98				
	3290	+35 48	N		29 59·03	+1·63	60·66	N		36 21·05	+1·63	22·68	22·02	m s 6 22·002	+ 0·124	− 0·082	6 22·044
	3297	+35 54	N		30 28·77	+1·63	30·40	N		36 50·79	+1·62	52·41	22·01				
	3314	+30 41	N		33 28·59	+1·62	30·21	N		39 50·65	+1·63	52·28	22·07				
	3317	+30 33	N		34 17·63	+1·62	19·25	N		40 39·61	+1·64	41·25	22·00				
	3331	+24 21	N		36 49·11	+1·61	50·72	N		43 11·06	+1·65	12·71	21·99				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

BOLARUM (E), *Lat.* 17° 30′, *Long.* 5h 14m 15s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star		Transits Observed at E — By Heaviside, with Telescope No. 2					Transits Observed at W — By Campbell, with Telescope No. 1					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$; $C_S - H_S = +0.041$	$\Delta L - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 23	8344	+ 12 9	S	I. P. E.	9 38 49·36	− 1·63	47·73	S	I. P. E.	9 45 11·16	− 1·53	9·63	6 21·90				
	8355	+ 21 45	N	d c + 2·2	40 57·23	− 1·62	55·61	N	d c − 0·6	47 19·10	− 1·54	17·56	21·95				
	8363	− 6 48	S	b − 2·8 a − 3·0	42 34·42	− 1·65	32·77	S	b + 3·2 a + 3·7	48 56·21	− 1·51	54·70	21·93				
	8378	− 7 31	S	s Q − 1·61	44 25·24	− 1·65	23·59	S	s Q − 1·60	50 47·10	− 1·51	45·59	22·00				
	8386	+ 5 32	S		45 41·02	− 1·64	39·38	S		52 2·83	− 1·52	1·31	21·93				
	8398	+ 9 31	S		47 54·75	− 1·64	53·11	S		54 16·60	− 1·53	15·07	21·96	m s 6 21·965	+ 0·124	− 0·065	6 22·024
	8406	+ 13 2	S		49 36·34	− 1·63	34·71	S		55 58·20	− 1·53	56·67	21·96				
	8415	+ 8 38	S		51 42·78	− 1·64	41·14	S		58 4·62	− 1·53	3·09	21·95				
	8423	+ 22 33	N		53 57·37	− 1·62	55·75	N		10 0 19·29	− 1·55	17·74	21·99				
	8431	+ 33 3	N		55 5·85	− 1·60	4·25	N		1 27·83	− 1·55	26·28	22·03				
	8439	+ 35 36	N		56 34·04	− 1·60	32·44	N		2 56·02	− 1·57	54·45	22·01				
	8446	+ 35 51	N		58 10·35	− 1·60	8·75	N		4 32·29	− 1·57	30·72	21·97				
Feb. 24	8222	− 8 41	S	I. P. E.	9 18 45·78	− 1·59	44·19	S	I. P. E.	9 25 4·44	+ 1·68	6·12	6 21·93				
	8223	− 8 7	S	d c + 3·5	19 5·28	− 1·59	3·69	S	d c − 1·5	25 23·83	+ 1·69	25·52	21·83				
	8255	+ 28 55	N	b − 1·8 a − 2·4	23 38·64	− 1·55	37·09	N	b + 3·3 a + 7·3	29 57·33	+ 1·59	58·92	21·83				
	8270	+ 13 12	S	s Q − 1·61	25 51·60	− 1·57	50·03	S	s Q + 1·59	32 10·20	+ 1·64	11·84	21·81				
	8278	+ 17 0	N		27 47·85	− 1·57	46·28	N		34 6·55	+ 1·63	8·18	21·90	m s 6 21·881	+ 0·123	− 0·082	6 21·922
	8290	+ 35 48	N		29 34·34	− 1·53	32·81	N		35 53·09	+ 1·56	54·65	21·84				
	8297	+ 35 54	N		30 4·02	− 1·54	2·48	N		36 22·79	+ 1·56	24·35	21·87				
	8314	+ 30 41	N		33 3·88	− 1·55	2·33	N		39 22·66	+ 1·58	24·24	21·91				
	8317	+ 30 33	N		33 52·92	− 1·55	51·37	N		40 11·73	+ 1·58	13·31	21·94				
	8331	+ 24 21	N		36 24·43	− 1·56	22·87	N		42 43·21	+ 1·61	44·82	21·95				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BOLARUM (E), *Lat.* 17° 30′, *Long.* 5h 14m 15s: AND BELLARY *Lat.* (W), 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Heaviside, with Telescope No. 2: Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W, By Campbell, with Telescope No. 1: Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0^s.041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 24	3344	+12 9	S	I. P. E.	9 38 18·18	+1·64	19·82	S	I. P. E.	9 44 43·25	−1·55	41·70	6 21·88				
	3355	+21 45	N	d o + 3·5	40 26·03	+1·65	27·68	N	d o − 1·5	46 51·17	−1·57	49·60	21·92				
	3363	− 6 48	S	b − 1·8 a − 2·4	42 3·23	+1·63	4·86	S	b + 3·3 a + 7·3	48 28·22	−1·49	26·73	21·87				
	3378	− 7 31	S	s Q + 1·61	43 54·09	+1·63	55·72	S	s Q − 1·59	50 19·08	−1·49	17·59	21·87				
	3386	+ 5 32	S		45 9·85	+1·64	11·49	S		51 34·87	−1·52	33·35	21·86				
	3398	+ 9 31	S		47 23·59	+1·64	25·23	S		53 48·64	−1·54	47·10	21·87	m s 6 21·882	+ 0·123	− 0·065	6 21·940
	3406	+13 2	S		49 5·23	+1·64	6·87	S		55 30·29	−1·54	28·75	21·88				
	3415	+ 8 38	S		51 11·63	+1·64	13·27	S		57 36·60	−1·53	35·07	21·80				
	3423	+22 33	N		53 26·24	+1·65	27·89	N		59 51·32	−1·57	49·75	21·86				
	3431	+33 3	N		54 34·71	+1·67	36·38	N		10 0 59·88	−1·61	58·27	21·89				
	3439	+35 36	N		56 2·87	+1·67	4·54	N		2 28·09	−1·62	26·47	21·93				
	3446	+35 51	N		57 39·14	+1·68	40·82	N		4 4·39	−1·62	2·77	21·95				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.
* ρ is the retardation of an electric signal between the stations.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BOLARUM (E), *Lat.* 17° 30′, *Long.* 5h 14m 15s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s·099$, $C_S - H_S = +0·041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 19	3663	− 1 5	S	I. P. W.	10 28 47·98	+ 1·18	49·16	S	I. P. W.	10 35 9·12	+ 1·96	11·08	6 21·92				
	3671	+ 23 50	N	d c − 6·1	30 22·72	+ 1·42	24·14	N	d c + 0·2	36 44·70	+ 1·37	46·07	21·93				
	3684	+ 3 8	S	b − 5·3 a − 27·7	32 28·36	+ 1·22	29·58	S	b − 0·2 a + 59·3	38 49·62	+ 1·87	51·49	21·91				
	3708	+ 11 12	S	s Q + 1·63	36 26·63	+ 1·30	27·93	S	s Q + 1·59	42 48·10	+ 1·68	49·78	21·85	m s 6 21·903	+ 0·002	− 0·051	6 21·854
	3718	− 8 14	S		37 47·06	+ 1·11	48·17	S		44 7·98	+ 2·12	10·10	21·93				
	3726	+ 1 41	S		39 33·69	+ 1·20	34·89	S		45 54·88	+ 1·89	56·77	21·88				
Feb. 19	3795	+ 2 33	S	I. P. W.	10 53 58·38	− 2·04	56·34	S	I. P. W.	11 0 19·59	− 1·30	18·29	6 21·95				
	3798	+ 2 38	S	d c − 6·1	54 20·14	− 2·04	18·10	S	d c + 0·2	0 41·33	− 1·29	40·04	21·94				
	3816	− 0 40	S	b − 5·3 a − 27·7	56 39·29	− 2·08	37·21	S	b − 0·2 a + 59·3	2 60·33	− 1·22	59·11	21·90				
	3824	+ 15 4	S	s Q − 1·63	58 59·03	− 1·92	57·11	S	s Q − 1·59	5 20·60	− 1·58	19·02	21·91				
	3831	+ 20 48	N		11 0 55·64	− 1·87	53·77	N		7 17·49	− 1·72	15·77	22·00				
	3834	+ 21 12	N		1 16·23	− 1·86	14·37	N		7 38·14	− 1·73	36·41	22·04	m s 6 21·957	+ 0·002	− 0·052	6 21·907
	3844	+ 13 17	S		3 13·11	− 1·94	11·17	S		9 34·66	− 1·54	33·12	21·95				
	3845	+ 13 31	S		3 14·53	− 1·94	12·59	S		9 36·10	− 1·55	34·55	21·96				
	3850	+ 20 41	S		4 39·93	− 2·04	37·89	S		10 61·14	− 1·30	59·84	21·95				
	3863	+ 7 19	S		8 49·93	− 2·00	47·93	S		15 11·26	− 1·40	9·86	21·93				
	3871	+ 7 16	S		10 36·08	− 2·00	34·08	S		16 57·48	− 1·40	56·08	22·00				
Feb. 20	3663	− 1 5	S	I. P. W.	10 28 50·56	− 2·07	48·49	S	I. P. W.	10 35 8·80	+ 1·55	10·35	6 21·86				
	3671	+ 23 50	N	d c − 6·6	30 25·38	− 1·89	23·49	N	d c + 1·0	36 43·67	+ 1·67	45·34	21·85				
	3684	+ 3 8	S	b − 7·3 a − 22·0	32 30·94	− 2·04	28·90	S	b + 0·7 a − 11·6	38 49·21	+ 1·57	50·78	21·88				
	3708	+ 11 12	S	s Q − 1·61	36 29·25	− 1·98	27·27	S	s Q + 1·59	42 47·48	+ 1·61	49·09	21·82				
	3718	− 8 14	S		37 49·68	− 2·12	47·56	S		44 7·83	+ 1·52	9·35	21·79				
	3726	+ 1 41	S		39 36·29	− 2·05	34·24	S		45 54·49	+ 1·57	56·06	21·82	m s 6 21·856	+ 0·004	− 0·057	6 21·803
	3735	+ 26 9	N		41 43·07	− 1·87	41·20	N		48 1·37	+ 1·69	3·06	21·86				
	3749	+ 1 24	S		43 4·42	− 2·05	2·37	S		49 22·65	+ 1·56	24·21	21·84				
	3752	+ 1 6	S		43 33·70	− 2·05	31·65	S		49 51·96	+ 1·56	53·52	21·87				
	3757	+ 41 6	N		46 16·43	− 1·74	14·69	N		52 34·82	+ 1·79	36·61	21·92				
	3768	+ 4 17	S		47 54·18	− 2·03	52·15	S	Q − 1·59	54 15·66	− 1·60	14·06	21·91				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

BOLARUM (E), *Lat. 17° 30′, Long. 5h 14m 15s*: AND BELLARY (W), *Lat. 15° 9′, Long. 5h 7m 52s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Heaviside, with Telescope No. 2: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W, By Campbell, with Telescope No. 1: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Peral. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 20	3782	+ 0 40	S	I. P. W.	10 50 57·34	+ 1·16	58·50	S	I. P. W.	10 57 22·03	− 1·62	20·41	6 21·91				
	3788	+ 8 0	S	d c − 6·6	52 18·85	+ 1·20	20·05	S	d c + 1·0	58 43·50	− 1·58	41·92	21·87				
	3795	+ 2 33	S	b − 7·3 a − 22·0	53 54·49	+ 1·17	55·66	S	b + 0·7 a − 11·6	11 0 19·14	− 1·61	17·53	21·87				
	3798	+ 2 38	S	s Q + 1·61	54 16·27	+ 1·17	17·44	S	s Q − 1·59	0 40·95	− 1·61	39·34	21·90				
	3816	− 0 40	S		56 35·39	+ 1·15	36·54	S		2 60·02	− 1·62	58·40	21·86				
	3824	+ 15 4	S		58 55·20	+ 1·25	56·45	S		5 19·85	− 1·55	18·30	21·85				
	3831	+ 20 48	N		11 0 51·80	+ 1·30	53·10	N		7 16·54	− 1·52	15·02	21·92	m s 6 21·886	+ 0·004	− 0·049	6 21·841
	3834	+ 21 12	N		1 12·41	+ 1·31	13·72	N		7 37·18	− 1·52	35·66	21·94				
	3844	+ 13 17	S		3 9·26	+ 1·25	10·51	S		9 33·96	− 1·56	32·40	21·89				
	3845	+ 13 31	S		3 10·64	+ 1·25	11·89	S		9 35·42	− 1·56	33·86	21·97				
	3850	+ 2 41	S		4 36·08	+ 1·17	37·25	S		10 60·73	− 1·61	59·12	21·87				
	3857	+ 2 20	S		6 14·69	+ 1·17	15·86	S		12 39·33	− 1·61	37·72	21·86				
	3863	+ 7 19	S		8 46·07	+ 1·20	47·27	S		15 10·71	− 1·59	9·12	21·85				
	3871	+ 7 16	S		10 32·27	+ 1·20	33·47	S		16 56·90	− 1·59	55·31	21·84				
Feb. 21	3663	− 1 5	S	I. P. W.	10 28 46·18	+ 1·27	47·45	S	I. P. W.	10 35 7·79	+ 1·54	9·33	6 21·88	m s 6 21·885	+ 0·004	− 0·070	6 21·819
	3671	+ 23 50	N	d c − 7·0 b − 2·1 a − 21·0	30 21·00	+ 1·45	22·45	N	d c − 1·5 b + 0·6 a − 5·5	36 42·74	+ 1·60	44·34	21·89				
				s Q + 1·62					s Q + 1·60								
Feb. 21	3824	+ 15 4	S	I. P. W.	10 58 57·25	− 1·85	55·40	S	I. P. W.	11 5 18·87	− 1·61	17·26	6 21·86				
	3831	+ 20 48	N	d c − 7·0	11 0 53·86	− 1·81	52·05	N	d c − 1·5	7 15·56	− 1·60	13·96	21·91	m s 6 21·873	+ 0·004	− 0·080	6 21·797
	3834	+ 21 12	N	b − 2·1 a − 21·0	1 14·57	− 1·80	12·77	N	b + 0·6 a − 5·5	7 36·22	− 1·60	34·62	21·85				
				s Q − 1·62					s Q − 1·60								

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BOLARUM (E), Lat. 17° 30′, Long. 5h 14m 15s: AND BELLARY (W), Lat. 15° 9′, Long. 5h 7m 53s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_E - H_E = +0^s.099$, $C_B - H_B = +0.041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 22	3663	− 1 5	S	I. P. E.	10 28 48·19	−1·68	46·51	S	I. P. E.	10 35 7·07	+1·42	8·49	6 21·98				
	3671	+23 50	N	d	30 23·17	−1·63	21·54	N	d	36 42·11	+1·41	43·52	21·98				
	3684	+ 3 8	S	c + 2·7, b − 3·8, a − 5·7	32 28·57	−1·67	26·90	S	c − 1·4, b − 6·2, a − 1·5	38 47·47	+1·42	48·89	21·99	m s 6 21·976	+ 0·004	− 0·053	6 21·927
	3708	+11 12	S	s	36 26·92	−1·65	25·27	S	s	42 45·81	+1·42	47·23	21·96				
	3718	− 8 14	S	Q − 1·62	37 47·24	−1·69	45·55	S	Q + 1·59	44 6·10	+1·42	7·52	21·97				
Feb. 22	3782	+ 0 40	S	I. P. E.	10 50 54·98	+1·56	56·54	S	I. P. E.	10 57 20·35	−1·77	18·58	6 22·04				
	3788	+ 8 0	S	d	52 16·46	+1·57	18·03	S	d	58 41·83	−1·77	40·06	22·03				
	3795	+ 2 33	S	c + 2·7, b − 3·8, a − 5·7	53 52·20	+1·56	53·76	S	c − 1·4, b − 6·2, a − 1·5	11 0 17·48	−1·77	15·71	21·95				
	3798	+ 2 38	S	s	54 13·92	+1·56	15·48	S	s	0 39·24	−1·77	37·47	21·99				
	3816	− 0 40	S	Q + 1·62	56 33·02	+1·56	34·58	S	Q − 1·59	2 58·33	−1·77	56·56	21·98				
	3824	+15 4	S		58 52·88	+1·59	54·47	S		5 18·23	−1·77	16·46	21·99				
	3831	+20 48	N		11 0 49·59	+1·60	51·19	N		7 14·95	−1·77	13·18	21·99	m s 6 22·001	+ 0·004	− 0·049	6 21·956
	3834	+21 12	N		1 10·20	+1·60	11·80	N		7 35·62	−1·77	33·85	22·05				
	3844	+13 17	S		3 6·98	+1·58	8·56	S		9 32·39	−1·77	30·62	22·06				
	3845	+13 31	S		3 8·44	+1·58	10·02	S		9 33·76	−1·77	31·99	21·97				
	3850	+ 2 41	S		4 33·72	+1·56	35·28	S		10 59·02	−1·77	57·25	21·97				
	3857	+ 2 20	S		6 12·30	+1·56	13·86	S		12 37·63	−1·77	35·86	22·00				
	3868	+ 7 19	S		8 43·71	+1·57	45·28	S		15 9·07	−1·77	7·30	22·02				
	3871	+ 7 16	S		10 29·94	+1·57	31·51	S		16 55·25	−1·77	53·48	21·97				
Feb. 23	3663	− 1 5	S	I. P. E.	10 28 44·06	+1·58	45·64	S	I. P. E.	10 35 5·94	+1·68	7·62	6 21·98				
	3671	+23 50	N	d	30 19·01	+1·60	20·61	N	d	36 41·01	+1·65	42·66	22·05				
	3684	+ 3 8	S	c + 2·2, b − 2·8, a − 3·0	32 24·38	+1·58	25·96	S	c − 0·6, b + 3·2, a + 3·7	38 46·34	+1·68	48·02	22·06				
	3708	+11 12	S	s	36 22·80	+1·59	24·39	S	s	42 44·73	+1·66	46·39	22·00				
	3718	− 8 14	S	Q + 1·61	37 43·08	+1·57	44·65	S	Q + 1·60	44 4·98	+1·68	6·66	22·01				
	3726	+ 1 41	S		39 29·77	+1·58	31·35	S		45 51·69	+1·67	53·36	22·01	m s 6 22·035	+ 0·004	− 0·057	6 21·982
	3735	+26 9	N		41 36·71	+1·61	38·32	N		47 58·71	+1·64	60·35	22·03				
	3749	+ 1 24	S		42 57·94	+1·58	59·52	S		49 19·86	+1·67	21·53	22·01				
	3752	+ 1 6	S		43 27·18	+1·58	28·76	S		49 49·16	+1·67	50·83	22·07				
	3757	+41 6	N		46 10·20	+1·63	11·83	N		52 32·30	+1·62	33·92	22·09				
	3768	+ 4 17	S		47 47·65	+1·58	49·23	S	Q − 1·60	54 12·83	−1·53	11·30	22·07				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BOLARUM (E), *Lat.* 17° 30′, *Long.* 5h 14m 15s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 23	3782	+ 0 40	S	I. P. E.	10 50 57·27	−1·64	55·63	S	I. P. E.	10 57 19·18	−1·52	17·66	6 22·03				
	3788	+ 8 0	S	d c + 2·2	52 18·79	−1·63	17·16	S	d c − 0·6	58 40·70	−1·53	39·17	22·01				
	3795	+ 2 33	S	b − 2·8 a − 3·0	53 54·43	−1·63	52·80	S	b + 3·2 a + 3·7	11 0 16·33	−1·52	14·81	22·01				
	3798	+ 2 38	S	s Q − 1·61	54 16·17	−1·64	14·53	S	s Q − 1·60	0 38·15	−1·53	36·62	22·09				
	3816	− 0 40	S		56 35·28	−1·64	33·64	S		2 57·24	−1·52	55·72	22·08				
	3824	+15 4	S		58 55·21	−1·62	53·59	S		5 17·14	−1·54	15·60	22·01				
	3831	+20 48	N		11 0 51·88	−1·61	50·27	N		7 13·82	−1·54	12·28	22·01	m s 6 22·046	+ 0·004	− 0·049	6 22·001
	3834	+21 12	N		1 12·44	−1·62	10·82	N		7 34·48	−1·54	32·94	22·12				
	3844	+13 17	S		3 9·29	−1·63	7·66	S		9 31·22	−1·53	29·69	22·03				
	3845	+13 31	S		3 10·68	−1·63	9·05	S		9 32·65	−1·53	31·12	22·07				
	3850	+ 2 41	S		4 36·04	−1·64	34·40	S		10 57·93	−1·52	56·41	22·01				
	3857	+ 2 20	S		6 14·58	−1·64	12·94	S		12 36·49	−1·52	34·97	22·03				
	3863	+ 7 19	S		8 45·96	−1·63	44·33	S		15 7·94	−1·53	6·41	22·08				
	3871	+ 7 16	S		10 32·19	−1·63	30·56	S		16 54·14	−1·52	52·62	22·06				
Feb. 24	3663	− 1 5	S	I. P. E.	10 28 46·29	−1·59	44·70	S	I. P. E.	10 35 4·97	+1·68	6·65	6 21·95				
	3671	+23 50	N	d c + 3·5	30 21·28	−1·57	19·71	N	d c − 1·5	36 40·12	+1·62	41·74	22·03				
	3684	+ 3 8	S	b − 1·8 a − 2·4	32 26·70	−1·59	25·11	S	b + 3·3 a + 7·3	38 45·43	+1·67	47·10	21·99				
	3708	+11 12	S	s Q − 1·61	36 25·09	−1·58	23·51	S	s Q + 1·60	42 43·81	+1·64	45·45	21·94				
	3718	− 8 14	S		37 45·34	−1·59	43·75	S		44 4·03	+1·70	5·73	21·98	m s 6 21·983	+ 0·004	− 0·060	6 21·927
	3726	+ 1 41	S		39 32·03	−1·59	30·44	S		45 50·74	+1·67	52·41	21·97				
	3735	+26 9	N		41 39·04	−1·56	37·48	N		47 57·85	+1·60	59·45	21·97				
	3757	+41 6	N		46 12·53	−1·53	11·00	N		52 31·53	+1·54	33·07	22·07				
	3768	+ 4 17	S		47 50·01	−1·58	48·43	S	Q − 1·60	54 11·90	−1·52	10·38	21·95				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BOLARUM (E), *Lat.* 17° 30′, *Long.* 5h 14m 15s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No. 2*					Transits Observed at W — *By Campbell, with Telescope No. 1*					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$ $C_S - H_S = +0.041$	$\Delta L + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 24	3782	+ 0 40	S	*I. P. E.*	10 50 53·15	+1·63	54·78	S	*I. P. E.*	10 57 18·30	−1·52	16·78	6 22·00				
	3788	+ 8 0	S	d	52 14·69	+1·64	16·33	S	d	58 39·77	−1·53	38·24	21·91				
	3795	+ 2 33	S	c + 3·5 b − 1·8 a − 2·4	53 50·36	+1·63	51·99	S	c − 1·5 b + 3·3 a + 7·3	11 0 15·46	−1·52	13·94	21·95				
	3798	+ 2 38	S	s	54 12·08	+1·63	13·71	S	s	0 37·21	−1·52	35·69	21·98				
	3816	− 0 40	S	Q + 1·61	56 31·13	+1·63	32·76	S	Q − 1·60	2 56·26	−1·51	54·75	21·99				
	3824	+15 4	S		58 51·09	+1·65	52·74	S		5 16·22	−1·55	14·67	21·93	m s 6 21·961	+ 0·004	− 0·052	6 21·913
	3831	+20 48	N		11 0 47·79	+1·66	49·45	N		7 12·98	−1·57	11·41	21·96				
	3834	+21 12	N		1 8·38	+1·66	10·04	N		7 33·62	−1·57	32·05	22·01				
	3850	+ 2 4	S		4 31·90	+1·64	33·54	S		10 57·03	−1·52	55·51	21·97				
	3857	+ 2 20	S		6 10·47	+1·63	12·10	S		12 35·56	−1·52	34·04	21·94				
	3863	+ 7 19	S		8 41·94	+1·64	43·58	S		15 7·04	−1·53	5·51	21·93				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

MADRAS (E), *Lat.* 13° 4′, *Long.* 5h 21m 8s: AND BOLARUM (W), *Lat.* 17° 30′, *Long.* 5h 14m 15s.

Astronomical Date	Star		Transits Observed at E — By Campbell, with Telescope No. 1					Transits Observed at W — By Heaviside, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0.041$	$\Delta L - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 3	3663	− 1 5	S	*I. P. E.*	10 35 5·18	+1·16	6·34	S	*I. P. E.*	10 41 59·35	+1·62	60·97	6 54·63				
	3671	+23 50	N	d c − 2·8	36 39·65	+1·84	41·49	N	d c − 0·4	43 34·34	+1·76	36·10	54·61				
	3684	+ 3 8	S	b − 5·0 a −69·2	38 45·50	+1·27	46·77	S	b + 4·8 a −12·8	45 39·76	+1·64	41·40	54·63				
	3690	+ 7 2	S	s Q +1·71	39 37·64	+1·37	39·01	S	s Q +1·62	46 31·98	+1·67	33·65	54·64				
	3696	+ 7 0	S		40 51·62	+1·36	52·98	S		47 45·96	+1·66	47·62	54·64				
	3708	+11 12	S		42 43·67	+1·48	45·15	S		49 38·08	+1·69	39·77	54·62				
	3718	− 8 14	S		44 4·42	+0·97	5·39	S		50 58·42	+1·58	60·00	54·61	m s 6 54·617	+ 0·008	+ 0·056	6 54·681
	3726	+ 1 41	S		45 50·87	+1·23	52·10	S		52 45·09	+1·64	46·73	54·63				
	3735	+26 9	N		47 57·29	+1·91	59·20	N		54 52·04	+1·77	53·81	54·61				
	3752	+ 1 6	S		49 48·35	+1·21	49·56	S		56 42·54	+1·63	44·17	54·61				
	3757	+41 6	N		52 30·31	+2·47	32·78	N		59 25·45	+1·89	27·34	54·56				
	3768	+ 4 17	S	Q −1·71	54 12·21	−2·12	10·09	S		11 1 3·05	+1·65	4·70	54·61				
Mar. 3	3776	+20 51	N	*I. P. E.*	10 55 45·26	−1·67	43·59	N	*I. P. E.*	11 2 39·64	−1·49	38·15	6 54·56				
	3782	+ 0 40	S	d c − 2·8	57 18·67	−2·21	16·46	S	d c − 0·4	4 12·66	−1·61	11·05	54·59				
	3788	+ 8 0	S	b − 5·0 a −69·2	58 40·05	−2·02	38·03	S	b + 4·8 a −12·8	5 34·15	−1·57	32·58	54·55				
	3798	+ 2 38	S	s Q −1·71	11 0 37·58	−2·16	35·42	S	s Q −1·62	7 31·60	−1·60	30·00	54·58				
	3816	− 0 40	S		2 56·73	−2·25	54·48	S		9 50·70	−1·62	49·08	54·60				
	3831	+20 49	N		7 12·80	−1·66	11·14	N		14 7·21	−1·49	5·72	54·58	m s 6 54·566	+ 0·008	+ 0·058	6 54·632
	3834	+21 13	N		7 33·46	−1·65	31·81	N		14 27·80	−1·50	26·30	54·49				
	3850	+ 2 42	S		10 57·39	−2·16	55·23	S		17 51·39	−1·60	49·79	54·56				
	3863	+ 7 19	S		15 7·29	−2·04	5·25	S		21 61·39	−1·57	59·82	54·57				
	3871	+ 7 16	S		16 53·49	−2·05	51·44	S		23 47·59	−1·57	46·02	54·58				

Note. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

MADRAS (E), *Lat. 13° 4′, Long. 5h 21m 8s*: AND BOLARUM (W), *Lat. 17° 30′, Long. 5h 14m 15s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $O_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0^s{\cdot}041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 5	3663	− 1 5	S	*I. P. E.*	10 35 1·39	+ 1·55	2·94	S	*I. P. E.*	10 41 59·11	− 1·63	57·48	6 54·54				
	3671	+ 23 50	N	d	36 36·12	+ 1·86	37·98	N	d	43 34·12	− 1·62	32·50	54·52				
	3684	+ 3 8	S	c − 1·3 b + 0·2 a − 31·5	38 41·73	+ 1·60	43·33	S	c − 0·7 b − 0·1 a − 2·3	45 39·51	− 1·63	37·88	54·55				
	3690	+ 7 2	S	s	39 33·94	+ 1·64	35·58	S	s	46 31·74	− 1·63	30·11	54·53				
	3696	+ 7 0	S	Q + 1·75	40 47·90	+ 1·64	49·54	S	Q − 1·60	47 45·70	− 1·63	44·07	54·53				
	3708	+ 11 12	S		42 40·02	+ 1·70	41·72	S		49 37·88	− 1·63	36·25	54·53	m s 6 54·534	+ 0·008	+ 0·057	6 54·599
	3718	− 8 14	S		44 0·52	+ 1·46	1·98	S		50 58·13	− 1·64	56·49	54·51				
	3726	+ 1 41	S		45 47·09	+ 1·58	48·67	S		52 44·82	− 1·63	43·19	54·52				
	3735	+ 26 9	N		47 53·78	+ 1·90	55·68	N		54 51·85	− 1·61	50·24	54·56				
	3749	+ 1 24	S		49 15·25	+ 1·58	16·83	S		56 13·01	− 1·63	11·38	54·55				
	3757	+ 41 6	N		52 27·14	+ 2·15	29·29	N		59 25·42	− 1·60	23·82	54·53				
Mar. 5	3776	+ 20 51	N	*I. P. E.*	10 55 41·80	− 1·67	40·13	N	*I. P. E.*	11 2 32·97	+ 1·59	34·56	6 54·43				
	3783	+ 0 40	S	d	57 14·94	− 1·92	13·02	S	d	4 6·01	+ 1·57	7·58	54·56				
	3788	+ 8 0	S	c − 1·3 b + 0·2 a − 31·5	58 36·35	− 1·83	34·52	S	c − 0·7 b − 0·1 a − 2·3	5 27·47	+ 1·57	29·04	54·52				
	3795	+ 2 33	S	s	11 0 12·06	− 1·90	10·16	S	s	7 3·08	+ 1·57	4·65	54·49				
	3798	+ 2 38	S	Q − 1·75	0 33·84	− 1·89	31·95	S	Q + 1·60	7 24·87	+ 1·57	26·44	54·49				
	3816	− 0 40	S		2 52·95	− 1·94	51·01	S		9 43·92	+ 1·57	45·49	54·48	m s 6 54·513	+ 0·008	+ 0·057	6 54·578
	3831	+ 20 49	N		7 9·32	− 1·67	7·65	N		14 0·63	+ 1·59	2·22	54·57				
	3834	+ 21 13	N		7 29·94	− 1·66	28·28	N		14 21·18	+ 1·59	22·77	54·49				
	3850	+ 2 42	S		10 53·62	− 1·89	51·73	S		17 44·73	+ 1·57	46·30	54·57				
	3863	+ 7 19	S		15 3·61	− 1·84	1·77	S		21 54·70	+ 1·57	56·27	54·50				
	3871	+ 7 16	S		16 49·77	− 1·84	47·93	S		23 40·90	+ 1·57	42·47	54·54				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

MADRAS (E), *Lat. 13° 4′, Long. 5h 21m 8s*: AND BOLARUM (W), *Lat. 17° 30′, Long. 5h 14m 15s*.

Astronomical Date	Star		Transits Observed at E — *By Campbell, with Telescope No. 1*					Transits Observed at W — *By Heaviside, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Peral. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 6	3663	− 1 5	S	*I. P. E.*	10 34 59·97	+1·21	61·18	S	*I. P. E.*	10 41 54·17	+1·61	55·78	6 54·60				
	3671	+23 50	N	d c − 4·0	36 34·62	+1·63	36·25	N	d c − 0·1	43 29·25	+1·61	30·86	54·61				
	3684	+ 3 8	S	b − 2·5 a −43·9	38 40·32	+1·28	41·60	S	b + 0·6 a + 0·6	45 34·60	+1·61	36·21	54·61				
	3690	+ 7 2	S	s Q +1·59	39 32·55	+1·34	33·89	S	s Q +1·60	46 26·86	+1·61	28·47	54·58				
	3696	+ 7 0	S		40 46·54	+1·34	47·88	S		47 40·79	+1·61	42·40	54·52				
	3708	+11 12	S		42 38·56	+1·41	39·97	S		49 32·94	+1·61	34·55	54·58	m s 6 54·591	+ 0·008	+ 0·058	6 54·657
	3726	+ 1 41	S		45 45·69	+1·25	46·94	S		52 39·96	+1·61	41·57	54·63				
	3735	+26 9	N		47 52·29	+1·68	53·97	N		54 46·96	+1·61	48·57	54·60				
	3757	+41 6	N		52 25·56	+2·02	27·58	N		59 20·60	+1·60	22·20	54·62				
	3768	+ 4 17	S	Q −1·59	54 6·87	−1·89	4·98	S		11 0 57·93	+1·61	59·54	54·56				
Mar. 6	3776	+20 51	N	*I. P. E.*	10 55 39·92	−1·60	38·32	N	*I. P. E.*	11 2 34·57	−1·58	32·99	6 54·67				
	3782	+ 0 40	S	d c − 4·0	57 13·23	−1·95	11·28	S	d c − 0·1	4 7·45	−1·58	5·87	54·59				
	3788	+ 8 0	S	b − 2·5 a −43·9	58 34·62	−1·82	32·80	S	b + 0·6 a + 0·6	5 28·96	−1·58	27·38	54·58				
	3795	+ 2 33	S	s Q −1·59	11 0 10·36	−1·92	8·44	S	s Q −1·60	7 4·69	−1·58	3·11	54·67				
	3798	+ 2 38	S		0 32·11	−1·91	30·20	S		7 26·46	−1·58	24·88	54·68				
	3816	− 0 40	S		2 51·24	−1·97	49·27	S		9 45·48	−1·58	43·90	54·63	m s 6 54·641	+ 0·008	+ 0·057	6 54·706
	3831	+20 49	N		7 7·57	−1·60	5·97	N		14 2·13	−1·58	0·55	54·58				
	3834	+21 13	N		7 28·15	−1·60	26·55	N		14 22·75	−1·58	21·17	54·62				
	3850	+ 2 42	S		10 51·93	−1·92	50·01	S		17 46·25	−1·58	44·67	54·66				
	3863	+ 7 19	S		14 61·83	−1·84	59·99	S		21 56·26	−1·58	54·68	54·69				
	3871	+ 7 16	S		16 48·07	−1·84	46·23	S		23 42·49	−1·58	40·91	54·68				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

MADRAS (E), *Lat.* 13° 4′, *Long.* 5ʰ 21ᵐ 8ˢ: AND BOLARUM (W), *Lat.* 17° 30′, *Long.* 5ʰ 14ᵐ 15ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0^s{\cdot}041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 7	3663	− 1 5	S	I. P. W.	10 34 57·97	+ 1·55	59·52	S	I. P. W.	10 41 55·68	− 1·65	54·03	6 54·51				
	3671	+ 23 50	N	d c + 1·0	36 32·79	+ 1·79	34·58	N	d c + 1·2	43 30·68	− 1·56	29·12	54·54				
	3684	+ 3 8	S	b + 2·2 a − 22·8	38 38·35	+ 1·58	39·93	S	b − 0·4 a − 8·8	45 36·13	− 1·64	34·49	54·56				
	3690	+ 7 2	S	s Q + 1·60	39 30·55	+ 1·62	32·17	S	s Q − 1·61	46 28·38	− 1·62	26·76	54·59				
	3696	+ 7 0	S		40 44·54	+ 1·62	46·16	S		47 42·29	− 1·62	40·67	54·51				
	3708	+ 11 12	S		42 36·61	+ 1·66	38·27	S		49 34·45	− 1·60	32·85	54·58				
	3718	− 8 14	S		43 57·08	+ 1·49	58·57	S		50 54·84	− 1·67	53·17	54·60	m s 6 54·542	+ 0·008	+ 0·054	6 54·604
	3726	+ 1 41	S		45 43·69	+ 1·57	45·26	S		52 41·46	− 1·64	39·82	54·56				
	3735	+ 26 9	N		47 50·50	+ 1·81	52·31	N		54 48·40	− 1·55	46·85	54·54				
	3749	+ 1 24	S		49 11·85	+ 1·57	13·42	S		56 9·61	− 1·64	7·97	54·55				
	3752	+ 1 6	S		49 41·17	+ 1·56	42·73	S		56 38·95	− 1·64	37·31	54·58				
	3757	+ 41 6	N		52 23·87	+ 2·01	25·88	N		59 21·82	− 1·48	20·34	54·46				
	3768	+ 4 17	S	Q − 1·60	54 4·89	− 1·61	3·28	S		11 0 59·38	− 1·63	57·75	54·47				
Mar. 7	3776	+ 20 51	N	I. P. W.	10 55 38·15	− 1·45	36·70	N	I. P. W.	11 2 29·62	+ 1·64	31·26	6 54·56				
	3782	+ 0 40	S	d c + 1·0	57 11·23	− 1·64	9·59	S	d c + 1·2	4 2·59	+ 1·57	4·16	54·57				
	3788	+ 8 0	S	b + 2·2 a − 22·8	58 32·69	− 1·57	31·12	S	b − 0·4 a − 8·8	5 24·08	+ 1·59	25·67	54·55				
	3795	+ 2 33	S	s Q − 1·60	11 0 8·40	− 1·63	6·77	S	s Q + 1·61	6 59·75	+ 1·57	61·32	54·55				
	3798	+ 2 38	S		0 30·18	− 1·62	28·56	S		7 21·53	+ 1·57	23·10	54·54				
	3816	− 0 40	S		2 49·25	− 1·65	47·60	S		9 40·59	+ 1·56	42·15	54·55	m s 6 54·557	+ 0·008	+ 0·057	6 54·622
	3831	+ 20 49	N		7 5·70	− 1·45	4·25	N		13 57·15	+ 1·64	58·79	54·54				
	3834	+ 21 13	N		7 26·34	− 1·45	24·89	N		14 17·75	+ 1·64	19·39	54·50				
	3850	+ 2 42	S		10 49·95	− 1·62	48·33	S		17 41·36	+ 1·57	42·93	54·60				
	3863	+ 7 19	S		14 59·92	− 1·58	58·34	S		21 51·35	+ 1·59	52·94	54·60				
	3871	+ 7 16	S		16 46·13	− 1·58	44·55	S		23 37·53	+ 1·59	39·12	54·57				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

MADRAS (E), *Lat. 13° 4′, Long. 5h 21m 8s:* AND BOLARUM (W), *Lat. 17° 30′, Long. 5h 14m 15s.*

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Peral. Equations $C_N - H_N = +0^s\cdot099$, $C_S - H_S = +0\cdot041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 8	3663	− 1 5	S	I. P. W.	10 34 56·23	+ 1·46	57·69	S	I. P. W.	10 41 50·76	+ 1·62	52·38	6 54·69				
	3671	+ 23 50	N	d c + 0·6	36 31·01	+ 1·76	32·77	N	d c + 1·9	43 25·77	+ 1·67	27·44	54·67				
	3684	+ 3 8	S	b + 0·3 a − 29·6	38 36·58	+ 1·51	38·09	S	b + 0·3 a − 3·7	45 31·20	+ 1·63	32·83	54·74				
	3690	+ 7 2	S	s Q + 1·60	39 28·79	+ 1·55	30·34	S	s Q + 1·60	46 23·41	+ 1·63	25·04	54·70				
	3696	+ 7 0	S		40 42·74	+ 1·55	44·29	S		47 37·37	+ 1·64	39·01	54·72				
	3708	+ 11 12	S		42 34·84	+ 1·60	36·44	S		49 29·51	+ 1·64	31·15	54·71				
	3718	− 8 14	S		43 55·38	+ 1·38	56·76	S		50 49·88	+ 1·62	51·50	54·74	m s 6 54·713	+ 0·008	+ 0·054	6 54·775
	3726	+ 1 41	S		45 41·91	+ 1·49	43·40	S		52 36·53	+ 1·63	38·16	54·76				
	3735	+ 26 9	N		47 48·67	+ 1·79	50·46	N		54 43·50	+ 1·67	45·17	54·71				
	3749	+ 1 24	S		49 10·06	+ 1·49	11·55	S		56 4·68	+ 1·63	6·31	54·76				
	3752	+ 1 6	S		49 39·37	+ 1·48	40·85	S		56 33·96	+ 1·63	35·59	54·74				
	3757	+ 41 6	N		52 22·05	+ 2·04	24·09	N		59 16·97	+ 1·71	18·68	54·59				
	3768	+ 4 17	S	Q − 1·60	54 3·04	− 1·68	1·36	S		11 0 54·46	+ 1·64	56·10	54·74				
Mar. 8	3776	+ 20 51	N	I. P. W.	10 55 36·33	− 1·48	34·85	N	I. P. W.	11 2 31·05	− 1·55	29·50	6 54·65				
	3782	+ 0 40	S	d c + 0·6	57 9·44	− 1·72	7·72	S	d c + 1·9	4 4·06	− 1·58	2·48	54·76				
	3788	+ 8 0	S	b + 0·3 a − 29·6	58 30·89	− 1·64	29·25	S	b + 0·3 a − 3·7	5 25·56	− 1·57	23·99	54·74				
	3795	+ 2 33	S	s Q − 1·60	11 0 6·59	− 1·70	4·89	S	s Q − 1·60	6 61·25	− 1·58	59·67	54·78				
	3798	+ 2 38	S		0 28·37	− 1·70	26·67	S		7 23·00	− 1·58	21·42	54·75				
	3816	− 0 40	S		2 47·44	− 1·74	45·70	S		9 42·06	− 1·58	40·48	54·78	m s 6 54·748	+ 0·008	+ 0·057	6 54·813
	3831	+ 20 49	N		7 3·87	− 1·48	2·39	N		13 58·65	− 1·55	57·10	54·71				
	3834	+ 21 13	N		7 24·49	− 1·48	23·01	N		14 19·28	− 1·55	17·73	54·72				
	3850	+ 2 42	S		10 48·14	− 1·70	46·44	S		17 42·80	− 1·58	41·22	54·78				
	3863	+ 7 19	S		14 58·14	− 1·65	56·49	S		21 52·82	− 1·57	51·25	54·76				
	3871	+ 7 16	S		16 44·28	− 1·65	42·63	S		23 39·00	− 1·57	37·43	54·80				

NOTE. $1^d = 0^s\cdot0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, ΔL — ρ.*

MADRAS (E), *Lat. 13° 4′, Long. 5ʰ 21ᵐ 8ˢ*: AND BOLARUM (W), *Lat. 17° 30′, Long. 5ʰ 14ᵐ 15ˢ.*

Astronomical Date	Star		Transits Observed at E — By Campbell, with Telescope No. 1					Transits Observed at W — By Heaviside, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0^s{\cdot}041$	ΔL − ρ
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 12	3663	− 1 5	S	*I. P. W.*	10 34 50·84	+ 1·31	52·15	S	*I. P. W.*	10 41 48·40	− 1·71	46·69	6 54·54				
	3671	+ 23 50	N	d c + 0·8	36 25·40	+ 1·81	27·21	N	d c 0·0	43 23·48	− 1·62	21·86	54·65				
	3684	+ 3 8	S	b − 0·8 *a* − 49·5	38 31·15	+ 1·39	32·54	S	b − 1·7 *a* − 8·4	45 28·85	− 1·69	27·16	54·62				
	3690	+ 7 2	S	s Q + 1·58	39 23·34	+ 1·46	24·80	S	s Q − 1·61	46 21·10	− 1·68	19·42	54·62				
	3696	+ 7 0	S		40 37·26	+ 1·46	38·72	S		47 35·02	− 1·68	33·34	54·62				
	3708	+ 11 12	S		42 29·36	+ 1·54	30·90	S		49 27·21	− 1·67	25·54	54·64				
	3718	− 8 14	S		43 49·98	+ 1·17	51·15	S		50 47·52	− 1·73	45·79	54·64				
	3726	+ 1 41	S		45 36·51	+ 1·36	37·87	S		52 34·20	− 1·70	32·50	54·63	m s 6 54·625	+ 0·007	+ 0·054	6 54·686
	3735	+ 26 9	N		47 43·09	+ 1·86	44·95	N		54 41·21	− 1·62	39·59	54·64				
	3749	+ 1 24	S		49 4·67	+ 1·35	6·02	S		56 2·37	− 1·70	0·67	54·65				
	3752	+ 1 6	S		49 34·01	+ 1·34	35·35	S		56 31·65	− 1·70	29·95	54·60				
	3757	+ 41 6	N		52 16·22	+ 2·28	18·50	N		59 14·73	− 1·55	13·18	54·68				
	3768	+ 4 17	S	Q − 1·58	53 57·62	− 1·75	55·87	S		11 0 52·15	− 1·69	50·46	54·59				
Mar. 12	3782	+ 0 40	S	*I. P. W.*	10 57 4·04	− 1·82	2·22	S	*I. P. W.*	11 3 55·31	+ 1·51	56·82	6 54·60				
	3788	+ 8 0	S	d c + 0·8	58 25·41	− 1·68	23·73	S	d c 0·0	5 16 81	+ 1·53	18·34	54·61				
	3795	+ 2 33	S	b − 0·8 *a* − 49·5	59 61·19	− 1·78	59·41	S	b − 1·7 *a* − 8·4	6 52·49	+ 1·52	54·01	54·60				
	3798	+ 2 38	S	s Q − 1·58	11 0 22·98	− 1·78	21·20	S	s Q + 1·61	7 14·22	+ 1·52	15·74	54·54				
	3816	− 0 40	S		2 42·07	− 1·84	40·23	S		9 33·30	+ 1·50	34·80	54·57				
	3831	+ 20 49	N		6 58·28	− 1·41	56·87	N		13 49·93	+ 1·58	51·51	54·64	m s 6 54·608	+ 0·007	+ 0·047	6 54·662
	3850	+ 2 42	S		10 42·73	− 1·78	40·95	S		17 34·05	+ 1·52	35·57	54·62				
	3863	+ 7 19	S		14 52·68	− 1·69	50·99	S		21 44·11	+ 1·53	45·64	54·65				
	3871	+ 7 16	S		16 38·90	− 1·69	37·21	S		23 30·32	+ 1·53	31·85	54·64				

Note. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, ΔL + ρ.*

MADRAS (E), *Lat.* 13° 4′, *Long.* 5h 21m 8s: AND BOLARUM (W), *Lat.* 17° 30′, *Long.* 5h 14m 15s.

Astronomical Date	Star		Transits Observed at E, By Campbell, with Telescope No. 1					Transits Observed at W, By Heaviside, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Peral. Equations $C_N - H_N = + 0^s.099$, $C_S - H_S = + 0^s.041$	ΔL + ρ
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 3	4039	+ 4 10	S	I. P. E.	11 45 7·52	+ 1·30	8·82	S	I. P. E.	11 52 1·80	+ 1·64	3·44	6 54·62				
	4049	+ 4 21	S	d c − 2·8	46 50·75	+ 1·30	52·05	S	d c − 0·4	53 45·03	+ 1·64	46·67	54·62				
	4055	+ 4 19	S	b − 5·0 a − 69·2	48 4·30	+ 1·30	5·60	S	b + 4·8 a − 12·8	54 58·59	+ 1·64	60·23	54·63				
	4072	+ 9 25	S	s Q + 1·71	52 8·40	+ 1·44	9·84	S	s Q + 1·61	59 2·73	+ 1·67	4·40	54·56	m s 6 54·607	+ 0·001	+ 0·041	6 54·649
	4079	+ 10 21	S		54 5·60	+ 1·46	7·06	S		12 0 59·97	+ 1·67	61·64	54·58				
	4094	+ 2 36	S		56 34·99	+ 1·25	36·24	S		3 29·26	+ 1·63	30·89	54·65				
	4104	+ 4 45	S		58 34·59	+ 1·31	35·90	S		5 28·84	+ 1·65	30·49	54·59				
Mar. 3	4114	+ 10 57	S	I. P. E.	12 0 25·28	− 1·94	23·34	S	I. P. E.	12 7 19·50	− 1·55	17·95	6 54·61				
	4119	− 5 2	S	d c − 2·8	1 12·79	− 2·37	10·42	S	d c − 0·4	8 6·67	− 1·64	5·03	54·61				
	4137	− 0 6	S	b − 5·0 a − 69·2	5 37·28	− 2·24	35·04	S	b + 4·8 a − 12·8	12 31·24	− 1·61	29·63	54·59				
	4145	+ 0 1	S	s Q − 1·71	6 52·08	− 2·24	49·84	S	s Q − 1·61	13 46·07	− 1·61	44·46	54·62	m s 6 54·597	+ 0·001	+ 0·049	6 54·647
	4156	+ 18 29	N		7 45·30	− 1·74	43·56	N		14 39·64	− 1·51	38·13	54·57				
	4168	+ 6 0	S		9 32·02	− 2·08	29·94	S		16 26·17	− 1·57	24·60	54·66				
	4211	− 15 49	S		16 45·63	− 2·66	42·97	S		23 39·19	− 1·70	37·49	54·52				
Mar. 5	4063	− 4 47	S	I. P. E.	11 50 29·18	+ 1·46	30·64	S	I. P. E.	11 57 26·79	− 1·64	25·15	6 54·51				
	4072	+ 9 25	S	d c − 1·3 b + 0·2	52 7·84	+ 1·63	9·47	S	d c − 0·7	59 5·61	− 1·63	3·98	54·51				
	4079	+ 10 21	S	a − 31·5	54 5·04	+ 1·64	6·68	S	b − 0·1 a − 2·3	12 1 2·87	− 1·63	1·24	54·56	m s 6 54·546	+ 0·001	+ 0·041	6 54·588
	4094	+ 2 36	S	s Q + 1·70	56 34·36	+ 1·55	35·91	S	s Q − 1·60	3 32·05	− 1·63	30·42	54·51				
	4104	+ 4 45	S	Q − 1·70	58 37·21	− 1·82	35·39	S		5 31·66	− 1·63	30·03	54·64				
Mar. 5	4114	+ 10 57	S	I. P. E.	12 0 24·62	− 1·75	22·87	S	I. P. E.	12 7 15·85	+ 1·58	17·43	6 54·56				
	4137	− 0 6	S	d c − 1·3	5 36·44	− 1·88	34·56	S	d c − 0·7	12 27·60	+ 1·57	29·17	54·61				
	4145	+ 0 1	S	b + 0·2 a − 31·5	6 51·30	− 1·89	49·41	S	b − 0·1 a − 2·3	13 42·44	+ 1·57	44·01	54·60	m s 6 54·577	+ 0·001	+ 0·049	6 54·627
	4156	+ 18 29	N	s Q − 1·70	7 44·76	− 1·66	43·10	N	s Q + 1·60	14 36·04	+ 1·59	37·63	54·53				
	4168	+ 6 0	S		9 31·29	− 1·81	29·48	S		16 22·52	+ 1·58	24·10	54·62				
	4179	− 9 47	S		11 15·60	− 2·00	13·60	S		18 6·63	+ 1·56	8·19	54·59				
	4211	− 15 49	S		16 44·60	− 2·08	42·52	S		23 35·50	+ 1·55	37·05	54·53				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

MADRAS (E), *Lat. 13° 4′, Long. 5h 21m 8s*; AND BOLARUM (W), *Lat. 17° 30′, Long. 5h 14m 15s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0^s{\cdot}041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s	m s			
Mar. 6	4021	+ 5 34	S	I. P. E.	11 40 57·07	+1·32	58·39	S	I. P. E.	11 47 51·54	+1·61	53·15	6 54·76				
	4039	+ 4 10	S	d: c − 4·0	45 6·72	+1·30	8·02	S	d: c − 0·1	52 1·18	+1·61	2·79	54·77				
	4049	+ 4 21	S	b − 2·5, a −43·9	46 49·99	+1·30	51·29	S	b + 0·6, a + 0·6	53 44·42	+1·61	46·03	54·74				
	4055	+ 4 19	S	s: Q + 1·60	48 3·56	+1·30	4·86	S	s: Q + 1·60	54 57·95	+1·61	59·56	54·70				
	4063	− 4 47	S		50 29·10	+1·15	30·25	S		57 23·38	+1·61	24·99	54·74	6 54·712	+ 0·001	+ 0·041	6 54·754
	4072	+ 9 25	S		52 7·70	+1·39	9·09	S		59 2·15	+1·61	3·76	54·67				
	4079	+10 21	S		54 4·95	+1·40	6·35	S		12 0 59·42	+1·61	61·03	54·68				
	4094	+ 2 36	S		56 34·30	+1·27	35·57	S		3 28·62	+1·61	30·23	54·66				
	4104	+ 4 45	S	Q − 1·60	58 37·03	−1·88	35·15	S		5 28·23	+1·61	29·84	54·69				
Mar. 6	4114	+10 57	S	I. P. E.	12 0 24·35	−1·78	22·57	S	I. P. E	12 7 18·89	−1·58	17·31	6 54·74				
	4137	− 0 6	S	d: c − 4·0	5 36·23	−1·97	34·26	S	d: c − 0·1	12 30·58	−1·58	29·00	54·74				
	4145	+ 0 1	S	b − 2·5, a −43·9	6 51·09	−1·96	49·13	S	b + 0·6, a + 0·6	13 45·40	−1·58	43·82	54·69				
	4156	+18 29	N	s: Q − 1·60	7 44·43	−1·65	42·78	N	s: Q − 1·60	14 38·97	−1·58	37·39	54·61	6 54·687	+ 0·001	+ 0·049	6 54·737
	4168	+ 6 0	S		9 31·08	−1·86	29·22	S		16 25·51	−1·58	23·93	54·71				
	4179	− 9 47	S		11 15·41	−2·12	13·29	S		18 9·58	−1·58	8·00	54·71				
	4211	−15 49	S		16 44·51	−2·24	42·27	S		23 38·46	−1·58	36·88	54·61				
Mar. 7	4006	− 4 39	S	I. P. W.	11 37 55·52	+1·51	57·03	S	I. P. W.	11 44 53·30	−1·66	51·64	6 54·61				
	4021	+ 5 34	S	d: c + 1·0	40 56·49	+1·61	58·10	S	d: c + 1·2	47 54·36	−1·62	52·74	54·64				
	4039	+ 4 10	S	b + 2·2, a −22·8	45 6·10	+1·60	7·70	S	b − 0·4, a − 8·8	52 4·06	−1·63	2·43	54·73				
	4049	+ 4 21	S	s: Q + 1·60	46 49·38	+1·60	50·98	S	s: Q − 1·60	53 47·30	−1·63	45·67	54·69				
	4055	+ 4 19	S		48 2·91	+1·60	4·51	S		54 60·83	−1·63	59·20	54·69	6 54·676	+ 0·002	+ 0·041	6 54·719
	4063	− 4 47	S		50 28·43	+1·52	29·95	S		57 26·28	−1·66	24·62	54·67				
	4072	+ 9 25	S		52 7·09	+1·65	8·74	S		59 5·04	−1·61	3·43	54·69				
	4079	+10 21	S		54 4·32	+1·65	5·97	S		12 1 2·27	−1·61	0·66	54·69				
	4094	+ 2 36	S		56 33·61	+1·58	35·19	S		3 31·49	−1·64	29·85	54·66				
	4104	+ 4 45	S	Q − 1·60	58 36·36	−1·60	34·76	S		5 31·08	−1·63	29·45	54·69				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

MADRAS (E), *Lat.* 13° 4′, *Long.* 5h 21m 8s: AND **BOLARUM** (W), *Lat.* 17° 30′, *Long.* 5h 14m 15s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	E: Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	W: Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference of Corrected Times (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Peral. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0.041$	$\Delta L + \rho$
Transits Observed at E: *By Campbell, with Telescope No. 1*								Transits Observed at W: *By Heaviside, with Telescope No. 2*									
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 7	4114	+ 10 57	S	*I. P. W.*	12 0 23·76	− 1·55	22·21	S	*I. P. W.*	12 7 15·34	+ 1·61	16·95	6 54·74				
	4137	− 0 6	S	d; c + 1·0	5 35·55	− 1·65	33·90	S	d; c + 1·2	12 27·10	+ 1·56	28·66	54·76				
	4145	+ 0 1	S	b + 2·2; a − 22·8	6 50·40	− 1·65	48·75	S	b − 0·4; a − 8·8	13 41·93	+ 1·56	43·49	54·74				
	4156	+ 18 29	N	s; Q − 1·60	7 43·87	− 1·48	42·39	N	s; Q + 1·60	14 35·46	+ 1·63	37·09	54·70	m s 6 54·741	+ 0·002	+ 0·049	6 54·792
	4168	+ 6 0	S		9 30·43	− 1·60	28·83	S		16 22·01	+ 1·59	23·60	54·77				
	4179	− 9 47	S		11 14·69	− 1·73	12·96	S		18 6·13	+ 1·54	7·67	54·71				
	4211	− 15 49	S		16 43·68	− 1·79	41·89	S		23 35·15	+ 1·51	36·66	54·77				
Mar. 8	4006	− 4 39	S	*I. P. W.*	11 37 55·12	+ 1·41	56·53	S	*I. P. W.*	11 44 49·71	+ 1·59	51·30	6 54·77				
	4021	+ 5 34	S	d; c + 0·6	40 56·05	+ 1·52	57·57	S	d; c + 1·9	47 50·79	+ 1·60	52·39	54·82				
	4039	+ 4 10	S	b + 0·3; a − 29·6	45 5·73	+ 1·50	7·23	S	b − 1·1; a − 3·7	52 0·43	+ 1·60	2·03	54·80				
	4049	+ 4 21	S	s; Q + 1·59	46 48·97	+ 1·51	50·48	S	s; Q + 1·61	53 43·71	+ 1·60	45·31	54·83				
	4055	+ 4 19	S		48 2·56	+ 1·51	4·07	S		54 57·22	+ 1·60	58·82	54·75	m s 6 54·819	+ 0·002	+ 0·041	6 54·862
	4063	− 4 47	S		50 27·96	+ 1·40	29·36	S		57 22·65	+ 1·59	24·24	54·88				
	4079	+ 10 21	S		54 3·87	+ 1·57	5·44	S		12 0 58·67	+ 1·61	60·28	54·84				
	4094	+ 2 36	S		56 33·18	+ 1·49	34·67	S		3 27·89	+ 1·60	29·49	54·82				
	4104	+ 4 45	S	Q − 1·59	58 35·89	− 1·66	34·23	S		5 27·49	+ 1·60	29·09	54·86				
Mar. 8	4114	+ 10 57	S	*I. P. W.*	12 0 23·34	− 1·59	21·75	S	*I. P. W.*	12 7 18·15	− 1·60	16·55	6 54·80				
	4137	− 0 6	S	d; c + 0·6	5 35·17	− 1·72	33·45	S	d; c + 1·9	12 29·83	− 1·61	28·22	54·77				
	4145	+ 0 1	S	b + 0·3; a − 29·6	6 49·99	− 1·72	48·27	S	b − 1·1; a − 3·7	13 44·68	− 1·61	43·07	54·80				
	4156	+ 18 29	N	s; Q − 1·59	7 43·41	− 1·50	41·91	N	s; Q − 1·61	14 38·28	− 1·59	36·69	54·78				
	4168	+ 6 0	S		9 30·01	− 1·65	28·36	S		16 24·78	− 1·61	23·17	54·81	m s 6 54·800	+ 0·002	+ 0·048	6 54·850
	4179	− 9 47	S		11 14·28	− 1·82	12·46	S		18 8·90	− 1·62	7·28	54·82				
	4200	− 3 56	S		14 46·14	− 1·76	44·38	S		21 40·77	− 1·62	39·15	54·77				
	4211	− 15 49	S		16 43·29	− 1·90	41·39	S		23 37·87	− 1·63	36·24	54·85				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

MADRAS (E), *Lat.* 13° 4′, *Long.* $5^h\ 21^m\ 8^s$: AND BOLARUM (W), *Lat.* 17° 30′, *Long.* $5^h\ 14^m\ 15^s$.

Astronomical Date	Star		Transits Observed at E — *By Campbell, with Telescope No. 1*					Transits Observed at W — *By Heaviside, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $O_N - H_N = +0^s\cdot099$, $C_S - H_S = +0^s\cdot041$	$\Delta L + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 12	4006	− 4 39	S	*I. P. W.*	11 37 58·34	+1·22	59·56	S	*I. P. W.*	11 44 55·85	−1·72	54·13	6 54·57				
	4021	+ 5 34	S	d: c + 0·8	40 59·22	+1·42	60·64	S	d: c 0·0	47 56·96	−1·69	55·27	54·63				
	4039	+ 4 10	S	b − 0·8, a −49·5	45 8·87	+1·39	10·26	S	b − 1·7, a − 8·4	52 6·59	−1·70	4·89	54·63				
	4049	+ 4 21	S	s: Q +1·56	46 52·14	+1·39	53·53	S	s: Q −1·61	53 49·86	−1·69	48·17	54·64				
	4055	+ 4 19	S		48 5·67	+1·39	7·06	S		55 3·37	−1·70	1·67	54·61	m s 6 54·612	− 0·004	+ 0·041	6 54·649
	4068	− 4 47	S		50 31·25	+1·22	32·47	S		57 28·77	−1·72	27·05	54·58				
	4072	+ 9 25	S		52 9·79	+1·49	11·28	S		59 7·60	−1·67	5·93	54·65				
	4079	+10 21	S		54 7·08	+1·51	8·59	S		12 1 4·80	−1·67	3·13	54·54				
	4094	+ 2 36	S		56 36·39	+1·36	37·75	S		3 34·05	−1·70	32·35	54·60				
	4104	+ 4 45	S	Q −1·56	58 39·01	−1·72	37·29	S		5 33·65	−1·69	31·96	54·67				
Mar. 12	4114	+10 57	S	*I. P. W.*	12 0 26·32	−1·60	24·72	S	*I. P. W.*	12 7 17·86	+1·55	19·41	6 54·69				
	4137	− 0 6	S	d: c + 0·8	5 38·22	−1·81	36·41	S	d: c 0·0	12 29·57	+1·51	31·08	54·67				
	4145	+ 0 1	S	b − 0·8, a −49·5	6 53·10	−1·81	51·29	S	b − 1·7, a − 8·4	13 44·39	+1·51	45·90	54·61				
	4156	+18 29	N	s: Q −1·56	7 46·37	−1·44	44·93	N	s: Q +1·61	14 38·03	+1·57	39·60	54·67	m s 6 54·653	− 0·004	+ 0·048	6 54·697
	4168	+ 6 0	S		9 33·06	−1·70	31·36	S		16 24·47	+1·53	26·00	54·64				
	4179	− 9 47	S		11 17·42	−1·99	15·43	S		18 8·64	+1·49	10·13	54·70				
	4200	− 3 56	S		14 49·27	−1·89	47·38	S		21 40·50	+1·50	42·00	54·62				
	4211	−15 49	S		16 46·50	−2·11	44·39	S		23 37·54	+1·47	39·01	54·62				

NOTE. $1^d = 0^s\cdot0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

MADRAS (E), *Lat.* 13° 4′, *Long.* 5ʰ 21ᵐ 8ˢ: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5ʰ 7ᵐ 52ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = + 0^s{\cdot}099$, $C_S - H_S = + 0{\cdot}041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 22	4006	− 4 39	S	I. P. W.	11 44 14·94	+0·81	15·75	S	I. P. E.	11 57 33·68	−1·43	32·25	13 16·50				
	4014	+16 8	N	d c + 0·5	45 55·42	+1·47	56·89	N	d c − 4·7	59 15·38	−1·93	13·45	16·56				
	4031	+16 20	N	b − 1·5 a −80·7	48 50·48	+1·48	51·96	N	b − 8·3 a +57·7	12 2 10·46	−1·93	8·53	16·57				
	4039	+ 4 10	S	s Q +1·39	51 25·36	+1·10	26·46	S	s Q −1·60	4 44·63	−1·64	42·99	16·53				
	4049	+ 4 21	S		53 8·62	+1·09	9·71	S		6 27·93	−1·64	26·29	16·58	m s 13 16·544	+ 0·013	+ 0·054	13 16·611
	4072	+ 9 25	S		58 26·26	+1·25	27·51	S		11 45·82	−1·77	44·05	16·54				
	4079	+10 21	S		12 0 23·43	+1·28	24·71	S		13 43·05	−1·78	41·27	16·56				
	4094	+ 2 36	S		2 52·88	+1·04	53·92	S		16 12·07	−1·60	10·47	16·55				
	4104	+ 4 45	S	Q − 1·39	4 55·23	−1·68	53·55	S		18 11·72	−1·66	10·06	16·51				
Mar. 22	4114	+10 57	S	I. P. W.	12 6 42·47	−1·48	40·99	S	I. P. E.	12 19 56·11	+1·40	57·51	13 16·52				
	4125	+15 35	N	d c + 0·5	9 17·74	−1·34	16·40	N	d c − 4·7	22 31·56	+1·29	32·85	16·45				
	4137	− 0 6	S	b − 1·5 a − 80·7	11 54·52	−1·83	52·69	S	b − 8·3 a + 57·7	25 7·54	+1·66	9·20	16·51	m s 13 16·483	+ 0·013	+ 0·060	13 16·556
	4145	+ 0 1	S	s Q − 1·39	13 9·35	−1·83	7·52	S	s Q + 1·60	26 22·35	+1·65	24·00	16·48				
	4156	+18 29	N		14 2·41	−1·23	1·18	N		27 16·42	+1·21	17·63	16·45				
	4211	−15 49	S		23 2·94	−2·33	0·61	S		36 15·08	+2·02	17·10	16·49				
Mar. 24	4006	− 4 39	S	I. P. W.	11 44 11·94	+0·83	12·77	S	I. P. E.	11 57 27·73	+1·52	29·25	13 16·48				
	4014	+16 8	N	d c + 0·9	45 52·45	+1·53	53·98	N	d c − 4·5	59 8·88	+1·57	10·45	16·47				
	4031	+16 20	N	b + 0·5 a − 85·8	48 47·49	+1·54	49·03	N	b − 1·8 a − 5·5	12 2 3·97	+1·57	5·54	16·51				
	4072	+ 9 25	S	s Q + 1·39	58 23·24	+1·30	24·54	S	s Q + 1·63	11 39·55	+1·55	41·10	16·56	m s 13 16·496	+ 0·014	+ 0·058	13 16·568
	4079	+10 21	S		12 0 20·45	+1·33	21·78	S		13 36·68	+1·55	38·23	16·45				
	4094	+ 2 36	S		2 49·90	+1·07	50·97	S		16 5·91	+1·54	7·45	16·48				
	4104	+ 4 45	S	Q − 1·39	4 52·21	−1·63	50·58	S		18 5·55	+1·55	7·10	16·52				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

MADRAS (E), *Lat.* 13° 4′, *Long.* 5h 21m 8s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0.041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 24	4114	+10 57	S	*I. P. W.*	12 6 39·44	−1·42	38·02	S	*I. P. E.*	12 19 56·17	−1·70	54·47	13 16·45				
	4125	+15 35	N	d c + 0·9	9 14·73	−1·27	13·46	N	d c − 4·5	22 31·61	−1·69	29·92	16·46				
	4137	− 0 6	S	b + 0·5 a − 85·8	11 51·50	−1·80	49·70	S	b − 1·8 a − 5·5	25 7·92	−1·73	6·19	16·49				
	4145	+ 0 1	S	s Q − 1·39	13 6·36	−1·80	4·56	S	s Q − 1·63	26 22·72	−1·73	20·99	16·43				
	4156	+18 29	N		13 59·42	−1·16	58·26	N		27 16·41	−1·69	14·72	16·46	m s 13 16·448	+ 0·014	+ 0·058	13 16·520
	4168	+ 6 0	S		15 46·26	−1·60	44·66	S		29 2·80	−1·71	1·09	16·43				
	4179	− 9 47	S		17 30·86	−2·11	28·75	S		30 46·95	−1·75	45·20	16·45				
	4184	+24 37	N		18 32·98	−0·92	32·06	N		31 50·23	−1·68	48·55	16·49				
	4200	− 3 56	S		21 2·61	−1·93	0·68	S		34 18·83	−1·74	17·09	16·41				
	4211	−15 49	S		22 60·01	−2·33	57·68	S		36 15·86	−1·77	14·09	16·41				
Mar. 26	4079	+10 21	S	*I. P. W.*	12 0 17·37	+1·30	18·67	S	*I. P. W.*	12 13 36·58	−1·37	35·21	13 16·54	m s 13 16·540	+ 0·014	+ 0·041	13 16·595
	4104	+ 4 45	S	d c + 0·5 b + 0·3 a − 89·1 s Q ± 1·38†	4 49·13	−1·65	47·48	S	d c + 3·7 b + 5·0 a + 29·7 s Q − 1·62	18 5·33	−1·31	4·02	16·54				
Mar. 26	4114	+10 57	S	*I. P. W.*	12 6 36·37	−1·43	34·94	S	*I. P. W.*	12 19 49·60	+1·87	51·47	13 16·53				
	4125	+15 35	N	d c + 0·5	9 11·64	−1·27	10·37	N	d c + 3·7	22 25·04	+1·82	26·86	16·49				
	4145	+ 0 1	S	b + 0·3 a − 89·1	13 3·27	−1·82	1·45	S	b + 5·0 a + 29·7	26 15·95	+1·99	17·94	16·49				
	4156	+18 29	N	s Q − 1·38	13 56·32	−1·16	55·16	N	s Q + 1·62	27 9·93	+1·79	11·72	16·56	m s 13 16·540	+ 0·014	+ 0·063	13 16·617
	4168	+ 6 0	S		15 43·15	−1·61	41·54	S		28 56·18	+1·93	58·11	16·57				
	4184	+24 37	N		18 29·91	−0·91	29·00	N		31 43·71	+1·72	45·43	16·43				
	4200	− 3 56	S		20 59·49	−1·95	57·54	S		34 12·11	+2·04	14·15	16·61				
	4211	−15 49	S		22 56·93	−2·37	54·56	S		36 9·03	+2·17	11·20	16·64				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at E after the observation of star 4079.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

MADRAS (E), *Lat.* 13° 4′, *Long.* 5h 21m 8s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Campbell, with Telescope No. 1: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W, By Heaviside, with Telescope No. 2: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 29	4079	+10 21	S	*I. P. E.*	12 0 12·62	+1·24	13·86	S	*I. P. W.*	12 13 28·49	+1·94	30·43	13 16·57				
	4094	+ 2 36	S	d c − 3·9	2 41·93	+1·16	43·09	S	d c + 4·5	15 57·54	+2·16	59·70	16·61	m s 13 16·583	+ 0·015	+ 0·041	13 16·639
	4104	+ 4 45	S	b − 0·6 a −28·8	4 44·27	−1·57	42·70	S	b + 3·1 a +74·5	17 57·17	+2·10	59·27	16·57				
				s Q ±1·38†					s Q + 1·62								
Mar. 29	4125	+15 35	N	*I. P. E.*	12 9 7·09	−1·45	5·64	N	*I. P. W.*	12 22 23·56	−1·45	22·11	13 16·47				
	4145	+ 0 1	S	d c − 3·9	12 58·36	−1·62	56·74	S	d c + 4·5	26 14·29	−1·01	13·28	16·54				
	4156	+18 29	N	b − 0·6 a −28·8	13 51·81	−1·41	50·40	N	b + 3·1 a +74·5	27 8·46	−1·55	6·91	16·51				
	4168	+ 6 0	S	s Q −1·38	15 38·36	−1·56	36·80	S	s Q −1·62	28 54·50	−1·19	53·31	16·51	m s 13 16·527	+ 0·015	+ 0·066	13 16·608
	4184	+24 37	N		18 25·56	−1·34	24·22	N		31 42·45	−1·73	40·72	16·50				
	4200	− 3 56	S		20 54·49	−1·67	52·82	S		34 10·28	−0·90	9·38	16·56				
	4211	−15 49	S		22 51·64	−1·80	49·84	S		36 7·00	−0·56	6·44	16·60				
Mar. 30	4039	+ 4 10	S	*I. P. E.*	11 51 12·82	+1·16	13·98	S	*I. P. W.*	12 4 31·77	−1·24	30·53	13 16·55				
	4049	+ 4 21	S	d c − 4·3	52 56·09	+1·16	57·25	S	d c + 3·7	6 14·98	−1·24	13·74	16·49				
	4055	+ 4 19	S	b − 0·5 a −33·6	54 9·67	+1·16	10·83	S	b − 3·8 a +87·5	7 28·48	−1·24	27·24	16·41				
	4072	+ 9 25	S	s Q +1·38	58 13·80	+1·23	15·03	S	s Q −1·62	11 32·94	−1·42	31·52	16·49	m s 13 16·464	+ 0·015	+ 0·041	13 16·520
	4079	+10 21	S		12 0 11·04	+1·24	12·28	S		13 30·13	−1·45	28·68	16·40				
	4094	+ 2 36	S		2 40·36	+1·14	41·50	S		15 59·14	−1·18	57·96	16·46				
	4104	+ 4 45	S	Q −1·38	4 42·66	−1·60	41·06	S		17 58·77	−1·26	57·51	16·45				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of *Q* was changed at E after the observation of star 4094.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, ΔL — ρ.*

MADRAS (E), *Lat.* 13° 4′, *Long.* 5h 21m 8s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Peral. Equations $O_N - H_N = +0^s.099$, $C_S - H_S = +0^s.041$	ΔL − ρ
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 30	4114	+ 10 57	S	*I. P. E.*	12 6 30·06	− 1·52	28·54	S	*I. P. W.*	12 19 43·20	+ 1·76	44·96	13 16·42				
	4125	+ 15 35	N	d c − 4·3	9 5·45	− 1·46	3·99	N	d c + 3·7	22 18·74	+ 1·61	20·35	16·36				
	4137	− 0 6	S	b − 0·5 a − 33·6	11 41·94	− 1·66	40·28	S	b − 3·8 a + 87·5	24 54·55	+ 2·15	56·70	16·42				
	4145	+ 0 1	S	s Q − 1·38	12 56·75	− 1·66	55·09	S	s Q + 1·62	26 9·37	+ 2·15	11·52	16·43				
	4156	+ 18 29	N		13 50·19	− 1·42	48·77	N		27 3·66	+ 1·50	5·16	16·39	m s 13 16·410	+ 0·015	+ 0·058	13 16·483
	4168	+ 6 0	S		15 36·78	− 1·58	35·20	S		28 49·70	+ 1·94	51·64	16·44				
	4179	− 9 47	S		17 21·10	− 1·79	19·31	S		30 33·24	+ 2·47	35·71	16·40				
	4184	+ 24 37	N		18 23·94	− 1·33	22·61	N		31 37·68	+ 1·27	38·95	16·34				
	4200	− 3 56	S		20 52·92	− 1·71	51·21	S		34 5·38	+ 2·28	7·66	16·45				
	4211	− 15 49	S		22 50·11	− 1·87	48·24	S		36 2·00	+ 2·69	4·69	16·45				
Mar. 31	4006	− 4 39	S	*I. P. E.*	11 44 0·38	+ 1·29	1·67	S	*I. P. W.*	11 57 15·77	+ 2·46	18·23	13 16·56				
	4014	+ 16 8	N	d c + 0·8	45 41·30	+ 1·52	42·82	N	d c + 4·0	58 57·72	+ 1·56	59·28	16·46				
	4031	+ 16 20	N	b + 3·5 a − 26·8	48 36·40	+ 1·52	37·92	N	b − 4·4 a + 108·5	12 1 52·82	+ 1·56	54·38	16·46				
	4039	+ 4 10	S	s Q + 1·38	51 11·04	+ 1·39	12·43	S	s Q + 1·62	4 26·86	+ 2·08	28·94	16·51				
	4055	+ 4 19	S		54 7·89	+ 1·39	9·28	S		7 23·61	+ 2·08	25·69	16·41	m s 13 16·466	+ 0·015	+ 0·054	13 16·535
	4072	+ 9 25	S		58 12·06	+ 1·44	13·50	S		11 28·04	+ 1·86	29·90	16·40				
	4079	+ 10 21	S		12 0 9·28	+ 1·45	10·73	S		13 25·31	+ 1·82	27·13	16·40				
	4094	+ 2 36	S		2 38·53	+ 1·37	39·90	S		15 54·29	+ 2·16	56·45	16·55				
	4104	+ 4 45	S	Q − 1·38	4 40·90	− 1·37	39·53	S		17 53·92	+ 2·05	55·97	16·44				
Mar. 31	4114	+ 10 57	S	*I. P. E.*	12 6 28·31	− 1·30	27·01	S	*I. P. W.*	12 19 44·89	− 1·44	43·45	13 16·44				
	4125	+ 15 35	N	d c + 0·8	9 3·68	− 1·26	2·42	N	d c + 4·0	22 20·43	− 1·64	18·79	16·37				
	4137	− 0 6	S	b + 3·5 a − 26·8	11 40·12	− 1·42	38·70	S	b − 4·4 a + 108·5	24 56·14	− 0·98	55·16	16·46				
	4145	+ 0 1	S	s Q − 1·38	12 54·98	− 1·43	53·55	S	s Q − 1·62	26 10·99	− 0·98	10·01	16·46				
	4156	+ 18 29	N		13 48·47	− 1·22	47·25	N		27 5·38	− 1·78	3·60	16·35	m s 13 16·437	+ 0·015	+ 0·054	13 16·506
	4168	+ 6 0	S		15 34·99	− 1·36	33·63	S		28 51·32	− 1·24	50·08	16·45				
	4179	− 9 47	S		17 19·30	− 1·53	17·77	S		30 34·78	− 0·57	34·21	16·44				
	4200	− 3 56	S		20 51·12	− 1·47	49·65	S		34 6·87	− 0·81	6·06	16·41				
	4211	− 15 49	S		22 48·26	− 1·59	46·67	S		36 3·52	− 0·30	3·22	16·55				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

MADRAS (E), *Lat. 13° 4′, Long. 5h 21m 8s*: AND BELLARY (W), *Lat. 15° 9′, Long. 5h 7m 52s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0.041$	$\Delta L - \rho$
1876 Apl. 2	4006	− 4 39	S	*I. P. E.*	11 43 57·24	+ 1·21	58·45	S	*I. P. E.*	11 57 12·93	+ 1·97	14·90	13 16·45				
	4014	+ 16 8	N	d c + 0·2	45 38·10	+ 1·50	39·60	N	d c − 4·9	58 54·38	+ 1·65	56·03	16·43				
	4021	+ 5 34	S	b + 3·2 a − 34·0	46 58·21	+ 1·35	59·56	S	b + 7·5 a + 40·5	12 0 14·14	+ 1·82	15·96	16·40				
	4031	+ 16 20	N	s	48 33·17	+ 1·50	34·67	N	s	1 49·46	+ 1·65	51·11	16·44				
	4039	+ 4 10	S	Q + 1·37	51 7·87	+ 1·33	9·20	S	Q + 1·61	4 23·79	+ 1·84	25·63	16·43	m s 13 16·429	+ 0·015	+ 0·053	13 16·497
	4049	+ 4 21	S		52 51·09	+ 1·33	52·42	S		6 7·03	+ 1·84	8·87	16·45				
	4055	+ 4 19	S		54 4·65	+ 1·33	5·98	S		7 20·57	+ 1·84	22·41	16·43				
	4072	+ 9 25	S		58 8·83	+ 1·40	10·23	S		11 24·89	+ 1·76	26·65	16·42				
	4094	+ 2 36	S		12 2 35·37	+ 1·30	36·67	S		15 51·25	+ 1·86	53·11	16·44				
	4104	+ 4 45	S	Q − 1·37	4 37·72	− 1·41	36·31	S		17 50·88	+ 1·83	52·71	16·40				
Apl. 2	4114	+ 10 57	S	*I. P. E.*	12 6 25·09	− 1·32	23·77	S	*I. P. E.*	12 19 41·66	− 1·50	40·16	13 16·39				
	4125	+ 15 35	N	d c + 0·2	8 60·44	− 1·26	59·18	N	d c − 4·9	22 17·10	− 1·57	15·53	16·35				
	4137	− 0 6	S	b + 3·2 a − 34·0	11 36·95	− 1·47	35·48	S	b + 7·5 a + 40·5	24 53·17	− 1·33	51·84	16·36				
	4145	+ 0 1	S	s Q − 1·37	12 51·79	− 1·47	50·32	S	s Q − 1·62	26 8·02	− 1·33	6·69	16·37	m s 13 16·389	+ 0·015	+ 0·058	13 16·462
	4156	+ 18 29	N		13 45·18	− 1·21	43·97	N		27 2·04	− 1·62	0·42	16·45				
	4179	− 9 47	S		17 16·11	− 1·60	14·51	S		30 32·05	− 1·19	30·86	16·35				
	4211	− 15 49	S		22 45·14	− 1·68	43·46	S		35 61·01	− 1·10	59·91	16·45				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

MADRAS (E), *Lat.* 13° 4′, *Long.* 5h 21m 8s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0^s.041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar.22	4438	+41 31	S	*I. P. W.*	12 56 53·76	+2·52	56·28	S	*I. P. E.*	13 10 15·54	−2·67	12·87	13 16·59	m s 13 16·600	+ 0·068	+ 0·041	13 16·709
	4446	+ 6 8	S	d c + 0·5 b − 1·5 a − 80·7 s Q + 1·39	58 17·50	+1·15	18·65	S	d c − 4·7 b − 5·6 a + 57·7 s Q − 1·60	11 36·89	−1·63	35·26	16·61				
Mar.22	4570	+ 4 10	S	*I. P. W.*	13 23 49·24	−1·68	47·56	S	*I. P. E.*	13 37 2·53	+1·62	4·15	13 16·59				
	4578	− 7 1	S	d	25 26·69	−2·04	24·65	S	d	38 39·37	+1·88	41·25	16·60				
	4600	+39 10	N	c + 0·5 b − 1·5 a − 80·7	28 37·65	−0·38	37·27	N	c − 4·7 b − 5·6 a + 57·7	41 53·18	+0·63	53·81	16·54				
	4615	+16 25	N	s	30 29·02	−1·30	27·72	N	s	43 42·92	+1·33	44·25	16·53	m s 13 16·554	+ 0·068	+ 0·085	13 16·707
	4627	+35 23	N	Q − 1·39	32 34·99	−0·56	34·43	N	Q + 1·60	45 50·21	+0·77	50·98	16·55				
	4628	+35 17	N		32 39·74	−0·57	39·17	N		45 54·89	+0·77	55·66	16·49				
	4632	+35 4	N		33 18·13	−0·58	17·55	N		46 33·31	+0·79	34·10	16·55				
	4648	+19 1	N		35 45·94	−1·21	44·73	N		49 0·04	+1·27	1·31	16·58				
Mar.24	4462	+ 5 29	S	*I. P. W.*	13 0 59·60	+1·17	60·77	S	*I. P. E.*	13 14 15·73	+1·58	17·31	13 16·54				
	4472	+ 5 48	S	d c + 0·9	2 36·15	+1·17	37·32	S	d c − 4·5	15 52·22	+1·58	53·80	16·48	m s 13 16·553	+ 0·072	+ 0·056	13 16·681
	4526	+25 0	N	b + 0·5 a − 85·8	13 36·78	+1·87	38·65	N	b + 3·4 a − 5·5	26 53·56	+1·62	55·18	16·53				
	4532	+ 0 2	S	s Q ± 1·39†	15 6·89	−1·80	5·09	S	s Q + 1·63	28 20·18	+1·57	21·75	16·66				
Mar.24	4552	+36 56	N	*I. P. W.*	13 18 40·69	−0·36	40·33	N	*I. P. E.*	13 31 58·54	−1·61	56·93	13 16·60				
	4565	− 8 5	S	d c + 0·9	21 50·81	−2·05	48·76	S	d c − 4·5	35 6·98	−1·71	5·27	16·51				
	4570	+ 4 10	S	b + 0·5 a − 85·8	23 34·00	−1·65	32·35	S	b + 3·4 a − 5·5	36 50·50	−1·69	48·81	16·46				
	4578	− 7 1	S	s Q − 1·39	25 11·42	−2·03	9·39	S	s Q − 1·63	38 27·65	−1·71	25·94	16·55	m s 13 16·525	+ 0·072	+ 0·077	13 16·674
	4600	+39 10	N		28 22·35	−0·25	22·10	N		41 40·22	−1·61	38·61	16·51				
	4627	+35 23	N		32 19·65	−0·45	19·20	N		45 37·34	−1·62	35·72	16·52				
	4628	+35 17	N		32 24·39	−0·45	23·94	N		45 42·06	−1·62	40·44	16·50				
	4648	+19 1	N		35 30·66	−1·14	29·52	N		48 47·72	−1·65	46·07	16·55				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at E after the observation of star 4526.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

MADRAS (E), *Lat.* 13° 4′, *Long.* 5h 21m 8s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Campbell, with Telescope No. 1: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W, By Heaviside, with Telescope No. 2: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = + 0^s.099$, $C_S - H_S = + 0.041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 26	4438	+41 31	S	I. P. W.	12 56 22·14	+2·69	24·83	S	I. P. W.	13 9 42·88	−1·75	41·13	13 16·30				
	4462	+ 5 29	S	d c + 0·5	13 0 43·42	+1·13	44·55	S	d c + 3·7	14 2·42	−1·29	1·13	16·58				
	4472	+ 5 48	S	b + 0·3 a −89·1	2 19·95	+1·14	21·09	S	b + 5·8 a +29·7	15 38·96	−1·30	37·66	16·57				
	4477	− 4 16	S	s Q +1·38	3 19·05	+0·80	19·85	S	s Q −1·62	16 37·56	−1·18	36·38	16·53	m s 13 16·541	+ 0·073	+ 0·041	13 16·655
	4492	−12 4	S		6 36·03	+0·54	36·57	S		19 54·28	−1·10	53·18	16·61				
	4496	− 0 11	S		8 20·75	+0·94	21·69	S		21 39·48	−1·23	38·25	16·56				
	4504	+11 28	S		9 29·59	+1·34	30·93	S		22 48·90	−1·36	47·54	16·61				
	4516	− 5 37	S		11 56·75	+0·75	57·50	S		25 15·24	−1·17	14·07	16·57				
Mar. 26	4615	+16 25	N	I. P. W.	13 29 57·55	−1·23	56·32	N	I. P. W.	13 43 10·99	+1·83	12·82	13 16·50	m s 13 16·495	+ 0·073	+ 0·099	13 16·667
	4648	+19 1	N	d c + 0·5 b + 0·3 a −89·1 s Q −1·38	35 14·49	−1·14	13·35	N	d c + 3·7 b + 5·8 a +29·7 s Q +1·62	48 28·04	+1·80	29·84	16·49				
Mar. 30	4472	+ 5 48	S	I. P. E.	13 1 48·78	+1·17	49·95	S	I. P. W.	13 15 7·64	−1·29	6·35	13 16·40				
	4477	− 4 16	S	d c − 4·3	2 47·54	+1·05	48·59	S	d c + 3·7	16 6·04	−0·95	5·09	16·50				
	4478	− 4 31	S	b − 0·5 a −33·6	4 0·13	+1·05	1·18	S	b − 3·0 a + 87·5	17 18·62	−0·94	17·68	16·50				
	4492	−12 4	S	s Q +1·38	6 4·43	+0·94	5·37	S	s Q − 1·63	19 22·55	−0·68	21·87	16·50				
	4496	− 0 11	S		7 49·41	+1·10	50·51	S		21 8·00	−1·08	6·92	16·41	m s 13 16·457	+ 0·072	+ 0·047	13 16·576
	4504	+11 28	S		8 58·53	+1·25	59·78	S		22 17·68	−1·48	16·20	16·42				
	4508	− 5 50	S		9 51·76	+1·03	52·79	S		23 10·18	−0·89	9·29	16·50				
	4516	− 5 37	S		11 25·32	+1·03	26·35	S		24 43·67	−0·90	42·77	16·42				
	4526	+25 0	N		12 49·79	+1·43	51·22	N		26 9·61	−1·98	7·63	16·41				
	4532	+ 0 2	S	Q −1·38	14 19·33	−1·66	17·67	S		27 35·26	−1·08	34·18	16·51				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

MADRAS (E), *Lat.* 13° 4′, *Long.* 5h 21m 8s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0.041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 30	4546	− 7 14	S	*I. P. E.*	13 17 2·40	−1·75	0·65	S	*I. P. W.*	13 30 14·60	+2·42	17·02	13 16·37				
	4552	+36 56	N	d c − 4·3	17 54·01	−1·12	52·89	N	d c + 3·7	31 8·55	+0·73	9·28	16·39				
	4559	+11 25	S	b − 0·5 a −33·6	19 24·49	−1·51	22·98	S	b − 3·0 a +87·5	32 37·66	+1·77	39·43	16·45				
	4565	− 8 5	S	s Q −1·38	21 3·16	−1·76	1·40	S	s Q +1·63	34 15·39	+2·44	17·83	16·43				
	4570	+ 4 10	S		22 46·53	−1·60	44·93	S		35 59·38	+2·02	61·40	16·47				
	4578	− 7 1	S		24 23·75	−1·75	22·00	S		37 36·07	+2·41	38·48	16·48				
	4591	− 9 5	S		26 37·08	−1·77	35·31	S		39 49·31	+2·47	51·78	16·47	m s 13 16·443	+ 0·072	+ 0·070	13 16·585
	4615	+16 25	N		29 26·53	−1·44	25·09	N		42 39·95	+1·61	41·56	16·47				
	4627	+35 23	N		31 32·96	−1·16	31·80	N		44 47·46	+0·81	48·27	16·47				
	4628	+35 17	N		31 37·68	−1·16	36·52	N		44 52·16	+0·81	52·97	16·45				
	4632	+35 4	N		32 16·13	−1·17	14·96	N		45 30·54	+0·83	31·37	16·41				
	4648	+19 1	N		34 43·53	−1·41	42·12	N		47 57·07	+1·50	58·57	16·45				
Mar. 31	4438	+41 31	S	*I. P. E.*	12 55 43·93	+1·88	45·81	S	*I. P. W.*	13 9 1·91	+0·19	2·10	13 16·29				
	4446	+ 6 8	S	d c + 0·8	57 6·77	+1·40	8·17	S	d c + 4·0	10 22·52	+2·02	24·54	16·37				
	4462	+ 5 29	S	b + 3·5 a −26·8	13 0 4·19	+1·40	5·59	S	b − 3·2 a +108·5	13 19·81	+2·05	21·86	16·27				
	4472	+ 5 48	S	s Q +1·38	1 40·77	+1·40	42·17	S	s Q +1·62	14 56·53	+2·04	58·57	16·40				
	4480	−10 31	S		4 25·91	+1·23	27·14	S		17 40·72	+2·73	43·45	16·31				
	4492	−12 4	S		5 56·37	+1·21	57·58	S		19 11·18	+2·80	13·98	16·40				
	4496	− 0 11	S		7 41·38	+1·34	42·72	S		20 56·84	+2·31	59·15	16·43	m s 13 16·387	+ 0·073	+ 0·046	13 16·506
	4504	+11 28	S		8 50·51	+1·46	51·97	S		22 6·63	+1·81	8·44	16·47				
	4508	− 5 50	S		9 43·73	+1·28	45·01	S		22 58·89	+2·54	61·43	16·42				
	4516	− 5 37	S		11 17·27	+1·28	18·55	S		24 32·43	+2·52	34·95	16·40				
	4526	+25 0	N		12 41·83	+1·63	43·46	N		25 58·70	+1·19	59·89	16·43				
	4532	+ 0 2	S	Q −1·38	14 11·33	−1·43	9·90	S		27 24·06	+2·29	26·35	16·45				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

MADRAS (E), *Lat. 13° 4′, Long. 5ʰ 21ᵐ 8ˢ*: AND BELLARY (W), *Lat. 15° 9′, Long. 5ʰ 7ᵐ 52ˢ.*

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = + 0^s{\cdot}099$, $C_S - H_S = + 0{\cdot}041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 31	4546	− 7 14	S	*I. P. E.*	13 16 54·36	−1·50	52·86	S	*I. P. W.*	13 30 9·94	−0·64	9·30	13 16·44				
	4552	+36 56	N	d c + 0·8	17 46·09	−0·96	45·13	N	d c + 4·0	31 4·24	−2·74	1·50	16·37				
	4559	+11 25	S	b + 3·5	19 16·49	−1·30	15·19	S	b − 3·2	32 33·06	−1·44	31·62	16·43				
	4565	− 8 5	S	a − 26·8	20 55·12	−1·51	53·61	S	a + 108·5	34 10·68	−0·62	10·06	16·45				
	4570	+ 4 10	S	s Q − 1·38	22 38·54	−1·38	37·16	S	s Q − 1·62	35 54·71	−1·14	53·57	16·41				
	4578	− 7 1	S		24 15·77	−1·50	14·27	S		37 31·38	−0·65	30·73	16·46				
	4591	− 9 5	S		26 29·06	−1·51	27·55	S		39 44·56	−0·58	43·98	16·43	m s 13 16·417	+ 0·073	+ 0·072	13 16·562
	4600	+39 10	N		27 27·81	−0·92	26·89	N		40 46·13	−2·88	43·25	16·36				
	4615	+16 25	N		29 18·58	−1·24	17·34	N		42 35·44	−1·66	33·78	16·44				
	4627	+35 23	N		31 25·02	−0·99	24·03	N		44 43·10	−2·64	40·46	16·43				
	4628	+35 17	N		31 29·79	−0·99	28·80	N		44 47·81	−2·63	45·18	16·38				
	4632	+35 4	N		32 8·17	−0·99	7·18	N		45 26·20	−2·62	23·58	16·40				
	4648	+19 1	N		34 35·59	−1·21	34·38	N		47 52·58	−1·78	50·80	16·42				
Aprl. 1	4462	+ 5 29	S	*I. P. E.*	12 59 56·25	+1·41	57·66	S	*I. P. E.*	13 13 15·40	−1·51	13·89	13 16·23				
	4472	+ 5 48	S	d o + 1·7	13 1 32·76	+1·41	34·17	S	d c − 4·9	14 52·00	−1·50	50·50	16·33				
	4477	− 4 16	S	b + 4·0	2 31·64	+1·30	32·94	S	b + 7·3	15 50·68	−1·44	49·24	16·30				
	4480	−10 31	S	a − 28·3	4 17·95	+1·23	19·18	S	a + 19·4	17 36·82	−1·40	35·42	16·24				
	4492	−12 4	S	s Q + 1·36	5 48·47	+1·21	49·68	S	s Q − 1·63	19 7·36	−1·38	5·98	16·30	m s 13 16·287	+ 0·074	+ 0·047	13 16·408
	4496	− 0 11	S		7 33·43	+1·34	34·77	S		20 52·52	−1·46	51·06	16·29				
	4504	+11 28	S		8 42·52	+1·48	44·00	S		22 1·87	−1·54	0·33	16·33				
	4516	− 5 37	S		11 9·33	+1·28	10·61	S		24 28·27	−1·43	26·84	16·23				
	4526	+25 0	N		12 33·87	+1·65	35·52	N		25 53·50	−1·65	51·85	16·33				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

MADRAS (E), *Lat.* 13° 4′, *Long.* 5h 21m 8s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0^s.041$	$\Delta L + \rho$
1876 Apl. 1	4546	− 7 14	S	I. P. E.	13 16 46·43	−1·46	44·97	S	I. P. E.	13 29 59·32	+1·84	61·16	13 16·19				
	4552	+36 56	N	d: c + 1·7	17 38·09	−0·89	37·20	N	d: c − 4·9	30 51·97	+1·47	53·44	16·24				
	4559	+11 25	S	b + 4·0, a −28·3	19 8·55	−1·25	7·30	S	b + 7·3, a +19·4	32 21·87	+1·71	23·58	16·28				
	4565	− 8 5	S	s: Q − 1·36	20 47·18	−1·47	45·71	S	s: Q + 1·63	34 0·05	+1·84	1·89	16·18				
	4570	+ 4 10	S		22 30·55	−1·33	29·22	S		35 43·71	+1·76	45·47	16·25				
	4578	− 7 1	S		24 7·81	−1·46	6·35	S		37 20·76	+1·84	22·60	16·25	13 16·248	+ 0·074	+ 0·070	13 16·392
	4591	− 9 5	S		26 21·15	−1·48	19·67	S		39 34·03	+1·85	35·88	16·21				
	4600	+39 10	N		27 19·82	−0·85	18·97	N		40 33·81	+1·45	35·26	16·29				
	4627	+35 23	N		31 17·01	−0·92	16·09	N		44 30·95	+1·50	32·45	16·36				
	4628	+35 17	N		31 21·82	−0·92	20 90	N		44 35·60	+1·50	37·10	16·20				
	4632	+35 4	N		31 60·22	−0·92	59·30	N		45 14·10	+1·50	15·60	16·30				
	4648	+19 1	N		34 27·63	−1·16	26·47	N		47 41·05	+1·65	42·70	16·23				
Apl. 2	4446	+ 6 8	S	I. P. E.	12 56 50·75	+1·36	52·11	S	I. P. E.	13 10 6·68	+1·82	8·50	13 16·39				
	4462	+ 5 29	S	d: c + 0·2	59 48·14	+1·35	49·49	S	d: c − 4·9	13 4·04	+1·83	5·87	16·38				
	4472	+ 5 48	S	b + 3·2, a −34·0	13 1 24·72	+1·35	26·07	S	b + 7·6, a +40·5	14 40·60	+1·83	42·43	16·36				
	4477	− 4 16	S	s: Q + 1·37	2 23·57	+1·22	24·79	S	s: Q + 1·62	15 39·21	+1·98	41·19	16·40				
	4480	−10 31	S		4 9·92	+1·14	11·06	S		17 25·24	+2·07	27·31	16·25				
	4492	−12 4	S		5 40·45	+1·11	41·56	S		18 55·81	+2·09	57·90	16·34	13 16·351	+ 0·075	+ 0·046	13 16·472
	4496	− 0 11	S		7 25·39	+1·27	26·66	S		20 41·15	+1·92	43·07	16·41				
	4508	− 5 50	S		9 27·79	+1·20	28·99	S		22 43·32	+2·00	45·32	16·33				
	4516	− 5 37	S		11 1·25	+1·20	2·45	S		24 16·79	+2·00	18·79	16·34				
	4526	+25 0	N		12 25·79	+1·63	27·42	N		25 42·28	+1·51	43·79	16·37				
	4532	+ 0 2	S	Q − 1·37	13 55·39	−1·47	53·92	S		27 8·30	+1·91	10·21	16·29				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

MADRAS (E), *Lat. 13° 4', Long. 5h 21m 8s* : AND **BELLARY** (W), *Lat. 15° 9', Long. 5h 7m 52s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = + 0^s{\cdot}099$, $C_S - H_S = + 0{\cdot}041$	$\Delta L + \rho$
1876		° '			h m s	s	s			h m s	s	s	m s				
Apl. 2	4546	− 7 14	S	*I. P. E.*	13 16 38·35	−1·57	36·78	S	*I. P. E.*	13 29 54·34	−1·22	53·12	13 16·34				
	4552	+36 56	N	d c + 0·2	17 29·97	−1·89	29·08	N	d c − 4·9	30 47·36	−1·99	45·37	16·29				
	4559	+11 25	S	b + 3·2 a − 34·0	18 60·50	−1·32	59·18	S	b + 7·6 a + 40·5	32 17·03	−1·50	15·53	16·35				
	4565	− 8 5	S	s Q − 1·37	20 39·16	−1·58	37·58	S	s Q − 1·62	33 55·10	−1·21	53·89	16·31				
	4570	+ 4 10	S		22 22·50	−1·41	21·09	S		35 38·84	−1·39	37·45	16·36				
	4578	− 7 1	S		23 59·79	−1·57	58·22	S		37 15·79	−1·22	14·57	16·35	m s 13 16·318	+ 0·075	+ 0·070	13 16·463
	4591	− 9 5	S		26 13·11	−1·59	11·52	S		39 29·04	−1·19	27·85	16·33				
	4600	+39 10	N		27 11·71	−0·85	10·86	N		40 29·20	−2·05	27·15	16·29				
	4615	+16 25	N		29 2·57	−1·25	1·32	N		42 19·24	−1·58	17·66	16·34				
	4627	+35 23	N		31 8·95	−0·93	8·02	N		44 26·31	−1·95	24·36	16·34				
	4628	+35 17	N		31 13·69	−0·93	12·76	N		44 30·96	−1·95	29·01	16·25				
	4648	+19 1	N		34 19·58	−1·21	18·37	N		47 36·26	−1·62	34·64	16·27				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BANGALORE (E), *Lat.* 12° 58′, *Long.* 5ʰ 10ᵐ 28ˢ: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5ʰ 7ᵐ 52ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0.041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s	m s			
Apl. 11	4072	+ 9 25	S	I. P. E. d c − 2·9 b 0·0 a − 5·8 s Q + 1·41	11 59 17·66	+ 1·34	19·00	S	I. P. E. d c + 2·1 b 0·0 a + 13·6 s Q + 1·62	12 1 54·57	+ 1·70	56·27	2 37·27	2 37·270	− 0·007	+ 0·041	2 37·304
Apl. 11	4200	− 3 56	S	I. P. E.	12 21 54·00	+ 1·30	55·30	S	I. P. E.	12 24 34·02	− 1·47	32·55	2 37·25				
	4228	+ 10 59	S	d c − 2·9	27 10·51	+ 1·34	11·85	S	d c + 2·1	29 50·71	− 1·56	49·15	37·30				
	4241	+ 19 4	N	b 0·0 a − 5·8	29 20·37	− 1·46	18·91	N	b 0·0 a + 13·6	31 57·79	− 1·59	56·20	37·29	2 37·290	− 0·007	+ 0·060	2 37·343
	4242	+ 19 4	N	s Q ± 1·41†	29 21·84	− 1·46	20·38	N	s Q − 1·62	31 59·24	− 1·59	57·65	37·27				
	4250	+ 9 29	S		31 18·00	− 1·49	16·51	S		33 55·37	− 1·55	53·82	37·31				
	4255	− 3 41	S		32 47·83	− 1·52	46·31	S		35 25·11	− 1·48	23·63	37·32				
Apl. 12	4072	+ 9 25	S	I. P. E.	11 59 21·44	+ 1·37	22·81	S	I. P. E.	12 1 61·58	− 1·54	60·04	2 37·23				
	4079	+ 10 21	S	d c − 2·4	12 1 18·69	+ 1·36	20·05	S	d c + 1·7	3 58·83	− 1·55	57·28	37·23				
	4094	+ 2 36	S	b + 0·6 a − 2·8	3 47·93	+ 1·36	49·29	S	b − 0·3 a + 25·6	6 28·02	− 1·47	26·55	37·26				
	4104	+ 4 45	S	s Q + 1·40	5 47·53	+ 1·35	48·88	S	s Q − 1·64	8 27·63	− 1·49	26·14	37·26				
	4114	+ 10 57	S		7 34·99	+ 1·36	36·35	S		10 15·17	− 1·56	13·61	37·26	2 37·228	− 0·007	+ 0·054	2 37·275
	4125	+ 15 35	N		10 10·44	+ 1·37	11·81	N		12 50·58	− 1·61	48·97	37·16				
	4137	− 0 6	S		12 46·75	+ 1·35	48·10	S		15 26·75	− 1·45	25·30	37·20				
	4145	+ 0 1	S		14 1·58	+ 1·36	2·94	S		16 41·60	− 1·45	40·15	37·21				
	4156	+ 18 29	N		14 55·24	+ 1·37	56·61	N		17 35·49	− 1·64	33·85	37·24				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at E after the observation of star 4228.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BANGALORE (E), *Lat.* 12° 58′, *Long.* 5h 10m 28s: AND BELLARY (W), *Lat* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star		Transits Observed at E — *By Campbell, with Telescope No.* 1					Transits Observed at W — *By Heaviside, with Telescope No.* 2					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Peral. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Apl. 12	4168	+ 6 0	S	*I. P. E.*	12 16 41·66	+1·35	43·01	S	*I. P. E.*	12 19 18·49	+1·76	20·25	2 37·24				
	4179	− 9 47	S	d c − 2·4	18 28·62	−1·47	27·15	S	d c + 1·7	21 2·44	+1·92	4·36	37·21				
	4184	+24 37	N	b + 0·6 a − 2·8	19 31·86	−1·43	30·43	N	b − 0·3 a + 25·6	22 6·00	+1·57	7·57	37·14				
	4200	− 3 56	S	s Q ± 1·40†	21 60·54	−1·47	59·07	S	s Q + 1·64	24 34·43	+1·86	36·29	37·22				
	4228	+10 59	S		27 17·13	−1·45	15·68	S		29 51·21	+1·71	52·92	37·24	m s 2 37·216	− 0·007	+ 0·058	2 37·267
	4241	+19 4	N		29 24·13	−1·43	22·70	N		31 58·26	+1·63	59·89	37·19				
	4242	+19 4	N		29 25·57	−1·43	24·14	N		31 59·72	+1·63	61·35	37·21				
	4250	+ 9 29	S		31 21·71	−1·44	20·27	S		33 55·81	+1·73	57·54	37·27				
	4255	− 3 41	S		32 51·52	−1·47	50·05	S		35 25·47	+1·86	27·33	37·28				
	4268	− 0 46	S		35 53·39	−1·46	51·93	S		38 27·26	+1·83	29·09	37·16				
Apl. 13	4072	+ 9 25	S	*I. P. E.*	11 59 25·25	+1·44	26·69	S	*I. P. E.*	12 2 2·17	+1·69	3·86	2 37·17				
	4079	+10 21	S	d c − 1·0	12 1 22·56	+1·44	24·00	S	d c + 1·0	3 59·45	+1·68	61·13	37·13				
	4094	+ 2 36	S	b + 2·2 a − 2·2	3 51·77	+1·43	53·20	S	b − 1·3 a + 30·4	6 28·60	+1·77	30·37	37·17				
	4104	+ 4 45	S	s Q + 1·41	5 51·42	+1·42	52·84	S	s Q + 1·62	8 28·28	+1·75	30·03	37·19				
	4114	+10 57	S		7 38·88	+1·44	40·32	S		10 15·80	+1·67	17·47	37·15	m s 2 37·138	− 0·007	+ 0·054	2 37·185
	4125	+15 35	N		10 14·34	+1·44	15·78	N		12 51·19	+1·62	52·81	37·03				
	4137	− 0 6	S		12 50·59	+1·43	52·02	S		15 27·37	+1·80	29·17	37·15				
	4145	+ 0 2	S		14 5·46	+1·43	6·89	S		16 42·18	+1·80	43·98	37·09				
	4156	+18 29	N	Q − 1·41	15 1·92	−1·37	0·55	N		17 36·13	+1·58	37·71	37·16				
Apl. 13	4168	+ 6 0	S	*I. P. E.*	12 16 48·33	−1·40	46·93	S	*I. P. E.*	12 19 25·64	−1·52	24·12	2 37·19				
	4179	− 9 47	S	d c − 1·0	18 32·50	−1·41	31·09	S	d c + 1·0	21 9·54	−1·32	8·22	37·13				
	4200	− 3 56	S	b + 2·2 a − 2·2	22 4·42	−1·39	3·03	S	b − 1·3 a + 30·4	24 41·58	−1·39	40·19	37·16				
	4228	+10 59	S	s Q − 1·41	27 21·01	−1·38	19·63	S	s Q − 1·62	29 58·34	−1·58	56·76	37·13	m s 2 37·135	− 0·007	+ 0·056	2 37·184
	4241	+19 4	N		29 28·06	−1·38	26·68	N		32 5·46	−1·67	3·79	37·11				
	4242	+19 4	N		29 29·49	−1·38	28·11	N		32 6·92	−1·68	5·24	37·13				
	4255	− 3 41	S		32 55·49	−1·40	54·09	S		35 32·60	−1·40	31·20	37·11				
	4268	− 0 46	S		35 57·24	−1·40	55·84	S		38 34·40	−1·44	32·96	37·12				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at E after the observation of star 4168.

OF THE APPARENT DIFFERENCE OF LONGITUDES, ΔL — ρ.*

BANGALORE (E), Lat. 12° 58′, Long. 5h 10m 28s: AND BELLARY (W), Lat. 15° 9′, Long. 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Peral. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	ΔL − ρ
1876		° ′			h m s	s	s			h m s	s	s	m s				
Apl. 14	4156	+ 18 29	N	I. P. W. d c − 0·8 b + 2·7 a − 15·3 s Q + 1·41	12 15 2·80	+ 1·50	4·30	N	I. P. W. d c + 1·2 b − 5·5 a + 50·0 s Q − 1·61	12 17 43·35	− 1·78	41·57	2 37·27	m s 2 37·270	− 0·007	+ 0·099	2 37·362
Apl. 14	4168	+ 6 0	S	I. P. W. d c − 0·8 b + 2·7 a − 15·3 s Q + 1·41	12 16 49·20	+ 1·42	50·62	S	I. P. W. d c + 1·2 b − 5·5 a + 50·0 s Q + 1·61	12 19 26·26	+ 1·70	27·96	2 37·34	m s 2 37·340	− 0·007	+ 0·041	2 37·374
Apl. 17	4072	+ 9 25	S	I. P. W.	11 59 39·33	+ 1·37	40·70	S	I. P. W.	12 2 16·45	+ 1·56	18·01	2 37·31				
	4079	+ 10 21	S	d c − 0·7	12 1 36·58	+ 1·37	37·95	S	d c 0·0	4 13·70	+ 1·54	15·24	37·29				
	4094	+ 2 36	S	b − 0·7 a − 7·1	4 5·83	+ 1·35	7·18	S	b − 1·2 a + 16·2	6 42·94	+ 1·60	44·54	37·36				
	4104	+ 4 45	S	s	6 5·47	+ 1·36	6·83	S	s	8 42·53	+ 1·59	44·12	37·29				
	4114	+ 10 57	S	Q + 1·41	7 52·90	+ 1·37	54·27	S	Q + 1·54	10 30·13	+ 1·55	31·68	37·41	m s 2 37·304	− 0·007	+ 0·054	2 37·351
	4125	+ 15 35	N		10 28·39	+ 1·39	29·78	N		13 5·42	+ 1·52	6·94	37·16				
	4137	− 0 6	S		13 4·61	+ 1·34	5·95	S		15 41·74	+ 1·61	43·35	37·40				
	4145	+ 0 2	S		14 19·50	+ 1·34	20·84	S		16 56·52	+ 1·62	58·14	37·30				
	4156	+ 18 29	N		15 13·16	+ 1·40	14·56	N		17 50·29	+ 1·49	51·78	37·22				
Apl. 17	4168	+ 6 0	S	I. P. W.	12 16 59·59	+ 1·36	60·95	S	I. P. W.	12 19 39·79	− 1·51	38·28	2 37·33				
	4179	− 9 47	S	d c − 0·7	18 46·55	− 1·50	45·05	S	d c 0·0	21 23·87	− 1·41	22·46	37·41				
	4184	+ 24 37	N	b − 0·7 a − 7·1	19 49·82	− 1·40	48·42	N	b − 1·2 a + 16·2	22 27·28	− 1·64	25·64	37·22				
	4200	− 3 56	S	s	22 18·47	− 1·49	16·98	S	s	24 55·83	− 1·45	54·38	37·40				
	4228	+ 10 59	S	Q ± 1·41†	27 35·06	− 1·45	33·61	S	Q − 1·54	30 12·52	− 1·54	10·98	37·37	m s 2 37·330	− 0·007	+ 0·058	2 37·381
	4241	+ 19 4	N		29 42·10	− 1·42	40·68	N		32 19·51	− 1·60	17·91	37·23				
	4242	+ 19 4	N		29 43·53	− 1·42	42·11	N		32 20·95	− 1·60	19·35	37·24				
	4250	+ 9 29	S		31 39·70	− 1·45	38·25	S		34 17·09	− 1·53	15·56	37·31				
	4255	− 3 41	S		33 9·49	− 1·49	8·00	S		35 46·86	− 1·45	45·41	37·41				
	4268	− 0 46	S		36 11·27	− 1·48	9·79	S		38 48·64	− 1·47	47·17	37·38				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at E after the observation of star 4168.

TABLE XIII. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L - \rho$.*

BANGALORE (E), *Lat.* 12° 58′, *Long.* $5^h\ 10^m\ 28^s$: AND BELLARY (W), *Lat.* 15° 9′, *Long.* $5^h\ 7^m\ 52^s$.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0^s.041$	$\Delta L - \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Apl. 18	4072	+ 9 25	S	*I. P. W.*	11 59 43·17	+1·36	44·53	S	*I. P. W.*	12 2 23·39	−1·44	21·95	2 37·42				
	4079	+10 21	S	d c − 0·9	12 1 40·47	+1·36	41·83	S	d c + 0·3	4 20·57	−1·45	19·12	37·29				
	4094	+ 2 36	S	b − 0·7 a − 7·3	4 9·67	+1·34	11·01	S	b + 0·7 a +32·2	6 49·83	−1·35	48·48	37·47				
	4104	+ 4 45	S	s Q +1·41	6 9·31	+1·35	10·66	S	s Q −1·54	8 49·44	−1·38	48·06	37·40				
	4114	+10 57	S		7 56·74	+1·36	58·10	S		10 36·96	−1·45	35·51	37·41	m s 2 37·388	− 0·007	+ 0·054	2 37·435
	4125	+15 35	N		10 32·21	+1·38	33·59	N		13 12·37	−1·52	10·85	37·26				
	4137	− 0 6	S		13 8·51	+1·33	9·84	S		15 48·62	−1·33	47·29	37·45				
	4145	+ 0 2	S		14 23·34	+1·33	24·67	S		17 3·47	−1·33	2·14	37·47				
	4156	+18 29	N		15 16·98	+1·39	18·37	N		17 57·25	−1·56	55·69	37·32				
Apl. 18	4168	+ 6 0	S	*I. P. W.*	12 17 3·43	+1·35	4·78	S	*I. P. W.*	12 19 40·52	+1·68	42·20	2 37·42				
	4179	− 9 47	S	d c − 0·9	18 50·38	−1·51	48·87	S	d c + 0·3	21 24·46	+1·88	26·34	37·47				
	4184	+24 37	N	b − 0·7 a − 7·3	19 53·61	−1·40	52·21	N	b + 0·7 a +32·2	22 28·12	+1·43	29·55	37·34				
	4200	− 3 56	S	s Q ±1·41†	22 22·28	−1·49	20·79	S	s Q +1·54	24 56·50	+1·80	58·30	37·51				
	4228	+10 59	S		27 38·87	−1·45	37·42	S		30 13·27	+1·62	14·89	37·47	m s 2 37·431	− 0·007	+ 0·058	2 37·482
	4241	+19 4	N		29 45·93	−1·43	44·50	N		32 20·35	+1·51	21·86	37·36				
	4242	+19 4	N		29 47·35	−1·42	45·93	N		32 21·82	+1·51	23·33	37·40				
	4250	+ 9 29	S		31 43·52	−1·45	42·07	S		34 17·86	+1·63	19·49	37·42				
	4255	− 3 41	S		33 13·31	−1·49	11·82	S		35 47·50	+1·80	49·30	37·48				
	4268	− 0 46	S		36 15·13	−1·48	13·65	S		38 49·33	+1·76	51·09	37·44				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at E after the observation of star 4168.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BANGALORE (E), *Lat.* 12° 58′, *Long.* $5^h\ 10^m\ 28^s$: AND BELLARY (W), *Lat.* 15° 9′, *Long.* $5^h\ 7^m\ 52^s$.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Campbell, with Telescope No. 1: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W, By Heaviside, with Telescope No. 2: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Apl. 11	4446	+ 6 8	S	*I. P. E.*	13 9 4·11	+ 1·33	5·44	S	*I. P. E.*	13 11 41·07	+ 1·70	42·77	2 37·33				
	4462	+ 5 29	S	d c − 2·9	12 1·49	+ 1·33	2·82	S	d c + 2·1	14 38·38	+ 1·70	40·08	37·26				
	4472	+ 5 48	S	b 0·0	13 38·05	+ 1·33	39·38	S	b 0·0	16 15·01	+ 1·70	16·71	37·33				
	4477	− 4 16	S	a − 5·8	14 36·80	+ 1·31	38·11	S	a + 13·6	17 13·68	+ 1·75	15·43	37·32				
	4480	− 10 31	S	s Q + 1·41	16 23·09	+ 1·29	24·38	S	s Q + 1·60	18 59·83	+ 1·79	61 62	37·24	m s 2 37·293	+ 0·002	+ 0·041	2 37·336
	4496	− 0 11	S		19 38·70	+ 1·32	40·02	S		22 15·58	+ 1·73	17·31	37·29				
	4504	+ 11 28	S		20 47·90	+ 1·34	49·24	S		23 24·88	+ 1·67	26·55	37·31				
	4508	− 5 50	S		21 41·03	+ 1·30	42·33	S		24 17·83	+ 1·76	19·59	37·26				
	4516	− 5 37	S		23 14·52	+ 1·31	15·83	S		25 51·37	+ 1·76	53·13	37·30				
Apl. 11	4532	+ 0 2	S	*I. P. E.*	13 26 8·74	− 1·50	7·24	S	*I. P. E.*	13 28 42·77	+ 1·73	44·50	2 37·26				
	4546	− 7 14	S	d c − 2·9	28 51·71	− 1·52	50·19	S	d c + 2·1	31 28·97	− 1·44	27·53	37·34				
	4559	+ 11 25	S	b 0·0	31 14·05	− 1·48	12·57	S	b 0·0	33 51·44	− 1·54	49·90	37·33				
	4565	− 8 5	S	a − 5·8	32 52·49	− 1·52	50·97	S	a + 13·6	35 29·70	− 1·44	28·26	37·29				
	4570	+ 4 10	S	s Q − 1·41	34 36·04	− 1·50	34·54	S	s Q ± 1·60†	37 13·33	− 1·50	11·83	37·29	m s 2 37·302	+ 0·002	+ 0·054	2 37·358
	4578	− 7 1	S		36 13·15	− 1·52	11·63	S		38 50·45	− 1·44	49·01	37·38				
	4591	− 9 5	S		38 26·44	− 1·52	24·92	S		41 3·68	− 1·43	2·25	37·33				
	4615	+ 16 25	N		41 16·26	− 1·47	14·79	N		43 53·60	− 1·57	52·03	37·24				
	4648	+ 19 1	N		46 33·30	− 1·46	31·84	N		49 10·68	− 1·58	9·10	37·26				
Apl. 12	4477	− 4 16	S	*I. P. E.*	13 14 35·64	+ 1·35	36·99	S	*I. P. E.*	13 17 15·72	− 1·40	14·32	2 37·33				
	4480	− 10 31	S	d c − 2·4	16 21·86	+ 1·34	23·20	S	d c + 1·7	19 1·87	− 1·34	0·53	37·33				
	4496	− 0 11	S	b + 0·6	19 37·56	+ 1·35	38·91	S	b − 0·2	22 17·61	− 1·44	16·17	37·26				
	4504	+ 11 28	S	a − 2·8	20 46·80	+ 1·37	48·17	S	a + 25·6	23 27·04	− 1·56	25·48	37·31	m s 2 37·293	+ 0·002	+ 0·049	2 37·344
	4508	− 5 50	S	s Q + 1·41	21 39·85	+ 1·35	41·20	S	s Q − 1·63	24 19·93	− 1·38	18·55	37·35				
	4516	− 5 37	S		23 13·38	+ 1·35	14·73	S		25 53·39	− 1·39	52·00	37·27				
	4526	+ 25 0	N		24 38·34	+ 1·39	39·73	N		27 18·63	− 1·70	16·93	37·20				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at W after the observation of star 4532.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BANGALORE (E), *Lat.* 12° 58′, *Long.* 5h 10m 28s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s.099$, $C_S - H_S = +0.041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Apl. 12	4532	+ 0 2	S	I. P. E.	13 26 7·63	−1·46	6·17	S	I. P. E.	13 28 44·89	−1·45	43·44	2 37·27				
	4546	− 7 14	S	d c − 2·4	28 50·57	−1·47	49·10	S	d c + 1·7	31 24·51	+1·89	26·40	37·30				
	4565	− 8 5	S	b + 0·6	32 51·33	−1·47	49·86	S	b − 0·2	35 25·25	+1·90	27·15	37·29	m s 2 37·275	+ 0·002	+ 0·051	2 37·328
	4570	+ 4 10	S	a − 2·8	34 34·90	−1·46	33·44	S	a + 25·6	37 8·95	+1·77	10·72	37·28				
	4578	− 7 1	S	s Q − 1·41	36 12·02	−1·47	10·55	S	s Q ∓ 1·63†	38 45·96	+1·89	47·85	37·30				
	4648	+ 19 1	N		46 32·15	−1·44	30·71	N		49 6·29	+1·63	7·92	37·21				
Apl. 13	4615	+ 16 25	N	I. P. E.	13 41 14·48	−1·39	13·09	N	I. P. E.	13 43 51·88	−1·63	50·25	2 37·16	m s 2 37·150	+ 0·001	+ 0·099	2 37·250
	4648	+ 19 1	N	d c − 1·0	46 31·51	−1·38	30·13	N	d c + 1·0	49 8·94	−1·67	7·27	37·14				
				b + 2·2					b − 1·0								
				a − 2·2					a + 30·4								
				s Q − 1·41					s Q − 1·62								
Apl. 14	4446	+ 6 8	S	I. P. W.	13 9 1·24	+1·43	2·67	S	I. P. W.	13 11 41·66	−1·53	40·13	2 37·46				
	4462	+ 5 29	S	d c − 0·8	11 58·67	+1·42	60·09	S	d c + 1·2	14 39·05	−1·52	37·53	37·44				
	4472	+ 5 48	S	b + 2·7	13 35·25	+1·43	36·68	S	b − 5·5	16 15·68	−1·52	14·16	37·48				
	4477	− 4 16	S	a − 15·3	14 34·02	+1·36	35·38	S	a + 50·0	17 14·21	−1·33	12·88	37·50				
	4480	− 10 31	S	s Q + 1·42	16 20·27	+1·32	21·59	S	s Q − 1·62	18 60·33	−1·20	59·13	37·54	m s 2 37·482	+ 0·002	+ 0·047	2 37·531
	4496	− 0 11	S		19 35·86	+1·39	37·25	S		22 16·14	−1·40	14·74	37·49				
	4504	+ 11 28	S		20 45·05	+1·46	46·51	S		23 25·63	−1·64	23·99	37·48				
	4508	− 5 50	S		21 38·21	+1·35	39·56	S		24 18·39	−1·29	17·10	37·54				
	4516	− 5 37	S		23 11·69	+1·35	13·04	S		25 51·91	−1·29	50·62	37·58				
	4526	+ 25 0	N		24 36·60	+1·55	38·15	N		27 17·39	−1·93	15·46	37·31				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.   † The sign of Q was changed at W after the observation of star 4532.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BANGALORE (E), *Lat.* 12° 58′, *Long.* 5h 10m 28s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star		Transits Observed at E — By Campbell, with Telescope No. 1					Transits Observed at W — By Heaviside, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_S - H_S = +0{\cdot}041$	$\Delta L + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1876		° ′			h m s	s	s			h m s	s	s	m s				
Apl. 14	4532	+ 0 2	S	I. P. W.	13 26 5·98	−1·46	4·52	S	I. P. W.	13 28 43·40	−1·41	41·99	2 37·47				
	4546	− 7 14	S	d; c − 0·8	28 48·90	−1·51	47·39	S	d; c + 1·2	31 22·94	+1·97	24·91	37·52				
	4559	+11 25	S	b + 2·7; a − 15·3	31 11·23	−1·38	9·85	S	b − 5·5; a + 50·0	33 45·64	+1·60	47·24	37·39				
	4565	− 8 5	S	s; Q − 1·42	32 49·69	−1·50	48·19	S	s; Q ∓ 1·62†	35 23·74	+1·97	25·71	37·52	m s 2 37·478	+ 0·002	+ 0·048	2 37·528
	4570	+ 4 10	S		34 33·24	−1·43	31·81	S		37 7·47	+1·74	9·21	37·40				
	4578	− 7 1	S		36 10·34	−1·50	8·84	S		38 44·47	+1·97	46·44	37·60				
	4591	− 9 5	S		38 23·67	−1·51	22·16	S		40 57·72	+2·00	59·72	37·56				
	4648	+19 1	N		46 30·45	−1·34	29·11	N		49 5·04	+1·43	6·47	37·36				
Apl. 17	4472	+ 5 48	S	I. P. W.	13 13 32·89	+1·36	34·25	S	I. P. W.	13 16 10·05	+1·56	11·61	2 37·36				
	4477	− 4 16	S	d; c − 0·7	14 31·64	+1·33	32·97	S	d; c 0·0	17 8·72	+1·63	10·35	37·38				
	4480	−10 31	S	b − 0·7; a − 7·1	16 17·97	+1·31	19·28	S	b − 1·8; a + 16·2	18 54·99	+1·66	56·65	37·37				
	4496	− 0 11	S	s; Q + 1·41	19 33·61	+1·34	34·95	S	s; Q + 1·54	22 10·66	+1·60	12·26	37·31	m s 2 37·334	+ 0·001	+ 0·048	2 37·383
	4504	+11 28	S		20 42·82	+1·38	44·20	S		23 20·01	+1·52	21·53	37·33				
	4508	− 5 50	S		21 35·91	+1·33	37·24	S		24 12·99	+1·64	14·63	37·39				
	4516	− 5 37	S		23 9·39	+1·33	10·72	S		25 46·43	+1·64	48·07	37·35				
	4526	+25 0	N		24 34·40	+1·42	35·82	N		27 11·57	+1·43	13·00	37·18				
Apl. 17	4532	+ 0 2	S	I. P. W.	13 26 3·67	−1·48	2·19	S	I. P. W.	13 28 37·92	+1·60	39·52	2 37·33				
	4546	− 7 14	S	d; c − 0·7	28 46·60	−1·50	45·10	S	d; c 0·0	31 23·97	−1·44	22·53	37·43				
	4559	+11 25	S	b − 0·7; a − 7·1	31 8·98	−1·45	7·53	S	b − 1·8; a + 16·2	33 46·43	−1·56	44·87	37·34				
	4565	− 8 5	S	s; Q − 1·41	32 47·38	−1·50	45·88	S	s; Q ± 1·54†	35 24·71	−1·43	23·28	37·40	m s 2 37·347	+ 0·001	+ 0·054	2 37·402
	4570	+ 4 10	S		34 30·96	−1·47	29·49	S		37 8·32	−1·51	6·81	37·32				
	4578	− 7 1	S		36 8·06	−1·50	6·56	S		38 45·42	−1·44	43·98	37·42				
	4591	− 9 5	S		38 21·38	−1·50	19·88	S		40 58·74	−1·43	57·31	37·43				
	4615	+16 25	N		41 11·22	−1·43	9·79	N		43 48·63	−1·59	47·04	37·25				
	4648	+19 1	N		46 28·27	−1·43	26·84	N		49 5·66	−1·62	4·04	37·20				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at W after the observation of star 4532.

TABLE XIV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\Delta L + \rho$.*

BANGALORE (E), *Lat.* 12° 58′, *Long.* 5ʰ 10ᵐ 28ˢ: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5ʰ 7ᵐ 52ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Campbell, with Telescope No. 1: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W, By Heaviside, with Telescope No. 2: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - H_N = +0^s{\cdot}099$, $C_B - H_B = +0{\cdot}041$	$\Delta L + \rho$
1876		° ′			h m s	s	s			h m s	s	s	m s				
Apl. 18	4462	+ 5 29	S	*I. P. W.*	13 11 56·18	+1·35	57·53	S	*I. P. W.*	13 14 36·37	−1·43	34·94	2 37·41				
	4472	+ 5 48	S	d c − 0·9	13 32·72	+1·36	34·08	S	d c + 0·3	16 12·93	−1·43	11·50	37·42				
	4477	− 4 16	S	b − 0·7 a − 7·3	14 31·47	+1·32	32·79	S	b − 0·7 a + 32·2	17 11·54	−1·30	10·24	37·45				
	4480	− 10 31	S	s Q + 1·41	16 17·71	+1·31	19·02	S	s Q − 1·54	18 57·75	−1·23	56·52	37·50				
	4496	− 0 11	S		19 33·32	+1·33	34·65	S		22 13·50	−1·35	12·15	37·50	m s 2 37·443	0·000	+ 0·047	2 37·490
	4504	+ 11 28	S		20 42·59	+1·37	43·96	S		23 22·89	−1·50	21·39	37·43				
	4508	− 5 50	S		21 35·66	+1·33	36·99	S		24 15·74	−1·29	14·45	37·46				
	4516	− 5 37	S		23 9·16	+1·33	10·49	S		25 49·25	−1·29	47·96	37·47				
	4526	+ 25 0	N		24 34·11	+1·41	35·52	N		27 14·56	−1·69	12·87	37·35				
Apl. 18	4532	+ 0 2	S	*I. P. W.*	13 26 3·43	−1·49	1·94	S	*I. P. W.*	13 28 40·76	−1·36	39·40	2 37·46				
	4546	− 7 14	S	d c − 0·9	28 46·33	−1·51	44·82	S	d c + 0·3	31 20·42	+1·81	22·23	37·41				
	4559	+ 11 25	S	b − 0·7 a − 7·3	31 8·69	−1·45	7·24	S	b − 0·7 a + 32·2	33 43·01	+1·58	44·59	37·35				
	4565	− 8 5	S	s Q − 1·41	32 47·13	−1·50	45·63	S	s Q ∓ 1·54†	35 21·29	+1·82	23·11	37·48				
	4570	+ 4 10	S		34 30·68	−1·48	29·20	S		37 4·94	+1·67	6·61	37·41	m s 2 37·400	0·000	+ 0·054	2 37·454
	4578	− 7 1	S		36 7·77	−1·50	6·27	S		38 41·91	+1·81	43·72	37·45				
	4591	− 9 5	S		38 21·08	−1·51	19·57	S		40 55·18	+1·83	57·01	37·44				
	4615	+ 16 25	N		41 10·90	−1·44	9·46	N		43 45·25	+1·51	46·76	37·30				
	4648	+ 19 1	N		46 27·96	−1·43	26·53	N		49 2·35	+1·48	3·83	37·30				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † The sign of Q was changed at W after the observation of star 4532.

TABLE XV. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5h 33m 20s: AND MADRAS (W), *Lat.* 13° 4′, *Long.* 5h 21m 8s.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No. 1*					Transits Observed at W — *By Campbell, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}015$, $C_N - C_S = +0{\cdot}077$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 22	2632	+20 12	N	*I. P. E.* d c − 4·4 b − 4·8 a −17·4 s Q +1·70	7 48 42·00	+1·50	43·50	N	*I. P. E.* d c − 4·2 b − 3·1 a −55·6 s Q +1·48	8 0 51·77	+1·47	53·24	12 9·74	m s 12 9·763	−0·037	−0·010 −0·011†	12 9·705
	2649	+16 51	S		51 43·27	+1·48	44·75	N		3 53·14	+1·39	54·53	9·78				
	2664	+16 48	S		54 42·46	+1·47	43·93	N		6 52·30	+1·40	53·70	9·77				
Jan. 22	2816	+17 27	N	*I. P. E.* d c − 4·4 b − 4·8 a −17·4 s Q −1·70	8 19 8·48	−1·92	6·56	N	*I. P. E.* d c − 4·2 b − 3·1 a −55·6 s Q −1·48	8 31 17·88	−1·54	16·34	12 9·78	m s 12 9·775	−0·037	0·000 −0·011†	12 9·727
	2833	+24 33	N		21 35·61	−1·87	33·74	N		33 44·88	−1·37	43·51	9·77				
Jan. 23	2690	+13 28	S	*I. P. E.* d c − 4·4 b − 5·3 a − 22·5 s Q + 1·70	7 58 30·75	+1·44	32·19	S	*I. P. E.* d c − 4·2 b − 3·0 a − 70·9 s Q + 1·47	8 10 40·60	+1·32	41·92	12 9·73	m s 12 9·730	−0·038	+0·062 −0·011†	12 9·743
Jan. 23	2782	+ 9 15	S	*I. P. E.* d c − 4·4 b − 5·3 a −22·5 s Q −1·70	8 11 12·80	−2·00	10·80	S	*I. P. E.* d c − 4·2 b − 3·0 a −70·9 s Q −1·47	8 23 22·30	−1·74	20·56	12 9·76	m s 12 9·710	−0·038	+0·013 −0·011†	12 9·674
	2786	+27 37	N		12 56·44	−1·84	54·60	N		25 5·45	−1·20	4·25	9·65				
	2791	+ 4 20	S		13 42·63	−2·04	40·59	S		25 52·18	−1·87	50·31	9·72				
	2810	+17 35	N		18 6·26	−1·93	4·33	N		30 15·55	−1·50	14·05	9·72				
	2816	+17 27	S		19 12·93	−1·93	11·00	N		31 22·24	−1·50	20·74	9·74				
	2833	+24 33	N		21 40·08	−1·87	38·21	N		33 49·22	−1·29	47·93	9·72				
	2840	+24 45	N		22 42·98	−1·87	41·11	N		34 52·06	−1·28	50·78	9·67				
	2850	+24 30	N		24 35·00	−1·87	33·13	N		36 44·12	−1·29	42·83	9·70				

Note. $1^d = 0^s{\cdot}0225$. † Correction for Transcribing Equation, each Observer having transcribed his own records.
* ρ is the retardation of an electric signal between the stations.

TABLE XV. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

VIZAGAPATAM (E), *Lat. 17° 41′, Long. 5h 33m 20s*: AND MADRAS (W), *Lat. 13° 4′, Long. 5h 21m 8s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Heaviside, with Telescope No. 1: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W, By Campbell, with Telescope No. 2: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}015$, $C_N - C_S = +0{\cdot}077$	$\delta L_N - \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 24	2613	+22 39	N	*I. P. E.*	7 46 4·24	+1·71	5·95	N	*I. P. E.*	7 58 14·04	+1·68	15·72	12 9·77				
	2639	+16 7	N	d c − 4·4	50 21·97	+1·64	23·61	N	d c − 4·2	8 2 32·06	+1·43	33·49	9·88				
	2649	+16 51	S	b + 2·3 a −26·1	51 51·95	+1·65	53·60	N	b − 2·9 a −89·4	4 1·97	+1·46	3·43	9·83	m s 12 9·802	− 0·038	+ 0·018 − 0·011†	12 9·771
	2664	+16 48	N	s Q + 1·70	54 51·22	+1·64	52·86	N	s Q + 1·48	7 1·14	+1·46	2·60	9·74				
	2673	+ 2 40	S		56 13·58	+1·50	15·08	S		8 23·88	+0·96	24·84	9·76				
	2690	+13 28	S		58 34·93	+1·61	36·54	S		10 45·04	+1·33	46·37	9·83				
Jan. 24	2782	+ 9 15	S	*I. P. E.*	8 11 17·10	−1·83	15·27	S	*I. P. E.*	8 23 26·79	−1·78	25·01	12 9·74				
	2786	+27 37	N	d c − 4·4	12 60·64	−1·64	59·00	N	d c − 4·2	25 9·90	−1·09	8·81	9·81				
	2791	+ 4 20	S	b + 2·3 a −26·1	13 46·94	−1·88	45·06	S	b − 2·9 a −89·4	25 56·72	−1·94	54·78	9·72				
	2799	+18 44	N	s Q − 1·70	16 44·31	−1·73	42·58	N	s Q − 1·48	28 53·80	−1·44	52·36	9·78				
	2810	+17 35	N		18 10·50	−1·75	8·75	N		30 20·02	−1·48	18·54	9·79	m s 12 9·779	− 0·038	+ 0·014 − 0·011†	12 9·744
	2816	+17 27	N		19 17·22	−1·75	15·47	N		31 26·74	−1·47	25·27	9·80				
	2833	+24 33	N		21 44·32	−1·67	42·65	N		33 53·65	−1·21	52·44	9·79				
	2840	+24 45	N		22 47·22	−1·66	45·56	N		34 56·54	−1·20	55·34	9·78				
	2850	+24 30	N		24 39·25	−1·67	37·58	N		36 48·59	−1·21	47·38	9·80				
Jan. 25	2778	+ 9 34	S	*I. P. E.*	8 10 20·16	−1·87	18·29	S	*I. P. E.*	8 22 29·90	−1·80	28·10	12 9·81				
	2782	+ 9 15	S	d c − 4·4	11 21·50	−1·87	19·63	S	d c − 4·2	23 31·21	−1·81	29·40	9·77				
	2799	+18 44	N	b + 0·8 a −30·9	16 48·76	−1·77	46·99	N	b − 4·0 a −93·8	28 58·31	−1·45	56·86	9·87	m s 12 9·810	− 0·038	+ 0·025 − 0·011†	12 9·786
	2810	+17 35	N	s Q − 1·69	18 14·93	−1·78	13·15	N	s Q − 1·49	30 24·49	−1·50	22·99	9·84				
	2833	+24 33	N		21 48·75	−1·68	47·07	N		33 58·04	−1·21	56·83	9·76				
Jan. 26	2664	+16 48	N	*I. P. E.*	7 55 0·23	+1·62	1·85	N	*I. P. E.*	8 7 10·20	+1·39	11·59	12 9·74				
	2673	+ 2 40	S	d c − 4·4	56 22·60	+1·46	24·06	S	d c − 4·2	8 33·00	+0·83	33·83	9·77	m s 12 9·763	− 0·038	+ 0·041 − 0·011†	12 9·755
	2690	+13 28	S	b + 1·8 a −29·3	58 43·98	+1·59	45·57	S	b − 3·2 a −100·9	10 54·09	+1·26	55·35	9·78				
				s Q + 1·69					s Q + 1·40								

NOTE. $1^d = 0^s{\cdot}0225$. † Correction for Transcribing Equation, each Observer having transcribed his own records.

* ρ is the retardation of an electric signal between the stations.

TABLE XV. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

VIZAGAPATAM (E), Lat. 17° 41′, Long. 5h 33m 20s: AND MADRAS (W), Lat. 13° 4′, Long. 5h 21m 8s.

Astronomical Date	Star		Transits Observed at E — By Heaviside, with Telescope No. 1					Transits Observed at W — By Campbell, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}015$ $C_N - C_S = +0{\cdot}077$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 26	2778	+ 9 34	S	I. P. E.	8 10 24·67	−1·84	22·83	S	I. P. E.	8 22 34·31	−1·71	32·60	12 9·77				
	2782	+ 9 15	S	d c − 4·4	11 25·99	−1·85	24·14	S	d c − 4·2	23 35·67	−1·72	33·95	9·81				
	2786	+27 37	N	b + 1·8 a − 29·3	13 9·64	−1·62	8·02	N	b − 3·2 a −100·9	25 18·75	−0·94	17·81	9·79				
	2791	+ 4 20	S	s Q − 1·69	13 55·86	−1·91	53·95	S	s Q − 1·40	26 5·69	−1·91	3·78	9·83				
	2799	+18 44	N		16 53·30	−1·74	51·56	N		29 2·75	−1·33	1·42	9·86	m s 12 9·834	− 0·038	+ 0·021 − 0·011†	12 9·806
	2810	+17 35	N		18 19·37	−1·76	17·61	N		30 28·97	−1·39	27·58	9·97				
	2816	+17 27	N		19 26·10	−1·76	24·34	N		31 35·61	−1·39	34·22	9·88				
	2833	+24 33	N		21 53·34	−1·67	51·67	N		34 2·56	−1·08	1·48	9·81				
	2850	+24 30	N		24 48·22	−1·66	46·56	N		36 57·43	−1·08	56·35	9·79				
Jan. 27	2605	+19 38	N	I. P. W.	7 45 22·37	+1·85	24·22	N	I. P. W.	7 57 32·57	+1·62	34·19	12 9·97				
	2613	+22 39	N	d c + 3·6	46 17·51	+1·89	19·40	N	d c + 1·6	58 27·70	+1·66	29·36	9·96				
	2632	+20 12	N	b + 1·1 a − 39·3	49 4·03	+1·85	5·88	N	b + 4·1 a − 24·8	8 1 14·26	+1·62	15·88	10·00				
	2639	+16 7	N	s Q + 1·69	50 35·31	+1·78	37·09	N	s Q + 1·41	2 45·51	+1·58	47·09	10·00				
	2649	+16 51	N		52 5·26	+1·80	7·06	N		4 15·50	+1·59	17·09	10·03	m s 12 10·025	− 0·038	+ 0·013 − 0·011†	12 9·989
	2673	+ 2 40	S		56 26·84	+1·57	28·41	S		8 37·02	+1·44	38·46	10·05				
	2690	+13 28	S		58 48·09	+1·74	49·83	S		10 58·38	+1·55	59·93	10·10				
	2698	+13 51	S		59 15·62	+1·75	17·37	N		11 25·91	+1·55	27·46	10·09				
Jan. 27	2786	+27 37	N	I. P. W.	8 13 13·79	−1·40	12·39	N	I. P. W.	8 25 23·51	−1·11	22·40	12 10·01				
	2791	+ 4 20	S	d c + 3·6	13 60·18	−1·79	58·39	S	d c + 1·6	26 9·84	−1·37	8·47	10·08				
	2799	+18 44	N	b + 1·1 a − 39·3	16 57·55	−1·57	55·98	N	b + 4·1 a − 24·8	29 7·21	−1·22	5·99	10·01				
	2810	+17 35	N	s Q − 1·69	18 23·75	−1·58	22·17	N	s Q − 1·41	30 33·37	−1·23	32·14	9·97				
	2816	+17 27	N		19 30·38	−1·58	28·80	N		31 40·09	−1·24	38·85	10·05	m s 12 10·005	− 0·038	+ 0·008 − 0·011†	12 9·964
	2833	+24 33	N		21 57·49	−1·45	56·04	N		34 7·14	−1·15	5·99	9·95				
	2840	+24 45	N		22 60·40	−1·45	58·95	N		35 10·07	−1·15	8·92	9·97				
	2850	+24 30	N		24 52·44	−1·46	50·98	N		37 2·13	−1·15	0·98	10·00				

NOTE. 1d = 0s·0225. † Correction for Transcribing Equation, each Observer having transcribed his own records.
* ρ is the retardation of an electric signal between the stations.

TABLE XV. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

VIZAGAPATAM (E), *Lat. 17° 41′, Long. 5ʰ 33ᵐ 20ˢ:* AND MADRAS (W), *Lat. 13° 4′, Long. 5ʰ 21ᵐ 8ˢ.*

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (*By Heaviside, with Telescope No. 1*): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (*By Campbell, with Telescope No. 2*): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.015$, $C_N - C_S = +0.077$	$\delta L_N - \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 29	2605	+19 38	N	*I. P. W.*	7 45 31·20	+1·82	33·02	N	*I. P. W.*	7 57 41·29	+1·68	42·97	12 9·95				
	2613	+22 39	N	d c + 3 6	46 26·38	+1·87	28·25	N	d c + 1·6	58 36·43	+1·74	38·17	9·92				
	2624	−14 32	S	b + 0·4	47 23·16	+1·28	24·44	S	b + 4·6	59 33·32	+1·09	34·41	9·97				
	2632	+20 12	N	a −40·3	49 12·87	+1·83	14·70	N	a −42·6	8 1 22·94	+1·69	24·63	9·93				
	2639	+16 7	N	s Q + 1·69	50 44·04	+1·76	45·80	N	s Q + 1·41	2 54·22	+1·61	55·83	10·03				
	2619	+16 51	N		52 14·12	+1·77	15·89	N		4 24·24	+1·63	25·87	9·98	m s 12 9·962	− 0·037	+ 0·021 − 0·011†	12 9·935
	2664	+16 48	N		55 13·34	+1·77	15·11	N		7 23·45	+1·63	25·08	9·97				
	2673	+ 2 40	S		56 35·74	+1·55	37·29	S		8 45·88	+1·38	47·26	9·97				
	2679	+10 17	S		57 14·94	+1·66	16·60	S		9 24·99	+1·51	26·50	9·90				
	2690	+13 28	S		58 57·06	+1·72	58·78	S		11 7·18	+1·56	8·74	9·96				
	2698	+13 51	S		59 24·56	+1·72	26·28	N		11 34·71	+1·57	36·28	10·00				
Jan. 29	2786	+27 37	N	*I. P. W.*	8 13 22·66	−1·41	21·25	N	*I. P. W.*	8 25 32·21	−0·99	31·22	12 9·97				
	2791	+ 4 20	S	d c + 3·6	14 9·11	−1·81	7·30	S	d c + 1·6	26 18·62	−1·42	17·20	9·90				
	2799	+18 44	N	b + 0·4	17 6·36	−1·57	4·79	N	b + 4·6	29 15·96	−1·16	14·80	10·01				
	2810	+17 35	N	a −40·3	18 32·59	−1·59	31·00	N	a −42·6	30 42·12	−1·18	40·94	9·94	m s 12 9·963	− 0·037	+ 0·008 − 0·011†	12 9·923
	2816	+17 27	N	s Q − 1·69	19 39·26	−1·59	37·67	N	s Q − 1·41	31 48·85	−1·18	47·67	10·00				
	2833	+24 33	N		22 6·35	−1·46	4·89	N		34 15·90	−1·05	14·85	9·96				
	2840	+24 45	N		23 9·22	−1·46	7·76	N		35 18·79	−1·04	17·75	9·99				
	2850	+24 30	N		24 61·31	−1·46	59·85	N		37 10·83	−1·05	9·78	9·93				
Jan. 31	2613	+22 39	N	*I. P. W.*	7 46 34·98	+1·90	36·88	N	*I. P. W.*	7 58 45·04	+1·83	46·87	12 9·99				
	2624	−14 32	S	d c + 3·6	47 31·81	+1·27	33·08	S	d c + 1·6	59 42·18	+0·92	43·10	10·02				
	2632	+20 12	N	b + 0·9	49 21·46	+1·85	23·31	N	b + 5·1	8 1 31·52	+1·76	33·28	9·97				
	2639	+16 7	N	a −42·8	50 52·76	+1·78	54·54	N	a −60·1	3 2·85	+1·66	4·51	9·97				
	2664	+16 48	N	s Q + 1·70	55 21·94	+1·79	23·73	N	s Q + 1·42	7 32·03	+1·67	33·70	9·97	m s 12 9·973	− 0·036	+ 0·026 − 0·011†	12 9·952
	2673	+ 2 40	S		56 44·36	+1·55	45·91	S		8 54·54	+1·33	55·87	9·96				
	2679	+10 17	S		57 23·56	+1·68	25·24	S		9 33·64	+1·51	35·15	9·91				
	2690	+13 28	S		59 5·68	+1·73	7·41	S		11 15·71	+1·59	17·30	9·89				
	2698	+13 51	S		59 33·11	+1·74	34·85	N		11 43·33	+1·60	44·93	10·08				

Note. $1^d = 0^s.0225$. † Correction for Transcribing Equation, each Observer having transcribed his own records.

* ρ is the retardation of an electric signal between the stations.

TABLE XV. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5ʰ 33ᵐ 20ˢ: AND MADRAS (W), *Lat.* 13° 4′, *Long.* 5ʰ 21ᵐ 8ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.015$, $C_N - C_S = +0.077$	$\delta L_N - \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 31	2778	+ 9 34	S	*I. P. W.*	8 10 46·40	−1·73	44·67	S	*I. P. W.*	8 22 56·01	−1·35	54·66	12 9·99				
	2782	+ 9 15	S	d c + 3·6	11 47·81	−1·73	46·08	S	d c + 1·6	23 57·34	−1·36	55·98	9·90				
	2786	+ 27 37	N	b + 0·9 a − 42·8	13 31·24	−1·39	29·85	N	b + 5·1 a − 60·1	25 40·66	−0·87	39·79	9·94				
	2791	+ 4 20	S	s Q − 1·70	14 17·68	−1·82	15·86	S	s Q − 1·42	26 27·26	−1·47	25·79	9·93				
	2799	+ 18 44	N		17 15·01	−1·57	13·44	N		29 24·47	−1·12	23·35	9·91	m s 12 9·918	− 0·036	+ 0·018 − 0·011†	12 9·889
	2810	+ 17 35	N		18 41·23	−1·59	39·64	N		30 50·67	−1·15	49·52	9·88				
	2816	+ 17 27	N		19 47·89	−1·59	46·30	N		31 57·36	−1·15	56·21	9·91				
	2833	+ 24 33	N		22 14·97	−1·45	13·52	N		34 24·37	−0·95	23·42	9·90				
	2840	+ 24 45	N		23 17·83	−1·45	16·38	N		35 27·24	−0·95	26·29	9·91				
	2850	+ 24 30	N		25 9·90	−1·45	8·45	N		37 19·31	−0·95	18·36	9·91				
Feb. 1	2605	+ 19 38	N	*I. P. W.*	7 45 43·98	+1·86	45·84	N	*I. P. W.*	7 57 54·09	+1·76	55·85	12 10·01				
	2613	+ 22 39	N	d c + 3·6	46 39·19	+1·92	41·11	N	d c + 1·6	58 49·16	+1·85	51·01	9·90				
	2624	− 14 32	S	b + 1·8 a − 49·1	47 36·07	+1·19	37·26	S	b + 6·1 a − 62·9	59 46·36	+0·89	47·25	9·99	m s 12 9·946	− 0·035	+ 0·012 − 0·011†	12 9·912
	2632	+ 20 12	N	s Q + 1·68	49 25·71	+1·87	27·58	N	s Q + 1·40	8 1 35·72	+1·77	37·49	9·91				
	2649	+ 16 51	N		52 26·96	+1·80	28·76	N		4 37·00	+1·68	38·68	9·92				

Note. 1ᵈ = 0ˢ·0225. † Correction for Transcribing Equation, each Observer having transcribed his own records.
* ρ is the retardation of an electric signal between the stations.

TABLE XVI. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5h 33m 20s: AND MADRAS (W), *Lat.* 13° 4′, *Long.* 5h 21m 8s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.015$, $C_N - C_S = +0.077$	$\delta L_N + \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 22	2999	+32 56	N	*I. P. E.*	8 32 57·82	−1·82	56·00	N	*I. P. E.*	8 45 4·09	+1·80	5·89	12 9·89				
	3016	+31 3	N	d c − 4·4	34 43·47	−1·83	41·64	N	d c − 4·2	46 49·78	+1·74	51·52	9·88	m s 12 9·868	− 0·006	− 0·004 − 0·011†	12 9·847
	3029	+17 42	S	b − 4·8 a −17·4	36 26·12	−1·92	24·20	N	b − 3·1 a −55·6	48 32·66	+1·42	34·08	9·88				
	3069	+28 23	N	s Q −1·70	42 27·97	−1·85	26·12	N	s Q +1·48	54 34·27	+1·67	35·94	9·82				
Jan. 22	3201	+26 27	N	*I. P. E.*	9 4 53·99	+1·54	55·53	N	*I. P. E.*	9 17 6·65	−1·34	5·31	12 9·78				
	3204	+26 43	N	d c − 4·4	5 25·13	+1·54	26·67	N	d c − 4·2	17 37·77	−1·32	36·45	9·78	m s 12 9·750	− 0·006	+ 0·021 − 0·011†	12 9·754
	3216	− 4 35	S	b − 4·8 a −17·4	7 10·51	+1·35	11·86	S	b − 3·1 a −55·6	19 23·56	−2·01	21·55	9·69				
				s Q + 1·70					s Q −1·48								
Jan. 23	2987	− 2 59	S	*I. P. E.*	8 31 7·15	+1·31	8·46	S	*I. P. E.*	8 43 17·40	+0·87	18·27	12 9·81				
	2999	+32 56	N	d c − 4·4	32 55·15	+1·60	56·75	N	d c − 4·2	45 4·67	+1·94	6·61	9·86				
	3016	+31 3	N	b − 5·3 a −22·5	34 40·83	+1·59	42·42	N	b − 3·0 a −70·9	46 50·33	+1·86	52·19	9·77				
	3037	− 7 30	S	s Q + 1·70	37 24·18	+1·27	25·45	S	s Q + 1·47	49 34·49	+0·75	35·24	9·79	m s 12 9·835	− 0·006	+ 0·031 − 0·011†	12 9·849
	3053	+ 9 52	S		39 0·28	+1·41	1·69	S		51 10·27	+1·22	11·49	9·80				
	3062	+13 33	N		40 37·40	+1·45	38·85	N		52 47·56	+1·32	48·88	10·03				
			S		40 37·46	+1·44	38·90	S		52 47·37	+1·32	48 69	9·79				
	3069	+28 23	N		42 25·32	+1·56	26·88	N		54 34·94	+1·77	36·71	9·83				
Jan. 23	3129	+18 33	N	*I. P. E.*	8 53 2·07	−1·92	0·15	N	*I. P. E.*	9 5 11·46	−1·48	9·98	12 9·83				
	3138	+21 47	N	d c − 4·4	54 35·50	−1·89	33·61	N	d c − 4·2	6 44·77	−1·39	43·38	9·77				
	3147	+15 27	N	b − 5·3 a −22·5	56 26·11	−1·94	24·17	N	b − 3·0 a −70·9	8 35·54	−1·57	33·97	9·80				
			S	s Q − 1·70	56 26·09	−1·94	24·15	S	s Q − 1·47	8 35·47	−1·57	33·90	9·75				
	3160	− 5 50	S		58 34·92	−2·11	32·81	S		10 44·71	−2·15	42·56	9·75	m s 12 9·795	− 0·006	+ 0·017 − 0·011†	12 9·795
	3171	+18 14	S		9 0 6·63	−1·93	4·70	N		12 16·07	−1·49	14·58	9·88				
	3178	+34 55	N		1 33·55	−1·77	31·78	N		13 42·49	−0·93	41·56	9·78				
	3201	+26 27	N		4 58·11	−1·85	56·26	N		17 7·29	−1·24	6·05	9·79				
	3204	+26 43	N		5 29·21	−1·85	27·36	N		17 38·44	−1·23	37·21	9·85				
	3216	− 4 35	S		7 14·70	−2·11	12·59	S		19 24·45	−2·11	22·34	9·75				

NOTE. 1d = 0s·0225. † Correction for Transcribing Equation, each Observer having transcribed his own records.
* ρ is the retardation of an electric signal between the stations.

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5h 33m 20s: AND MADRAS (W), *Lat.* 13° 4′, *Long.* 5h 21m 8s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	E: Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	W: Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference of Corrected Times (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.015$, $C_N - C_S = +0.077$	$\delta L_N + \rho$
				Transits Observed at E. *By Heaviside, with Telescope No. 1*					Transits Observed at W. *By Campbell, with Telescope No. 2*								
1877		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 24	2965	+29 13	N	*I. P. E.*	8 27 10·41	+1·79	12·20	N	*I. P. E.*	8 39 20·06	+1·94	22·00	12 9·80				
	2971	+ 6 52	S	d c − 4·4	28 12·61	+1·54	14·15	S	d c − 4·2	40 22·88	+1·10	23·98	9·83				
	2978	+ 6 17	S	b + 2·3 a −26·1	29 51·96	+1·54	53·50	S	b − 2·9 a −89·4	42 2·22	+1·08	3·30	9·80				
	2987	− 2 59	S	s Q +1·70	31 7·77	+1·44	9·21	S	s Q +1·48	43 18·29	+0·77	19·06	9·85				
	2999	+32 56	N		32 55·72	+1·83	57·55	N		45 5·32	+2·11	7·43	9·88				
	3016	+31 3	N		34 41·39	+1·81	43·20	N		46 51·03	+2·02	53·05	9·85	m s 12 9·817	− 0·007	+ 0·031 − 0·011†	12 9·830
	3029	+17 42	N		36 24·15	+1·65	25·80	N		48 34·15	+1·49	35·64	9·84				
	3037	− 7 30	S		37 24·83	+1·39	26·22	S		49 35·40	+0·61	36·01	9·79				
	3053	+ 9 52	S		39 0·91	+1·57	2·48	S		51 10·95	+1·20	12·15	9·67				
	3062	+13 33	{ N		40 38·12	+1·61	39·73	N		52 48·26	+1·33	49·59	9·86				
			{ S		40 38·10	+1·62	39·72	S		52 48·18	+1·33	49·51	9·79				
	3069	+28 23	N		42 25·89	+1·77	27·66	N		54 35·60	+1·91	37·51	9·85				
Jan. 24	3138	+21 47	N	*I. P. E.*	8 54 36·11	−1·70	34·41	N	*I. P. E.*	9 6 45·51	−1·32	44·19	12 9·78				
	3147	+15 27	{ N	d c − 4·4	56 26·77	−1·77	25·00	N	d c − 4·2	8 36·29	−1·55	34·74	9·74				
			{ S	b + 2·3 a −26·1	56 26·79	−1·77	25·02	S	b − 2·9 a −89·4	8 36·23	−1·56	34·67	9·65				
	3160	− 5 50	S	s Q −1·70	58 35·58	−1·98	33·60	S	s Q −1·48	10 45·65	−2·29	43·36	9·76				
	3171	+18 14	S		9 0 7·33	−1·74	5·59	N		12 16·81	−1·45	15·36	9·77	m s 12 9·754	− 0·007	+ 0·019 − 0·011†	12 9·755
	3178	+34 55	N		1 34·11	−1·54	32 57	N		13 43·13	−0·75	42·38	9·81				
	3201	+26 27	N		4 58·71	−1·65	57·06	N		17 7·97	−1·14	6·83	9·77				
	3204	+26 43	N		5 29·85	−1·64	28·21	N		17 39·09	−1·12	37·97	9·76				
	3216	− 4 35	S		7 15·35	−1·98	13·37	S		19 25·36	−2·24	23·12	9·75				
Jan. 25	3053	+ 9 52	S	*I. P. E.*	8 39 1·77	+1·51	3·28	S	*I. P. E.*	8 51 12·03	+1·18	13·21	12 9·93				
	3062	+13 33	S	d c − 4·4	40 38·92	+1·56	40·48	S	d c − 4·2	52 49·16	+1·32	50·48	10·00	m s 12 9·957	− 0·006	+ 0·041 − 0·011†	12 9·981
	3069	+28 23	N	b + 0·8 a −30·9	42 26·70	+1·75	28·45	N	b − 4·0 a −93·8	54 36·47	+1·92	38·39	9·94				
				s Q +1·69					s Q +1·49								

NOTE. 1d = 0s·0225. † Correction for Transcribing Equation, each Observer having transcribed his own records.
* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

VIZAGAPATAM (E), *Lat. 17° 41′, Long. 5h 33m 20s*: AND MADRAS (W), *Lat. 13° 4′, Long. 5h 21m 8s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.015$, $C_N - C_S = +0.077$	$\delta L_N + \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 25	8129	+18 33	N	I. P. E.	8 53 3·41	−1·77	1·64	N	I. P. E.	9 5 13·02	−1·46	11·56	12 9·92				
	8138	+21 47	N	d c − 4·4	54 36·86	−1·72	35·14	N	d c − 4·2	6 46·22	−1·34	44·88	9·74				
	8147	+15 27	N	b + 0·8 a −30·9	56 27·48	−1·80	25·68	N	b − 4·0 a −93·8	8 37·16	−1·59	35·57	9·89				
			S	s Q −1·69	56 27·44	−1·80	25·64	S	s Q −1·49	8 37·00	−1·58	35·42	9·78				
	8160	− 5 50	S		58 36·34	−2·05	34·29	S		10 46·46	−2·35	44·11	9·82				
	8171	+18 14	S		9 0 8·07	−1·77	6·30	N		12 17·62	−1·47	16·15	9·85	m s 12 9·829	−0·006	+0·021 −0·011†	12 9·833
	8178	+34 55	N		1 34·83	−1·53	33·30	N		13 43·93	−0·74	43·19	9·89				
	8188	− 9 2	S		2 29·82	−2·09	27·73	S		14 39·98	−2·47	37·51	9·78				
	8201	+26 27	N		4 59·47	−1·66	57·81	N		17 8·73	−1·14	7·59	9·78				
	8204	+26 43	N		5 30·56	−1·66	28·90	N		17 39·87	−1·12	38·75	9·85				
	8216	− 4 35	S		7 16·13	−2·04	14·09	S		19 26·21	−2·30	23·91	9·82				
Jan. 26	2971	+ 6 52	S	I. P. E.	8 28 14·20	+1·51	15·71	S	I. P. E.	8 40 24·44	+0·99	25·43	12 9·72				
	2978	+ 6 17	S	d c − 4·4	29 53·54	+1·50	55·04	S	d c − 4·2	42 3·86	+0·97	4·83	9·79				
	2987	− 2 59	S	b + 1·8 a −29·3	31 9·36	+1·39	10·75	S	b − 3·2 a −100·9	43 19·89	+0·62	20·51	9·76				
	2999	+32 56	N	s Q +1·69	32 57·26	+1·83	59·09	N	s Q +1·40	45 6·68	+2·14	8·82	9·73				
	3016	+31 3	N		34 42·99	+1·80	44·79	N		46 52·45	+2·03	54·48	9·69				
	3029	+17 42	N		36 25·70	+1·63	27·33	N		48 35·67	+1·43	37·10	9·77	m s 12 9·768	−0·006	+0·034 −0·011†	12 9·785
	3037	− 7 30	S		37 26·42	+1·35	27·77	S		49 37·13	+0·44	37·57	9·80				
	3058	+ 9 52	S		39 2·52	+1·54	4·06	S		51 12·72	+1·10	13·82	9·76				
	3062	+13 33	N		40 39·67	+1·59	41·26	N		52 49·83	+1·25	51·08	9·82				
			S		40 39·63	+1·58	41·21	S		52 49·76	+1·25	51·01	9·80				
	3069	+28 23	N		42 27·41	+1·76	29·17	N		54 37·08	+1·90	38·98	9·81				
Jan. 26	8129	+18 33	N	I. P. E.	8 53 4·14	−1·74	2·40	N	I. P. E.	9 5 13·60	−1·35	12·25	12 9·85				
	8138	+21 47	N	d c − 4·4	54 37·52	−1·70	35·82	N	d c − 4·2	6 46·86	−1·21	45·65	9·83				
	8147	+15 27	N	b + 1·8 a −29·3	56 28·10	−1·77	26·33	N	b − 3·2 a −100·9	8 37·74	−1·48	36·26	9·93	m s 12 9·887	−0·006	+0·018 −0·011†	12 9·888
			S	s Q −1·69	56 28·17	−1·78	26·39	S	s Q −1·40	8 37·72	−1·48	36·24	9·85				
	8160	− 5 50	S		58 36·99	−2·02	34·97	S		10 47·19	−2·30	44·89	9·92				
	8171	+18 14	S		9 0 8·71	−1·75	6·96	N		12 18·26	−1·36	16·90	9·94				

NOTE. 1d = 0s·0225. † Correction for Transcribing Equation, each Observer having transcribed his own records.

* ρ is the retardation of an electric signal between the stations.

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5h 33m 20s: AND MADRAS (W), *Lat.* 13° 4′, *Long.* 5h 21m 8s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, by Heaviside, with Telescope No. 1: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W, by Campbell, with Telescope No. 2: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.015$, $C_N - C_S = +0.077$	$\delta L_N + \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 27	2965	+29 13	N	I. P. W.	8 27 12·27	+2·03	14·30	N	I. P. W.	8 39 22·54	+1·73	24·27	12 9·97				
	2965½‡	+29 13	N	d c + 3·6	27 14·12	+2·03	16·15	N	d c + 1·6	39 24·36	+1·73	26·09	9·94				
	2971	+ 6 52	S	b + 1·1 a − 39·3	28 14·75	+1·65	16·40	S	b + 4·1 a − 24·8	40 24·83	+1·48	26·31	9·91				
	2987	− 2 59	S	s Q + 1·69	31 9·97	+1·49	11·46	S	s Q + 1·41	43 20·04	+1·39	21·43	9·97				
	2999	+32 56	N		32 57·66	+2·11	59·77	N		45 7·92	+1·78	9·70	9·93				
	3016	+31 3	N		34 43·29	+2·06	45·35	N		46 53·60	+1·76	55·36	10·01	m s 12 9·921	− 0·006	+ 0·026 − 0·011†	12 9·930
	3029	+17 42	N		36 26·12	+1·81	27·93	N		48 36·33	+1·60	37·93	10·00				
	3037	− 7 30	S		37 27·05	+1·42	28·47	S		49 37·02	+1·34	38·36	9·89				
	3053	+ 9 52	S		39 3·08	+1·68	4·76	S		51 13·04	+1·51	14·55	9·79				
	3062	+13 33	N		40 40·18	+1·74	41·92	N		52 50·30	+1·55	51·85	9·93				
			S		40 40·22	+1·74	41·96	S		52 50·21	+1·55	51·76	9·80				
	3069	+28 23	N		42 27·90	+2·01	29·91	N		54 38·10	+1·72	39·82	9·91				
Jan. 29	2965	+29 13	N	I. P. W.	8 27 13·65	+2·00	15·65	N	I. P. W.	8 39 23·67	+1·87	25·54	12 9·89				
	2965½‡	+29 13	N	d c + 3·6	27 15·52	+2·00	17·52	N	d c + 1·6	39 25·55	+1·87	27·42	9·90				
	2971	+ 6 52	S	b + 0·4 a − 40·3	28 16·05	+1·61	17·66	S	b + 4·6 a − 42·6	40 26·14	+1·44	27·58	9·92				
	2978	+ 6 17	S	s Q + 1·69	29 55·39	+1·61	57·00	S	s Q + 1·41	42 5·45	+1·44	6·89	9·89				
	2987	− 2 59	S		31 11·28	+1·46	12·74	S		43 21·38	+1·28	22·66	9·92				
	2999	+32 56	N		32 58·92	+2·09	61·01	N		45 9·03	+1·97	11·00	9·99				
	3016	+31 3	N		34 44·63	+2·05	46·68	N		46 54·72	+1·91	56·63	9·95	m s 12 9·938	− 0·005	+ 0·029 − 0·011†	12 9·951
	3029	+17 42	N		36 27·46	+1·79	29·25	N		48 37·54	+1·64	39·18	9·93				
	3037	− 7 30	S		37 28·28	+1·39	29·67	S		49 38·49	+1·21	39·70	10·03				
	3053	+ 9 52	S		39 4·32	+1·66	5·98	S		51 14·36	+1·50	15·86	9·88				
	3062	+13 33	N		40 41·44	+1·71	43·15	N		52 51·57	+1·56	53·13	9·98				
			S		40 41·47	+1·71	43·18	S		52 51·50	+1·57	53·07	9·89				
	3069	+28 23	N		42 29·15	+1·99	31·14	N		54 39·31	+1·86	41·17	10·03				

NOTE. 1d = 0s·0225. † Correction for Transcribing Equation, each Observer having transcribed his own records.
* ρ is the retardation of an electric signal between the stations. ‡ This star is not given in the B. A. Catalogue.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5h 33m 20s: AND MADRAS (W), *Lat.* 13° 4′, *Long.* 5h 21m 8s.

Astronomical Date	Star		Transits Observed at E — By Heaviside, with Telescope No. 1					Transits Observed at W — By Campbell, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}015$, $C_N - C_S = +0{\cdot}077$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 29	3129	+18 33	N	I. P. W.	8 53 5·92	−1·58	4·34	N	I. P. W.	9 5 15·59	−1·17	14·42	12 10·08				
	3138	+21 47	N	d c + 3·6	54 39·31	−1·52	37·79	N	d c + 1·6	6 48·87	−1·10	47·77	9·98				
	3147	+15 27	N	b + 0·4 a −40·3	56 29·94	−1·63	28·31	N	b + 4·6 a −42·6	8 39·54	−1·22	38·32	10·01				
			S	s Q −1·69	56 29·94	−1·63	28·31	S	s Q −1·41	8 39·53	−1·22	38·31	10·00				
	3160	− 5 50	S		58 39·01	−1·96	37·05	S		10 48·58	−1·59	46·99	9·94	m s 12 9·972	− 0·005	+ 0·023 − 0·011†	12 9·979
	3171	+18 14	S		9 0 10·58	−1·58	9·00	N		12 20·13	−1·17	18·96	9·96				
	3188	− 9 2	S		2 32·45	−2·01	30·44	S		14 42·02	−1·64	40·38	9·94				
	3201	+26 27	N		5 1·98	−1·43	0·55	N		17 11·46	−1·01	10·45	9·90				
	3204	+26 43	N		5 33·05	−1·43	31·62	N		17 42·59	−1·00	41·59	9·97				
	3216	− 4 35	S		7 18·74	−1·94	16·80	S		19 28·31	−1·57	26·74	9·94				
Jan. 31	2965	+29 13	N	I. P. W.	8 27 14·89	+2·04	16·93	N	I. P. W.	8 39 24·88	+2·02	26·90	12 9·97				
	2965½‡	+29 13	N	d c + 3·6	27 16·82	+2·04	18·86	N	d c + 1·6	39 26·70	+2·02	28·72	9·86				
	2971	+ 6 52	S	b + 0·9 a −42·8	28 17·24	+1·62	18·86	S	b + 5·1 a −60·1	40 27·49	+1·42	28·91	10·05				
	2978	+ 6 17	S	s Q +1·70	29 56·67	+1·61	58·28	S	s Q +1·42	42 6·84	+1·41	8·25	9·97				
	2987	− 2 59	S		31 12·51	+1·46	13·97	S		43 22·78	+1·19	23·97	10·00				
	2999	+32 56	N		33 0·23	+2·12	2·35	N		45 10·15	+2·15	12·30	9·95	m s 12 9·960	− 0·005	+ 0·031 − 0·011†	12 9·975
	3016	+31 3	N		34 45·92	+2·08	48·00	N		46 55·89	+2·08	57·97	9·97				
	3029	+17 42	N		36 28·71	+1·81	30·52	N		48 38·83	+1·70	40·53	10·01				
	3037	− 7 30	S		37 29·60	+1·39	30·99	S		49 39·85	+1·08	40·93	9·94				
	3053	+ 9 52	S		39 5·58	+1·67	7·25	S		51 15·68	+1·49	17·17	9·92				
	3062	+13 33	S		40 42·70	+1·73	44·43	S		52 52·79	+1·59	54·38	9·95				
	3069	+28 23	N		42 30·44	+2·02	32·46	N		54 40·39	+2·00	42·39	9·93				
Jan. 31	3129	+18 33	N	I. P. W.	8 53 7·27	−1·57	5·70	N	I. P. W.	9 5 16·78	−1·13	15·65	12 9·95				
	3138	+21 47	N	d c + 3·6 b + 0·9 a −42·8 s Q −1·70	54 40·62	−1·51	39·11	N	d c + 1·6 b + 5·1 a −60·1 s Q −1·42	6 50·09	−1·04	49·05	9·94	m s 12 9·945	− 0·005	0·000 − 0·011†	12 9·929

NOTE. 1d = 0s·0225. † Correction for Transcribing Equation, each Observer having transcribed his own records.
* ρ is the retardation of an electric signal between the stations. ‡ This star is not given in the B. A. Catalogue.

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5h 33m 20s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Perl. Equations $H_N - H_S = +0^s{\cdot}031$, $C_N - C_S = +0{\cdot}055$	$\delta L_N - \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 17	3016	+31 3	N	*I. P. W.*	8 47 3·62	+2·04	5·66	N	*I. P. W.*	9 12 30·72	+1·26	31·98	25 26·32				
	3053	+ 9 52	S	d: c + 2·9	51 23·08	+1·74	24·82	S	d: c − 1·7	16 49·91	+1·29	51·20	26·38	m s 25 26·393	− 0·003	+ 0·012	25 26·402
	3062	+13 33	S	b + 2·9, a −29·8	53 0·21	+1·78	1·99	S	b − 3·2, a + 1·7	18 27·14	+1·29	28·43	26·44				
	3069	+28 23	N	s: Q + 1·70	54 48·02	+1·99	50·01	N	s: Q + 1·40	20 15·17	+1·27	16·44	26·43				
Feb. 17	3129	+18 33	S	*I. P. W.*	9 5 24·84	−1·54	23·30	N	*I. P. W.*	9 30 51·30	−1·52	49·78	25 26·48				
	3138	+21 47	N	d: c + 2·9	6 58·21	−1·50	56·71	N	d: c − 1·7	32 24·71	−1·52	23·19	26·48				
	3147	+15 27	N	b + 2·9, a −29·8	8 48·91	−1·59	47·32	N	b − 3·2, a + 1·7	34 15·27	−1·51	13·76	26·44				
			S	s	8 48·84	−1·59	47·25	S	s	34 15·18	−1·51	13·67	26·42				
	3160	− 5 50	S	Q − 1·70	10 57·73	−1·84	55·89	S	Q − 1·40	36 23·86	−1·49	22·37	26·48				
	3171	+18 14	N		12 29·42	−1·55	27·87	N		37 55·93	−1·52	54·41	26·54	m s 25 26·483	− 0·003	+ 0·008	25 26·488
	3187½†	− 9 2	S		14 43·30	−1·87	41·43	S		40 9·40	−1·49	7·91	26·48				
	3188	− 9 2	S		14 51·21	−1·87	49·34	S		40 17·29	−1·49	15·80	26·46				
	3201	+26 27	N		17 20·85	−1·44	19·41	N		42 47·44	−1·53	45·91	26·50				
	3204	+26 43	N		17 51·96	−1·43	50·53	N		43 18·56	−1·52	17·04	26·51				
	3216	− 4 35	S		19 37·51	−1·82	35·69	S		45 3·70	−1·49	2·21	26·52				
Feb. 21	2965	+29 13	N	*I. P. E.*	8 39 33·48	+1·70	35·18	N	*I. P. E.*	9 5 0·28	+1·34	1·62	25 26·44				
	2965½†	+29 13	N	d: c − 3·8	39 35·35	+1·70	37·05	N	d: c − 1·5	5 2·11	+1·34	3·45	26·40				
	2971	+ 6 52	S	b + 2·6, a − 6·1	40 35·50	+1·64	37·14	S	b − 1·3, a − 2·1	6 2·24	+1·34	3·58	26·44				
	2978	+ 6 17	S	s: Q + 1·70	42 14·91	+1·64	16·55	S	s: Q + 1·41	7 41·57	+1·34	42·91	26·36				
	2987	− 2 59	S		43 30·60	+1·61	32·21	S		8 57·30	+1·33	58·63	26·42				
	2999	+32 56	N		45 18·87	+1·70	20·57	N		10 45·66	+1·35	47·01	26·44				
	3016	+31 3	N		47 4·53	+1·71	6·24	N		12 31·29	+1·35	32·64	26·40	m s 25 26·412	− 0·003	+ 0·013	25 26·422
	3029	+17 42	N		48 47·13	+1·67	48·80	N		14 13·89	+1·35	15·24	26·44				
			S		48 47·08	+1·67	48·75	S		14 13·83	+1·34	15·17	26·42				
	3037	− 7 30	S		49 47·62	+1·61	49·23	S		15 14·29	+1·33	15·62	26·39				
	3053	+ 9 52	S		51 23·80	+1·65	25·45	S		16 50·57	+1·34	51·91	26·46				
	3062	+13 33	S		53 1·04	+1·66	2·70	S		18 27·76	+1·34	29·10	26·40				
	3069	+28 23	N		54 49·10	+1·70	50·80	N		20 15·80	+1·35	17·15	26·35				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

TABLE XV. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5h 33m 20s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.031$, $C_N - C_B = +0.055$	$\delta L_N - \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 21	3129	+ 18 33	N	*I. P. E.*	9 5 25·69	− 1·72	23·97	N	*I. P. E.*	9 30 51·89	− 1·47	50·42	25 26·45				
	3138	+ 21 47	N	d c − 3·8	6 59·20	− 1·72	57·48	N	d c − 1·5	32 25·27	− 1·47	23·80	26·32				
	3147	+ 15 27	N	b + 2·6 a − 6·1	8 49·79	− 1·73	48·06	N	b − 1·3 a − 2·1	34 15·86	− 1·47	14·39	26·33				
			S	s Q − 1·70	8 49·68	− 1·73	47·95	S	s Q − 1·41	34 15·79	− 1·47	14·32	26·37				
	3160	− 5 50	S		10 58·46	− 1·79	56·67	S		36 24·44	− 1·49	22·95	26·28				
	3171	+ 18 14	N		12 30·38	− 1·72	28·66	N		37 56·50	− 1·47	55·03	26·37	m s 25 26·348	− 0·003	+ 0·011	25 26·356
	3187½†	− 9 2	S		14 43·98	− 1·79	42·19	S		40 10·00	− 1·49	8·51	26·32				
	3188	− 9 2	S		14 51·87	− 1·79	50·08	S		40 17·91	− 1·49	16·42	26·34				
	3201	+ 26 27	N		17 21·88	− 1·70	20·18	N		42 47·97	− 1·47	46·50	26·32				
	3204	+ 26 43	N		17 53·04	− 1·70	51·34	N		43 19·12	− 1·46	17·66	26·32				
	3216	− 4 35	S		19 38·17	− 1·78	36·39	S		45 4·28	− 1·48	2·80	26·41				
Feb. 22	2965	+ 29 13	N	*I. P. E.*	8 39 33·56	+ 1·71	35·27	N	*I. P. E.*	9 5 0·39	+ 1·30	1·69	25 26·42				
	2965½†	+ 29 13	N	d c − 3·8	39 35·39	+ 1·71	37·10	N	d c − 1·5	5 2·25	+ 1·30	3·55	26·45				
	2999	+ 32 56	N	b + 2·9 a − 7·8	45 18·98	+ 1·72	20·70	N	b − 2·5 a + 0·4	10 45·81	+ 1·29	47·10	26·40				
	3016	+ 31 3	N	s Q + 1·69	47 4·62	+ 1·71	6·33	N	s Q + 1·40	12 31·45	+ 1·30	32·75	26·42				
	3029	+ 17 42	N		48 47·29	+ 1·67	48·96	N		14 14·01	+ 1·31	15·32	26·36	m s 25 26·412	− 0·002	+ 0·010	25 26·420
			S		48 47·19	+ 1·68	48·87	S		14 13·94	+ 1·31	15·25	26·38				
	3037	− 7 30	S		49 47·73	+ 1·59	49·32	S		15 14·42	+ 1·32	15·74	26·42				
	3053	+ 9 52	S		51 23·93	+ 1·65	25·58	S		16 50·70	+ 1·31	52·01	26·43				
	3062	+ 13 33	S		53 1·19	+ 1·66	2·85	S		18 27·90	+ 1·31	29·21	26·36				
	3069	+ 28 23	N		54 49·05	+ 1·71	50·76	N		20 15·94	+ 1·30	17·24	26·48				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5ʰ 33ᵐ 20ˢ: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5ʰ 7ᵐ 52ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.031$, $C_N - C_S = +0.055$	$\delta L_N - \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 22	3129	+ 18 33	N	*I. P. E.*	9 5 25·90	− 1·71	24·19	N	*I. P. E.*	9 30 52·06	− 1·50	50·56	25 26·37				
	3138	+ 21 47	N	d c − 3·8	6 59·30	− 1·70	57·60	N	d c − 1·5	32 25·45	− 1·50	23·95	26·35				
	3147	+ 15 27	N	b + 2·9 a − 7·8	8 49·85	− 1·72	48·13	N	b − 2·5 a + 0·4	34 16·03	− 1·50	14·53	26·40				
			S	s Q − 1·69	8 49·82	− 1·72	48·10	S	s Q − 1·40	34 15·99	− 1·50	14·49	26·39				
	3160	− 5 50	S		10 58·49	− 1·79	56·70	S		36 24·64	− 1·49	23·15	26·45				
	3171	+ 18 14	N		12 30·43	− 1·71	28·72	N		37 56·71	− 1·50	55·21	26·49	m s 25 26·406	− 0·002	+ 0·011	25 26·415
	3187½†	− 9 2	S		14 44·04	− 1·80	42·24	S		40 10·15	− 1·49	8·66	26·42				
	3188	− 9 2	S		14 51·92	− 1·80	50·12	S		40 18·03	− 1·49	16·54	26·42				
	3201	+ 26 27	N		17 21·97	− 1·68	20·29	N		42 48·18	− 1·51	46·67	26·38				
	3204	+ 26 43	N		17 53·08	− 1·69	51·39	N		43 19·29	− 1·51	17·78	26·39				
	3216	− 4 35	S		19 38·30	− 1·79	36·51	S		45 4·41	− 1·49	2·92	26·41				
Feb. 23	3187½†	− 9 2	S	*I. P. W.*	9 14 43·98	− 1·63	42·35	S	*I. P. W.*	9 40 9·91	− 1·14	8·77	25 26·42				
	3188	− 9 2	S	d c + 1·3	14 51·86	− 1·63	50·23	S	d c − 1·7	40 17·82	− 1·14	16·68	26·45	m s 25 26·467	− 0·001	+ 0·016	25 26·482
	3201	+ 26 27	N	b + 4·4 a − 5·2	17 21·76	− 1·53	20·23	N	b − 0·2 a + 32·2	42 48·37	− 1·61	46·76	26·53				
				s Q − 1·70					s Q − 1·40								
Feb. 24	2965	+ 29 13	N	*I. P. W.*	8 39 33·46	+ 1·87	35·33	N	*I. P. W.*	9 5 0·48	+ 1·25	1·73	25 26·40				
	2965½†	+ 29 13	N	d c + 1·3	39 35·32	+ 1·87	37·19	N	d c − 1·7	5 2·35	+ 1·25	3·60	26·41				
	2971	+ 6 52	S	b + 3·9 a − 8·1	40 35·59	+ 1·78	37·37	S	b − 1·9 a + 10·9	6 2·34	+ 1·36	3·70	26·33				
	2978	+ 6 17	S	s Q + 1·70	42 14·92	+ 1·78	16·70	S	s Q + 1·41	7 41·66	+ 1·37	43·03	26·33				
	2987	− 2 59	S		43 30·61	+ 1·75	32·36	S		8 57·34	+ 1·40	58·74	26·38				
	2999	+ 32 56	N		45 18·82	+ 1·90	20·72	N		10 45·82	+ 1·23	47·05	26·33				
	3016	+ 31 3	N		47 4·50	+ 1·88	6·38	N		12 31·50	+ 1·24	32·74	26·36	m s 25 26·356	− 0·001	+ 0·013	25 26·368
	3029	+ 17 42	N		48 47·14	+ 1·82	48·96	N		14 14·02	+ 1·31	15·33	26·37				
			S		48 47·13	+ 1·83	48·96	S		14 13·94	+ 1·31	15·25	26·29				
	3037	− 7 30	S		49 47·64	+ 1·74	49·38	S		15 14·33	+ 1·43	15·76	26·38				
	3053	+ 9 52	S		51 23·90	+ 1·79	25·69	S		16 50·64	+ 1·35	51·99	26·30				
	3062	+ 13 33	S		53 1·03	+ 1·80	2·83	S		18 27·88	+ 1·33	29·21	26·38				
	3069	+ 28 23	N		54 49·01	+ 1·88	50·89	N		20 15·99	+ 1·27	17·26	26·37				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5h 33m 20s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star		Transits Observed at E — By Heaviside, with Telescope No. 1					Transits Observed at W — By Campbell, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.031$, $C_N - C_S = +0^s.055$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 24	3129	+18 33	N	*I. P. W.*	9 6 25·73	−1·58	24·15	N	*I. P. W.*	9 31 52·13	−1·51	50·62	25 26·47				
	3138	+21 47	N	d c + 1·3	6 59·12	−1·56	57·56	N	d c − 1·7	32 25·54	−1·53	24·01	26·45				
	3147	+15 27	N	b + 3·9 a − 8·1	8 49·72	−1·58	48·14	N	b − 1·9 a + 10·9	34 16·09	−1·49	14·60	26·46				
			S	s Q − 1·70	8 49·67	−1·58	48·09	S	s Q − 1·41	34 16·01	−1·49	14·52	26·43				
	3171	+18 14	N		12 30·34	−1·57	28·77	N		37 56·74	−1·51	55·23	26·46	m s 25 26·439	− 0·001	+ 0·008	25 26·446
	3188	− 9 2	S		14 51·90	−1·67	50·23	S		40 18·00	−1·39	16·61	26·38				
	3201	+26 27	N		17 21·83	−1·54	20·29	N		42 48·29	−1·56	46·73	26·44				
	3204	+26 43	N		17 52·99	−1·53	51·46	N		43 19·40	−1·56	17·84	26·38				
	3216	− 4 35	S		19 38·16	−1·65	36·51	S		45 4·40	−1·41	2·99	26·48				
Feb. 25	3053	+ 9 52	S	*I. P. E.*	8 51 23·71	+1·88	25·59	S	*I. P. E.*	9 16 50·66	+1·21	51·87	25 26·28				
	3062	+13 33	S	d c + 1·4	53 0·91	+1·89	2·80	S	d c − 1·5	18 27·87	+1·20	29·07	26·27	m s 25 26·283	− 0·002	+ 0·016	25 26·297
	3069	+28 23	N	b + 6·6 a + 1·6	54 48·98	+1·89	50·87	N	b − 7·1 a + 2·5	20 16·00	+1·17	17·17	26·30				
				s Q + 1·70					s Q + 1·40								
Feb. 25	3147	+15 27	N	*I. P. E.*	9 8 49·59	−1·51	48·08	N	*I. P. E.*	9 34 16·04	−1·60	14·44	25 26·36				
			S	d c + 1·4	8 49·50	−1·51	47·99	S	d c − 1·5	34 16·05	−1·60	14·45	26·46				
	3160	− 5 50	S	b + 6·6 a + 1·6	10 58·13	−1·52	56·61	S	b − 7·1 a + 2·5	36 24·55	−1·57	22·98	26·37				
	3171	+18 14	N	s Q − 1·70	12 30·07	−1·51	28·56	N	s Q − 1·40	37 56·69	−1·61	55·08	26·52				
	3188	− 9 2	S		14 51·58	−1·51	50·07	S		40 17·99	−1·57	16·42	26·35	m s 25 26·385	− 0·002	+ 0·012	25 26·395
	3201	+26 27	N		17 21·74	−1·50	20·24	N		42 48·27	−1·63	46·64	26·40				
	3204	+26 43	N		17 52·89	−1·51	51·38	N		43 19·34	−1·63	17·71	26·33				
	3216	− 4 35	S		19 38·07	−1·51	36·56	S		45 4·42	−1·57	2·85	26·29				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5h 33m 20s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star		Transits Observed at E — By Heaviside, with Telescope No. 1					Transits Observed at W — By Campbell, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.031$ $O_N - O_S = +0.055$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 17	3398	+ 9 31	S	I. P. W.	9 24 4·59	+ 1·74	6·33	S	I. P. W.	9 49 31·52	+ 1·29	32·81	25 26·48				
	3404	+ 15 48	S	d c + 2·9	25 40·40	+ 1·81	42·21	S	d c − 1·7	51 7·36	+ 1·29	8·65	26·44				
	3412	+ 3 58	S	b + 2·9 a − 29·8	27 30·15	+ 1·67	31·82	S	b − 3·2 a + 1·7	52 56·96	+ 1·30	58·26	26·44				
	3423	+ 22 33	N	s Q + 1·70	30 7·37	+ 1·90	9·27	N	s Q + 1·40	55 34·47	+ 1·28	35·75	26·48				
	3434	+ 12 13	S		31 43·09	+ 1·77	44·86	S		57 10·02	+ 1·29	11·31	26·45	m s 25 26·456	+ 0·038	+ 0·017	25 26·511
	3443	+ 16 21	N		33 10·41	+ 1·82	12·23	N		58 37·37	+ 1·28	38·65	26·42				
			S		33 10·38	+ 1·81	12·19	S		58 37·33	+ 1·28	38·61	26·42				
	3453	+ 17 22	N		34 47·46	+ 1·84	49·30	N		10 0 14·57	+ 1·28	15·85	26·55				
			S		34 47·48	+ 1·83	49·31	S		0 14·39	+ 1·28	15·67	26·36				
	3459	+ 12 34	S		35 59·10	+ 1·78	60·88	S		1 26·07	+ 1·29	27·36	26·48				
	3469	+ 16 19	S		38 13·53	+ 1·82	15·35	S		3 40·57	+ 1·28	41·85	26·50				
Feb. 17	3534	+ 15 36	N	I. P. W.	9 49 26·67	− 1·59	25·08	N	I. P. W.	10 14 53·06	− 1·51	51·55	25 26·47				
			S	d c + 2·9	49 26·64	− 1·59	25·05	S	d c − 1·7	14 53·00	− 1·51	51·49	26·44				
	3550	− 0 17	S	b + 2·9 a − 29·8	51 23·86	− 1·77	22·09	S	b − 3·2 a + 1·7	16 50·00	− 1·49	48·51	26·42				
	3561	+ 9 24	S	s Q − 1·70	52 59·47	− 1·66	57·81	S	s Q − 1·40	18 25·73	− 1·51	24·22	26·41				
	3562	+ 9 24	S		53 19·66	− 1·66	18·00	S		18 45·95	− 1·51	44·44	26·44				
	3579	+ 14 58	S		56 27·23	− 1·59	25·64	S		21 53·59	− 1·51	52·08	26·44	m s 25 26·455	+ 0·038	+ 0·020	25 26·513
	3597	0 0	S		58 13·37	− 1·77	11·60	S		23 39·58	− 1·50	38 08	26·48				
	3606	+ 14 46	S		59 50·98	− 1·60	49·38	S		25 17·37	− 1·51	15·86	26·48				
			N		59 51·00	− 1·59	49·41	N		25 17·42	− 1·51	15·91	26·50				
	3621	+ 7 35	S		10 2 36·20	− 1·68	34·52	S		28 2·48	− 1·50	0·98	26·46				
	3628	+ 7 40	S		3 52·52	− 1·68	50·84	S		29 18·82	− 1·51	17·31	26·47				
Feb. 21	3398	+ 9 31	S	I. P. E.	9 23 56·05	+ 1·65	57·70	S	I. P. E.	9 49 22·79	+ 1·33	24·12	25 26·42				
	3404	+ 15 48	S	d c − 3·8	25 31·75	+ 1·66	33·41	S	d c − 1·5	50 58·64	+ 1·34	59·98	26·57				
	3412	+ 3 58	S	b + 2·6 a − 6·1	27 21·50	+ 1·64	23·14	S	b − 1·3 a − 2·1	52 48·27	+ 1·33	49·60	26·46	m s 25 26·490	+ 0·038	+ 0·020	25 26·548
	3415	+ 8 38	S	s Q + 1·70	27 44·12	+ 1·65	45·77	S	s Q + 1·41	53 10·90	+ 1·34	12·24	26·47				
	3423	+ 22 33	N		29 58·91	+ 1·68	60·59	N		55 25·77	+ 1·35	27·12	26·53				
	3434	+ 12 13	S		31 34·54	+ 1·66	36·20	S		57 1·35	+ 1·34	2·69	26·49				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XVI. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5h 33m 20s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No. 1*					Transits Observed at W — *By Campbell, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}031$, $C_N - C_S = +0{\cdot}055$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 22	3398	+ 9 31	S	I. P. E	9 23 53·93	+1·65	55·58	S	I. P. E.	9 49 20·68	+1·31	21·99	25 26·41				
	3404	+15 48	N	d c − 3·8	25 29·74	+1·67	31·41	N	d c − 1·5	50 56·60	+1·31	57·91	26·50				
			S	b + 2·9 a − 7·8	25 29·69	+1·67	31·36	S	b − 2·5 a + 0·4	50 56·51	+1·31	57·82	26·46				
	3412	+ 3 58	S	s Q + 1·69	27 19·46	+1·63	21·09	S	s Q + 1·40	52 46·18	+1·32	47·50	26·41				
	3423	+22 33	N		29 56·89	+1·69	58·58	N		55 23·70	+1·31	25·01	26·43				
	3434	+12 13	S		31 32·45	+1·66	34·11	S		56 59·24	+1·31	60·55	26·44				
	3443	+16 21	N		32 59·79	+1·68	61·47	N		58 26·56	+1·31	27·87	26·40	m s 25 26·442	+ 0·034	+ 0·015	25 26·491
			S		32 59·74	+1·68	61·42	S		58 26·59	+1·32	27·91	26·49				
	3453	+17 22	N		34 36·94	+1·67	38·61	N		10 0 3·75	+1·31	5·06	26·45				
			S		34 36·87	+1·67	38·54	S		0 3·68	+1·31	4·99	26·45				
	3459	+12 34	S		35 48·53	+1·66	50·19	S		1 15·30	+1·31	16·61	26·42				
	3469	+16 19	N		38 3·03	+1·67	4·70	N		3 29·83	+1·32	31·15	26·45				
			S		38 3·03	+1·67	4·70	S		3 29·83	+1·31	31·14	26·44				
Feb. 22	3534	+15 36	N	I. P. E.	9 49 16·06	−1·72	14·34	N	I. P. E.	10 14 42·33	−1·50	40·83	25 26·49				
			S	d c − 3·8	49 16·01	−1·72	14·29	S	d c − 1·5	14 42·29	−1·50	40·79	26·50				
	3550	− 0 17	S	b + 2·9 a − 7·8	51 13·10	−1·77	11·33	S	b − 2·5 a + 0·4	16 39·24	−1·49	37·75	26·42				
	3561	+ 9 24	S	s Q − 1·69	52 48·83	−1·74	47·09	S	s Q − 1·40	18 15·03	−1·50	13·53	26·44				
	3562	+ 9 24	S		53 9·02	−1·74	7·28	S		18 35·25	−1·50	33·75	26·47				
	3579	+14 58	S		56 16·61	−1·72	14·89	S		21 42·84	−1·50	41·34	26·45	m s 25 26·452	+ 0·034	+ 0·020	25 26·506
	3597	0 0	S		58 2·71	−1·77	0·94	S		23 28·85	−1·49	27·36	26·42				
	3606	+14 46	N		59 40·44	−1·72	38·72	N		25 6·70	−1·50	5·20	26·48				
			S		59 40·46	−1·72	38·74	S		25 6·61	−1·50	5·11	26·37				
	3621	+ 7 35	S		10 2 25·58	−1·75	23·83	S		27 51·78	−1·50	50·28	26·45				
	3628	+ 7 40	S		3 41·91	−1·75	40·16	S		29 8·13	−1·49	6·64	26·48				

Note. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

VIZAGAPATAM (E), *Lat. 17° 41′, Long. 5h 33m 20s*: AND BELLARY (W), *Lat. 15° 9′, Long. 5h 7m 52s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}031$, $C_N - C_S = +0{\cdot}055$	$\delta L_N + \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 23	3398	+ 9 31	S	I. P. W.	9 23 52·12	+ 1·81	53·93	S	I. P. W.	9 49 18·97	+ 1·42	20·39	25 26·46				
	3404	+ 15 48	N	d c + 1·3	25 27·89	+ 1·82	29·71	N	d c − 1·7	50 54·77	+ 1·35	56·12	26·41				
			S	b + 4·4 a − 5·2	25 27·89	+ 1·82	29·71	S	b − 0·2 a + 32·2	50 54·75	+ 1·35	56·10	26·39				
	3412	+ 3 58	S	s Q + 1·70	27 17·57	+ 1·80	19·37	S	s Q + 1·40	52 44·44	+ 1·50	45·94	26·57				
	3415	+ 8 38	S		27 40·20	+ 1·81	42·01	S		53 7·00	+ 1·44	8·44	26·43				
	3423	+ 22 33	N		29 54·95	+ 1·85	56·80	N		55 21·86	+ 1·26	23·12	26·32				
	3434	+ 12 13	S		31 30·60	+ 1·82	32·42	S		56 57·43	+ 1·40	58·83	26·41				
	3443	+ 16 21	N		32 57·92	+ 1·83	59·75	N		58 24·80	+ 1·34	26·14	26·39	m s 25 26·431	+ 0·031	+ 0·015	25 26·477
			S		32 57·86	+ 1·83	59·69	S		58 24·74	+ 1·34	26·08	26·39				
	3453	+ 17 22	N		34 35·01	+ 1·84	36·85	N		10 0 1·94	+ 1·32	3·26	26·41				
			S		34 34·92	+ 1·83	36·75	S		0 1·88	+ 1·32	3·20	26·45				
	3459	+ 12 34	S		35 46·58	+ 1·82	48·40	S		1 13·49	+ 1·39	14·88	26·48				
	3469	+ 16 19	N		38 1·09	+ 1·83	2·92	N		3 28·03	+ 1·34	29·37	26·45				
			S		38 1·05	+ 1·83	2·88	S		3 28·01	+ 1·34	29·35	26·47				
Feb. 23	3584	+ 15 36	N	I. P. W.	9 49 14·13	− 1·57	12·56	N	I. P. W.	10 14 40·54	− 1·44	39·10	25 26·54				
			S	d c + 1·3	49 14·06	− 1·57	12·49	S	d c − 1·7	14 40·48	− 1·44	39·04	26·55				
	3550	− 0 17	S	b + 4·4 a − 5·2	51 11·15	− 1·61	9·54	S	b − 0·2 a + 32·2	16 37·49	− 1·25	36·24	26·70				
	3561	+ 9 24	S	s Q − 1·70	52 46·90	− 1·58	45·32	S	s Q − 1·40	18 13·23	− 1·37	11·86	26·54				
	3562	+ 9 24	S		53 7·06	− 1·58	5·48	S		18 33·42	− 1·37	32·05	26·57				
	3579	+ 14 58	S		56 14·65	− 1·57	13·08	S		21 41·04	− 1·44	39·60	26·52				
	3597	0 0	S		57 60·76	− 1·61	59·15	S		23 27·11	− 1·25	25·86	26·71	m s 25 26·577	+ 0·031	+ 0·020	25 26·628
	3606	+ 14 46	N		59 38·49	− 1·57	36·92	N		25 4·91	− 1·44	3·47	26·55				
			S		59 38·45	− 1·57	36·88	S		25 4·84	− 1·44	3·40	26·52				
	3621	+ 7 35	S		10 2 23·62	− 1·59	22·03	S		27 49·95	− 1·34	48·61	26·58				
	3628	+ 7 40	S		3 39·98	− 1·59	38·39	S		29 6·31	− 1·35	4·96	26·57				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

VIZAGAPATAM (E), *Lat.* 17° 41′, *Long.* 5h 33m 20s: AND BELLARY (W), *Lat.* 15° 9′, *Long.* 5h 7m 52s.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No.* 1					Transits Observed at W — *By Campbell, with Telescope No.* 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_B = +0^s.031$, $C_N - C_B = +0.055$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 24	3398	+ 9 31	S	*I. P. W.*	9 23 50·27	+1·79	52·06	S	*I. P. W.*	9 49 17·09	+1·35	18·44	25 26·38	m s 25 26·391	+ 0·033	+ 0·016	25 26·440
	3404	+15 48	N	d c + 1·3	25 26·14	+1·81	27·95	N	d c − 1·7	50 53·03	+1·32	54·35	26·40				
			S	b + 3·9 a − 8·1	25 26·06	+1·82	27·88	S	b − 1·9 a + 10·9	50 52·99	+1·32	54·31	26·43				
	3412	+ 3 58	S	s Q + 1·70	27 15·75	+1·77	17·52	S	s Q + 1·41	52 42·55	+1·38	43 93	26·41				
	3415	+ 8 38	S		27 38·32	+1·79	40·11	S		53 5·15	+1·36	6·51	26·40				
	3423	+22 33	N		29 53·17	+1·84	55·01	N		55 20·16	+1·29	21·45	26·44				
	3434	+12 13	S		31 28·80	+1·80	30·60	S		56 55·62	+1·34	56·96	26·36				
	3448	+16 21	S		32 56·11	+1·82	57·93	S		58 22·96	+1·33	24·29	26·36				
			N		32 56·09	+1·82	57·91	N		58 23·02	+1·33	24·35	26·44				
	3453	+17 22	S		34 33·24	+1·83	35·07	S		10 0 0·05	+1·32	1·37	26·30				
			N		34 33·20	+1·82	35·02	N		0 0·16	+1·31	1·47	26·45				
	3459	+12 34	S		35 44·88	+1·80	46·68	S		1 11·66	+1·34	13·00	26·32				
Feb. 24	3534	+15 36	N	*I. P. W.*	9 49 12·45	−1·59	10·86	N	*I. P. W.*	10 14 38·80	−1·49	37·31	25 26·45	m s 25 26·415	+ 0·033	+ 0·018	25 26·466
	3550	− 0 17	S	d c + 1·3	51 9·41	−1·63	7·78	S	d c − 1·7	16 35·64	−1·42	34·22	26·44				
	3579	+14 58	S	b + 3·9 a − 8·1	56 13·01	−1·58	11·43	S	b − 1·9 a + 10·9	21 39·29	−1·49	37·80	26·37				
	3597	0 0	S	s Q − 1·70	57 59·02	−1·64	57·38	S	s Q − 1·41	23 25·21	−1·43	23·78	26·40				
Feb. 25	3404	+15 48	N	*I. P. E.*	9 25 24·18	+1·88	26·06	N	*I. P. E.*	9 50 51·25	+1·20	52·45	25 26·39	m s 25 26·358	+ 0·035	+ 0·015	25 26·408
			S	d c + 1·4	25 24·13	+1·88	26·01	S	d c − 1·5	50 51·18	+1·20	52·38	26·37				
	3412	+ 3 58	S	b + 6·6 a + 1·6	27 13·77	+1·89	15·66	S	b − 7·1 a + 2·5	52 40·76	+1·22	41·98	26·32				
	3415	+ 8 38	S	s Q + 1·70	27 36·37	+1·88	38·25	S	s Q + 1·40	53 3·37	+1·22	4·59	26·34				
	3423	+22 33	N		29 51·30	+1·89	53·19	N		55 18·29	+1·19	19·48	26·29				
	3448	+16 21	S		32 54·14	+1·88	56·02	S		58 21·15	+1·20	22·35	26·33				
	3453	+17 22	S		34 31·27	+1·89	33·16	S		59 58·28	+1·20	59·48	26·32				
			N		34 31·32	+1·89	33·21	N		59 58·38	+1·20	59·58	26·37				
	3459	+12 34	S		35 42·84	+1·88	44·72	S		10 1 9·84	+1·21	11·05	26·33				
	3469	+16 19	N		37 57·29	+1·88	59·17	N		3 24·46	+1·20	25·66	26·49				
			S		37 57·35	+1·89	59·24	S		3 24·43	+1·20	25·63	26·39				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XVI. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

VIZAGAPATAM (E), *Lat. 17° 41′, Long. 5h 33m 20s*: AND BELLARY (W), *Lat. 15° 9′, Long. 5h 7m 52s*.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No. 1*					Transits Observed at W — *By Campbell, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.031$, $C_N - C_S = +0.055$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
		° ′			h m s	s	s			h m s	s	s	m s				
1877 Feb. 25	3534	+ 15 36	N	*I. P. E.*	9 49 10·43	−1·51	8·92	N	*I. P. E.*	10 14 36·93	−1·61	35·32	25 26·40				
			S	d: c + 1·4	49 10·43	−1·51	8·92	S	d: c − 1·5	14 36·91	−1·60	35·31	26·39				
	3550	− 0 17	S	b + 6·6, *a* + 1·6	51 7·38	−1·51	5·87	S	b − 7·1, *a* + 2·5	16 33·82	−1·58	32·24	26·37				
	3561	+ 9 24	S	s: Q − 1·70	52 43·15	−1·51	41·64	S	s: Q − 1·40	18 9·59	−1·60	7·99	26·35				
	3562	+ 9 24	S		53 3·33	−1·51	1·82	S		18 29·78	−1·59	28·18	26·36				
	3579	+ 14 58	S		56 11·00	−1·51	9·49	S		21 37·46	−1·61	35·85	26·36	m s 25 26·392	+ 0·035	+ 0·020	25 26·447
	3597	0 0	S		57 56·98	−1·51	55·47	S		23 23·40	−1·57	21·83	26·36				
	3606	+ 14 46	N		59 34·79	−1·51	33·28	N		24 61·27	−1·61	59·66	26·38				
			S		59 34·68	−1·51	33·17	S		24 61·23	−1·60	59·63	26·46				
	3621	+ 7 35	S		10 2 19·82	−1·51	18·31	S		27 46·29	−1·59	44·70	26·39				
	3628	+ 7 40	S		3 36·12	−1·51	34·61	S		29 2·69	−1·59	1·10	26·49				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XV. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

MANGALORE (E), *Lat.* 12° 52′, *Long.* 4h 59m 32s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 25s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}026$, $C_N - C_S = +0{\cdot}046$	$\delta L_N - \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s	m s			m s
Mar. 22	3979	+ 8 56	S	I. P. E.	11 38 31·55	+1·27	32·82	S	I. P. E.	11 46 38·92	+1·23	40·15	8 7·33	8 7·357	+0·006	+0·013	8 7·376
	3990	+20 54	N	d c − 1·0	41 12·43	+2·37	14·80	N	d c − 2·9	49 20·89	+1·28	22·17	7·37				
	4014	+16 7	S	b − 6·0 a −219·7	46 0·28	+1·91	2·19	S	b − 2·4 a −11·1	54 8·29	+1·27	9·56	7·37				
				s Q + 1·78					s Q + 1·40								
Mar. 22	4083	+ 1 18	S	I. P. E.	12 1 21·63	−2·95	18·68	S	I. P. E.	12 9 27·81	−1·59	26·22	8 7·54	8 7·435	+0·006	+0·018	8 7·459
	4094	+ 2 35	S	d c − 1·0	2 62·06	−2·84	59·22	S	d c − 2·9	11 8·21	−1·59	6·62	7·40				
	4114	+10 57	S	b − 6·0 a −219·7	6 48·42	−2·12	46·30	S	b − 2·4 a −11·1	14 55·25	−1·56	53·69	7·39				
	4119	− 5 2	S	s Q − 1·78	7 36·83	−3·47	33·36	S	s Q − 1·40	15 42·42	−1·61	40·81	7·45				
	4127	+24 38	N		9 44·39	−0·85	43·54	N		17 52·45	−1·50	50·95	7·41				
	4134	− 3 16	S		11 29·86	−3·31	26·55	S		19 35·63	−1·61	34·02	7·47				
	4135	− 3 16	S		11 30·26	−3·31	26·95	S		19 35·99	−1·61	34·38	7·43				
	4140	− 8 14	S		12 40·13	−3·73	36·40	S		20 45·41	−1·62	43·79	7·39				
Mar. 24	4031	+16 20	S	I. P. E.	11 48 53·68	+1·74	55·42	S	I. P. E.	11 57 1·51	+1·20	2·71	8 7·29	8 7·335	+0·006	+0·010	8 7·351
			N	d c − 1·0	48 53·65	+1·75	55·40	N	d c − 2·9	57 1·58	+1·20	2·78	7·38				
				b − 1·3 a − 5·5					b − 3·6 a −25·5								
				s Q + 1·79					s Q + 1·38								
Mar. 24	4072	+ 9 25	S	I. P. E.	11 58 32·78	−1·85	30·93	S	I. P. E.	12 6 39·88	−1·62	38·26	8 7·33	8 7·352	+0·006	+0·016	8 7·374
	4079	+10 21	S	d c − 1·0	12 0 30·02	−1·85	28·17	S	d c − 2·9	8 37·08	−1·62	35·46	7·29				
	4083	+ 1 18	S	b − 1·3 a − 5·5	1 18·75	−1·86	16·89	S	b − 3·6 a −25·5	9 25·98	−1·70	24·28	7·39				
	4094	+ 2 35	S	s Q − 1·79	2 59·22	−1·86	57·36	S	s Q − 1·38	11 6·40	−1·69	4·71	7·35				
	4107	+26 33	N		5 13·16	−1·81	11·35	N		13 20·13	−1·46	18·67	7·32				
	4114	+10 57	S		6 46·29	−1·84	44·45	S		14 53·41	−1·62	51·79	7·34				
	4119	− 5 2	S		7 33·41	−1·88	31·53	S		15 40·66	−1·76	38·90	7·37				
	4127	+24 38	N		9 43·52	−1·82	41·70	N		17 50·54	−1·48	49·06	7·36				
	4134	− 3 16	S		11 26·57	−1·87	24·70	S		19 33·87	−1·75	32·12	7·42				
	4135	− 3 16	S		11 27·02	−1·87	25·15	S		19 34·24	−1·74	32·50	7·35				

Note. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

MANGALORE (E), *Lat.* 12° 52′, *Long.* 4h 59m 32s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 26s.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No.* 1					Transits Observed at W — *By Campbell, with Telescope No.* 2					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Peral. Equations $H_N - H_S = +0^s{\cdot}026$, $C_N - C_S = +0{\cdot}046$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	m s	m s	s	s	m s
Mar. 25	3956	−12 32	S	*I. P. E.*	11 31 56·55	+1·66	58·21	S	*I. P. E.*	11 40 4·61	+0·86	5·47	8 7·26				
	3964	+22 2	N	d c − 1·0	33 55·00	+1·74	56·74	N	d c − 2·9	42 2·75	+1·27	4·02	7·28				
	3971	+ 5 26	S	b − 1·1 a − 6·0	35 21·31	+1·70	23·01	S	b − 4·1 a −32·7	43 29·27	+1·07	30·34	7·33				
	3975	− 6 0	S	s Q +1·77	37 9·50	+1·68	11·18	S	s Q +1·39	45 17·53	+0·93	18·46	7·28				
	3979	+ 8 56	S		38 28·15	+1·71	29·86	S		46 35·97	+1·11	37·08	7·22	8 7·257	+ 0·006	+ 0·016	8 7·279
	4002	+ 2 27	S		43 48·73	+1·70	50·43	S		51 56·66	+1·03	57·69	7·26				
	4014	+16 7	S		45 57·49	+1·73	59·22	S		54 5·24	+1·19	6·43	7·21				
	4021	+ 5 34	S		47 17·46	+1·70	19·16	S		55 25·32	+1·07	26·39	7·23				
	4031	+16 20	N		48 52·61	+1·73	54·34	N		57 0·40	+1·20	1·60	7·26				
			S		48 52·57	+1·73	54·30	S		57 0·34	+1·20	1·54	7·24				
Mar. 25	4107	+26 33	N	*I. P. E.*	12 5 12·01	−1·79	10·22	N	*I. P. E.*	12 13 18·88	−1·45	17·43	8 7·21				
	4114	+10 57	S	d c − 1·0	6 45·21	−1·82	43·39	S	d c − 2·9	14 52·26	−1·66	50·60	7·21				
	4119	− 5 2	S	b − 1·1 a − 6·0	7 32·21	−1·85	30·36	S	b − 4·1 a −32·7	15 39·51	−1·84	37·67	7·31				
	4127	+24 38	N	s Q −1·77	9 42·36	−1·79	40·57	N	s Q −1·39	17 49·31	−1·49	47·82	7·25	8 7·279	+ 0·006	+ 0·014	8 7·299
	4134	− 3 16	S		11 25·40	−1·85	23·55	S		19 32·68	−1·82	30·86	7·31				
	4135	− 3 16	S		11 25·79	−1·85	23·94	S		19 33·06	−1·82	31·24	7·30				
	4140	− 8 14	S		12 35·17	−1·86	33·31	S		20 42·55	−1·88	40·67	7·36				
Mar. 26	3990	+20 54	N	*I. P. W.*	11 41 9·07	+1·56	10·63	N	*I. P. W.*	11 49 16·63	+1·40	18·03	8 7·40				
	4002	+ 2 27	S	d c − 8·8	43 47·86	+1·35	49·21	S	d c − 0·9	51 55·46	+1·15	56·61	7·40				
	4014	+16 7	N	b − 4·9 a − 30·4	45 56·54	+1·51	58·05	N	b + 0·4 a − 35·7	54 4·05	+1·33	5·38	7·33	8 7·387	+ 0·006	+ 0·010	8 7·403
			S	s Q + 1·78	45 56·53	+1·50	58·03	S	s Q + 1·38	54 4·09	+1·33	5·42	7·39				
	4031	+16 20	N		48 51·60	+1·51	53·11	N		56 59·19	+1·34	60·53	7·42				
			S		48 51·60	+1·50	53·10	S		56 59·14	+1·34	60·48	7·38				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XV. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

MANGALORE (E), *Lat. 12° 52′, Long. 4h 59m 32s*: AND BOMBAY (W), *Lat. 18° 54′, Long. 4h 51m 25s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.026$, $C_N - C_S = +0.046$	$\delta L_N - \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 26	4079	+ 10 21	S	*I. P. W.*	12 0 27·91	−2·11	25·80	S	*I. P. W.*	12 8 34·76	−1·51	33·25	8 7·45				
	4083	+ 1 18	S	d c − 8·8	1 16·79	−2·20	14·59	S	d c − 0·9	9 23·70	−1·64	22·06	7·47				
	4094	+ 2 35	S	b − 4·9 a − 30·4	2 57·25	−2·19	55·06	S	b + 0·4 a − 35·7	11 4·08	−1·62	2·46	7·40				
	4107	+ 26 33	N	s	5 10·95	−1·92	9·03	N	s	13 17·63	−1·27	16·36	7·33				
	4114	+ 10 57	S	Q − 1·76	6 44·25	−2·09	42·16	S	Q − 1·38	14 51·04	−1·51	49·53	7·37	m s 8 7·441	+ 0·006	+ 0·016	8 7·463
	4119	− 5 2	S		7 31·43	−2·28	29·15	S		15 38·38	−1·72	36·66	7·51				
	4127	+ 24 38	N		9 41·33	−1·94	39·39	N		17 48·04	−1·31	46·73	7·34				
	4134	− 3 16	S		11 24·62	−2·25	22·37	S		19 31·58	−1·70	29·88	7·51				
	4135	− 3 16	S		11 25·00	−2·25	22·75	S		19 31·94	−1·70	30·24	7·49				
	4140	− 8 14	S		12 34·44	−2·31	32·13	S		20 41·44	−1·77	39·67	7·54				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

MANGALORE (E), *Lat.* 12° 52′, *Long.* 4^h 59^m 32^s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4^h 51^m 25^s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.026$, $C_N - C_S = +0.046$	$\delta L_N + \rho$
1877		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 22	4257	− 7 19	S	I. P. E.	12 24 48·21	−0·11	48·10	S	I. P. E.	12 32 54·40	+1·17	55·57	8 7·47				
	4267	+11 6	S	d c − 1·0	27 15·57	+1·45	17·02	S	d c − 2·9	35 23·15	+1·24	24·39	7·37				
	4277	− 0 54	S	b − 6·0 a −219·7	29 12·90	+0·44	13·34	S	b − 2·4 a −11·1	37 19·54	+1·20	20·74	7·40				
	4285	+39 57	N	s Q + 1·78	31 0·80	+4·52	5·32	N	s Q + 1·40	39 11·31	+1·37	12·68	7·36	m s 8 7·418	− 0·002	+ 0·017	8 7·433
	4292	+12 38	S		32 54·98	+1·60	56·58	S		41 2·78	+1·25	4·03	7·45				
	4299	+14 13	S		33 57·46	+1·73	59·19	S		42 5·39	+1·26	6·65	7·46				
Mar. 22	4351	+18 4	N	I. P. E.	12 44 46·35	−1·49	44·86	N	I. P. E.	12 52 53·94	−1·53	52·41	8 7·55				
			S	d c − 1·0	44 46·35	−1·49	44·86	S	d c − 2·9	52 53·90	−1·53	52·37	7·51				
	4358	− 2 42	S	b − 6·0 a −219·7	46 13·34	−3·27	10·07	S	b − 2·4 a −11·1	54 19·19	−1·60	17·59	7·52				
	4373	− 3 0	S	s Q − 1·78	49 31·56	−3·29	28·27	S	s Q − 1·40	57 37·41	−1·60	35·81	7·54				
	4384	+36 27	N		51 53·66	+0·50	54·16	N		13 0 3·07	−1·45	1·62	7·46	m s 8 7·529	− 0·002	+ 0·014	8 7·541
	4390	+28 17	N		53 11·69	−0·48	11·21	N		1 20·16	−1·49	18·67	7·46				
	4397	− 9 40	S		55 16·96	−3·86	13·10	S		3 22·34	−1·63	20·71	7·61				
	4423	+12 13	S		58 21·97	−2·01	19·96	S		6 29·04	−1·55	27·49	7·53				
	4432	− 9 43	S		13 0 16·22	−3·86	12·36	S		8 21·62	−1·64	19·98	7·62				
	4440	+10 4	S		2 36·71	−2·21	34·50	S		10 43·55	−1·56	41·99	7·49				
Mar. 24	4241	+19 3	N	I. P. E.	12 20 49·65	+1·74	51·39	N	I. P. E.	12 28 57·64	+1·23	58·87	8 7·48				
	4242	+19 3	N	d c − 1·0	20 51·14	+1·74	52·88	N	d c − 2·9	28 59·05	+1·23	60·28	7·40				
	4248	+17 46	N	b − 1·3 a − 5·5	22 41·87	+1·75	43·62	N	b − 3·6 a −25·5	30 49·77	+1·22	50·99	7·37				
			S	s Q + 1·79	22 41·87	+1·74	43·61	S	s Q + 1·38	30 49·69	+1·21	50·90	7·29				
	4257	− 7 19	S		24 47·23	+1·70	48·93	S		32 55·29	+0·99	56·28	7·35				
	4267	+11 6	S		27 16·04	+1·73	17·77	S		35 23·93	+1·16	25·09	7·32	m s 8 7·366	− 0·002	+ 0·013	8 7·377
	4271	+10 55	S		27 33·01	+1·73	34·74	S		35 40·97	+1·16	42·13	7·39				
	4277	− 0 54	S		29 12·40	+1·70	14·10	S		37 20·44	+1·05	21·49	7·39				
	4285	+39 57	N		31 4·20	+1·80	6·00	N		39 11·90	+1·47	13·37	7·37				
	4292	+12 38	S		32 55·65	+1·73	57·38	S		41 3·55	+1·17	4·72	7·34				
	4299	+14 13	S		33 58·24	+1·73	59·97	S		42 6·13	+1·18	7·31	7·34				
	4301	+14 48	S		34 37·92	+1·74	39·66	S		42 45·82	+1·19	47·01	7·35				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XVI. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

MANGALORE (E), *Lat.* 12° 52′, *Long.* 4h 59m 32s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 25s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.026$, $C_N - C_S = +0.046$	$\delta L_N + \rho$
		° ′			h m s	s	s			h m s	s	s	m s				
1877 Mar. 24	4351	+18 4	N	*I. P. E.*	12 44 47·53	−1·83	45·70	N	*I. P. E.*	12 52 54·66	−1·55	53·11	8 7·41				
			S	d: c − 1·0	44 47·56	−1·83	45·73	S	d: c − 2·9	52 54·61	−1·55	53·06	7·33				
	4358	− 2 42	S	b − 1·3, a − 5·5	46 12·78	−1·87	10·91	S	b − 3·6, a −25·5	54 20·05	−1·74	18·31	7·40				
	4364	+21 56	N	s	47 31·02	−1·82	29·20	N	s	55 38·04	−1·51	36·53	7·33				
	4373	− 3 0	S	Q −1·79	49 31·10	−1·87	29·23	S	Q −1·38	57 38·30	−1·74	36·56	7·33				
	4384	+36 27	N		51 56·77	−1·79	54·98	N		13 0 3·68	−1·34	2·34	7·36	m s 8 7·381	− 0·002	+ 0·010	8 7·389
	4390	+28 17	N		53 13·83	−1·80	12·03	N		1 20·81	−1·44	19·37	7·34				
	4397	− 9 40	S		55 15·88	−1·89	13·99	S		3 23·21	−1·80	21·41	7·42				
	4414	+39 23	N		56 19·84	−1·78	18·06	N		4 26·73	−1·31	25·42	7·36				
	4415	+39 9	N		56 21·76	−1·78	19·98	N		4 28·70	−1·31	27·39	7·41				
	4423	+12 13	S		58 22·61	−1·85	20·76	S		6 29·79	−1·60	28·19	7·43				
	4440	+10 4	S		13 2 37·12	−1·85	35·27	S		10 44·34	−1·62	42·72	7·45				
Mar. 25	4241	+19 3	N	*I. P. E.*	12 20 50·23	+1·73	51·96	N	*I. P. E.*	12 28 58·00	+1·23	59·23	8 7·27				
	4242	+19 3	N	d: c − 1·0	20 51·66	+1·73	53·39	N	d: c − 2·9	28 59·46	+1·22	60·68	7·29				
	4248	+17 46	N	b − 1·1, a − 6·0	22 42·29	+1·73	44·02	N	b − 4·1, a −32·7	30 50·15	+1·21	51·36	7·34				
			S	s	22 42·24	+1·73	43·97	S	s	30 50·09	+1·21	51·30	7·33				
	4257	− 7 19	S	Q +1·77	24 47·59	+1·67	49·26	S	Q +1·39	32 55·75	+0·92	56·67	7·41				
	4267	+11 6	S		27 16·44	+1·71	18·15	S		35 24·32	+1·13	25·45	7·30	m s 8 7·320	− 0·002	+ 0·013	8 7·331
	4271	+10 55	S		27 33·48	+1·71	35·19	S		35 41·34	+1·13	42·47	7·28				
	4277	− 0 54	S		29 12·81	+1·68	14·49	S		37 20·87	+0·99	21·86	7·37				
	4285	+39 57	N		31 4·67	+1·79	6·46	N		39 12·28	+1·55	13·83	7·37				
	4292	+12 38	S		32 56·07	+1·72	57·79	S		41 3·98	+1·15	5·13	7·34				
	4299	+14 13	S		33 58·73	+1·72	60·45	S		42 6·53	+1·17	7·70	7·25				
	4301	+14 48	S		34 38·39	+1·73	40·12	S		42 46·24	+1·17	47·41	7·29				

Note. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XVI. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

MANGALORE (E), *Lat.* 12° 52′, *Long.* 4h 59m 32s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 25s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}026$, $C_N - C_S = +0{\cdot}046$	$\delta L_N + \rho$
		° ′			h m s	s	s			h m s	s	s	m s				
1877 Mar. 25	4351	+18 4	N	I. P. E.	12 44 47·95	−1·80	46·15	N	I. P. E.	12 52 55·12	−1·57	53·55	8 7·40				
			S	d; c − 1·0	44 47·89	−1·80	46·09	S	d; c − 2·9	52 55·11	−1·58	53·53	7·44				
	4358	− 2 42	S	b − 1·1; a − 6·0	46 13·11	−1·85	11·26	S	b − 4·1; a −32·7	54 20·59	−1·82	18·77	7·51				
	4364	+21 56	N	s	47 31·43	−1·80	29·63	N	s	55 38·50	−1·52	36·98	7·35				
	4378	− 3 0	S	Q − 1·77	49 31·42	−1·85	29·57	S	Q − 1·39	57 38·82	−1·82	37·00	7·43				
	4384	+36 27	N		51 57·17	−1·75	55·42	N		13 0 4·08	−1·31	2·77	7·35				
	4390	+28 17	N		53 14·23	−1·78	12·45	N		1 21·28	−1·44	19·84	7·39	8 7·422	− 0·002	+ 0·011	8 7·431
	4397	− 9 40	S		55 16·22	−1·87	14·35	S		3 23·73	−1·90	21·83	7·48				
	4414	+39 23	N		56 20·17	−1·75	18·42	N		4 27·18	−1·25	25·93	7·51				
	4415	+39 9	N		56 22·15	−1·75	20·40	N		4 29·12	−1·26	27·86	7·46				
	4423	+12 13	S		58 23·06	−1·82	21·24	S		6 30·28	−1·65	28·63	7·39				
	4432	− 9 43	S		13 0 15·54	−1·86	13·68	S		8 23·01	−1·90	21·11	7·43				
	4440	+10 4	S		2 37·61	−1·82	35·79	S		10 44·80	−1·67	43·13	7·34				
Mar. 26	4285	+39 57	N	I. P. W.	12 31 5·09	+1·78	6·87	N	I. P. W.	12 39 12·56	+1·75	14·31	8 7·44				
	4292	+12 38	S	d; c − 8·8	32 56·78	+1·44	58·22	S	d; c − 0·9	41 4·37	+1·28	5·65	7·43	8 7·475	− 0·002	+ 0·015	8 7·488
	4299	+14 13	S	b − 4·9; a −30·4	33 59·29	+1·46	60·75	S	b + 0·4; a −35·7	42 6·98	+1·30	8·28	7·53				
	4301	+14 48	S	s; Q + 1·76	34 38·99	+1·46	40·45	S	s; Q + 1·38	42 46·64	+1·31	47·95	7·50				
Mar. 26	4351	+18 4	N	I. P. W.	12 44 48·53	−2·02	46·51	N	I. P. W.	12 52 55·49	−1·41	54·08	8 7·57				
			S	d; c − 8·8	44 48·55	−2·02	46·53	S	d; c − 0·9	52 55·44	−1·41	54·03	7·50				
	4358	− 2 42	S	b − 4·9; a −30·4	46 13·98	−2·25	11·73	S	b + 0·4; a −35·7	54 21·04	−1·69	19·35	7·62				
	4364	+21 56	N	s	47 31·98	−1·97	30·01	N	s	55 38·83	−1·35	37·48	7·47				
	4378	− 3 0	S	Q − 1·76	49 32·23	−2·25	29·98	S	Q − 1·38	57 39·27	−1·70	37·57	7·59				
	4384	+36 27	N		51 57·59	−1·79	55·80	N		13 0 4·34	−1·09	3·25	7·45				
	4390	+28 17	N		53 14·73	−1·90	12·83	N		1 21·60	−1·25	20·35	7·52	8 7·528	− 0·002	+ 0·011	8 7·537
	4397	− 9 40	S		55 17·13	−2·33	14·80	S		3 24·17	−1·79	22·38	7·58				
	4414	+39 23	N		56 20·62	−1·75	18·87	N		4 27·35	−1·03	26·32	7·45				
	4415	+39 9	N		56 22·55	−1·75	20·80	N		4 29·32	−1·04	28·28	7·48				
	4423	+12 13	S		58 23·69	−2·08	21·61	S		6 30·64	−1·49	29·15	7·54				
	4432	− 9 43	S		13 0 16·40	−2·33	14·07	S		8 23·44	−1·78	21·66	7·59				
	4440	+10 4	S		2 38·25	−2·11	36·14	S		10 45·16	−1·52	43·64	7·50				

Note. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

Arc	Approximate Difference of Longitude	Intervals between Nights of Observations	Rate Corrections for both Clocks Deduced from Transits Observed at both Stations, *viz.*: α, Corrections for the Intervals between Nights of Observations, and β, Hourly Corrections for Nights of Observations, Interpolated by means of the Quantities α.									Remarks
			α at E Station for		α at W Station for		Astronomical Dates of Observations	β for		Correction to Observed Difference of Times of Transit for		
			E Clock	W Clock	E Clock	W Clock		E Clock	W Clock	E Clock	W Clock	
		1875	s	s	s	s	1875	s	s	s	s	
Bolarum (E), and Bombay (W)	$22^m 50^s$	January 11 to 12	− 0·96	...	...	− 1·71	January 11	−0·036	−0·067			
		„ 12 „ 13	− 1·13	...	...	− 1·89	„ 12	− ·044	− ·075			
		„ 13 „ 16	− 6·13	...	...	...	„ 13	− ·057	− ·083			
		„ 16 „ 17	− 1·68	...	...	...	„ 14	− ·075	− ·075			
		„ 17 „ 18	− 2·28	...	..	− 1·38	„ 16	− ·074	− ·075			
		„ 18 „ 19	− 2·14	...	...	− 1·49	„ 17	− ·080	− ·056			
		„ 19 „ 20	− 1·97	...	...	− 1·67	„ 18	− ·090	− ·060			
		„ 20 „ 21	− 3·57	...	...	− 2·06	„ 19	− ·086	− ·064			
		......	...	...	...	...	„ 20	− ·115	− ·078			
		......	...	...	...	...	„ 21	− ·182	− ·094			
Bellary (E), and Bombay (W)	$16^m 27^s$	Jany. 28 to 30	− 0·44	− 5·01	− 0·54	− 5·16	January 28	−0·010	−0·106	− 0·003	− 0·029	W Clock was cleaned between February 1st and 8th.
		„ 30 „ Feb. 8	+ 6·66	...	+ 6·84	...	„ 29	− ·010	− ·106	− ·003	− ·029	
		February 8 to 9	+ 0·96	...	+ 1·07	...	„ 30	+ ·010	− ·106	+ ·003	− ·029	
		„ 9 „ 10	+ 0·90	+ 0·31	+ 0·79	+ 0·34	February 8	+ ·037	...	+ ·010	...	
		......	...	...	...	...	„ 9	+ ·038	+ ·014	+ ·011	+ ·004	
		......	...	...	...	...	„ 10	+ ·032	+ ·014	+ ·009	+ ·004	
Bolarum (E), and Bellary (W)	$6^m 23^s$	February 19 to 20	+27·59	+ 0·66	+27·71	+ 0·72	February 19	+1·150	+0·022	+ 0·122	+ 0·002	
		„ 20 „ 21	+27·80	+ 1·03	+27·74	+ 1·03	„ 20	+1·155	+ ·036	+ ·123	+ ·004	
		„ 21 „ 22	+27·62	+ 0·92	+27·56	+ 0·80	„ 21	+1·154	+ ·040	+ ·122	+ ·004	
		„ 22 „ 23	+28·12	+ 0·92	+27·97	+ 0·88	„ 22	+1·160	+ ·037	+ ·123	+ ·004	
		„ 23 „ 24	+27·88	+ 0·85	+27·98	+ 0·92	„ 23	+1·166	+ ·038	+ ·124	+ ·004	
		......	...	...	...	...	„ 24	+1·162	+ ·038	+ ·123	+ ·004	
Madras (E), and Bolarum (W)	$6^m 53^s$	March 3 to 5	+ 3·47	+ 0·43	+ 3·54	+ 0·46	March 3	+0·073	+0·009	+ 0·008	+ 0·001	No observations were obtained on March 9th, 10th, or 11th, and no date can be assigned for the change of rate of W Clock after 8th. The rates which obtained between 7th and 8th, and between 8th and 12th, are adopted as the rates on the 8th, and 12th respectively.
		„ 5 „ 6	+ 1·73	+ 0·31	+ 1·63	+ 0·19	„ 5	+ ·072	+ ·010	+ ·008	+ ·001	
		„ 6 „ 7	+ 1·68	+ 0·35	+ 1·75	+ 0·35	„ 6	+ ·071	+ ·013	+ ·008	+ ·001	
		„ 7 „ 8	+ 1·86	+ 0·50	+ 1·68	+ 0·39	„ 7	+ ·073	+ ·016	+ ·008	+ ·002	
		„ 8 „ 12	+ 5·52	− 3·03	+ 5·64	− 2·85	„ 8	+ ·073	+ ·018	+ ·008	+ ·002	
		......	...	...	...	...	„ 12	+ ·058	− ·031	+ ·007	− ·004	

Arc	Approximate Difference of Longitude	Intervals between Nights of Observations	Rate Corrections for both Clocks Deduced from Transits Observed at both Stations, viz.: α, Corrections for the Intervals between Nights of Observations, and β, Hourly Corrections for Nights of Observations, Interpolated by means of the Quantities α.									Remarks
			α at E Station for		α at W Station for		Astronomical Dates of Observations	β for		Correction to Observed Difference of Times of Transit for		
			E Clock	W Clock	E Clock	W Clock		E Clock	W Clock	E Clock	W Clock	
Madras (E), and Bellary (W)	13ᵐ 16ˢ	1875	s	s	s	s	1875	s	s	s	s	
		Mar. 22 to 24	+2·95	+15·22	+2·99	+15·26	March 22	+0·061	+0·309	+ 0·013	+ 0·068	
		" 24 " 26	+3·10	+16·21	+3·01	+16·18	" 24	+ ·063	+ ·328	+ ·014	+ ·072	
		" 26 " 29	+4·75	+31·19 (26 to 30)	+4·77	+31·30 (26 to 30)	" 26	+ ·065	+ ·332	+ ·014	+ ·073	
		" 29 " 30	+1·62		+1·72		" 29	+ ·067	...	+ ·015	...	
		" 30 " 31	+1·55	+ 7·77	+1·55	+ 7·79	" 30	+ ·067	+ ·325	+ ·015	+ ·072	
		" 31 " Apl. 1	+3·24 (31 to Apl. 2)	+ 7·92	+3·29 (31 to Apl. 2)	+ 8·06	" 31	+ ·067	+ ·329	+ ·015	+ ·073	
		April 1 " 2		+ 8·13		+ 8·05	April 1	...	+ ·335	...	+ ·074	
		......	...	...	...	...	" 2	+ ·066	+ ·339	+ ·015	+ ·075	
Bangalore (E), and Bellary (W)	2ᵐ 36ˢ	1876					1876					
		April 11 to 12	− 3·78	+ 1·11	− 3·73	+ 1·11	April 11	−0·160	+0·040	− 0·007	+ 0·002	The rate of W Clock between April 17th and 18th, is adopted for the 18th.
		" 12 " 13	− 3·95	+ 0·58	− 3·86	+ 0·66	" 12	− ·160	+ ·036	− ·007	+ ·002	
		" 13 " 14	− 3·72	+ 1·02	− 3·85	+ 0·77	" 13	− ·160	+ ·032	− ·007	+ ·001	
		" 14 " 17	−10·30	+ 2·32	−10·27	+ 2·46	" 14	− ·151	+ ·036	− ·007	+ ·002	
		" 17 " 18	− 3·83	+ 0·27	− 3·92	+ 0·19	" 17	− ·152	+ ·022	− ·007	+ ·001	
		......	...	...	...	...	" 18	− ·152	+ ·010	− ·007	·000	
Vizagapatam (E), and Madras (W)	12ᵐ 12ˢ	1877					1877					
		Jany. 21 to 22	− 4·35	...	...	...	January 22	−0·183	−0·031	− 0·037	− 0·006	
		" 22 " 23	− 4·46	− 0·74	− 4·44	− 0·74	" 23	− ·186	− ·032	− ·038	− ·006	
		" 23 " 24	− 4·45	− 0·80	− 4·51	− 0·79	" 24	− ·186	− ·033	− ·038	− ·007	
		" 24 " 25	− 4·43	− 0·73	− 4·42	− 0·82	" 25	− ·187	− ·031	− ·038	− ·006	
		" 25 " 26	− 4·55	− 0·71	− 4·57	− 0·68	" 26	− ·189	− ·030	− ·038	− ·006	
		" 26 " 27	− 4·40	− 0·68	− 4·60	− 0·84	" 27	− ·186	− ·029	− ·038	− ·006	
		" 27 " 29	− 8·84	− 1·28	− 8·80	− 1·28	" 29	− ·182	− ·027	− ·037	− ·005	
		" 29 " 31	− 8·63	− 1·30	− 8·61	− 1·30	" 31	− ·178	− ·027	− ·036	− ·005	
		" 31 " Feb. 1	− 4·23	...	− 4·18	− 0·64	February 1	− ·174	− ·027	− ·035	− ·005	
Vizagapatam (E), and Bellary (W)	25ᵐ 28ˢ	February 17 to 21	− 0·73	+ 8·70	− 0·64	+ 8·65	February 17	−0·008	+0·090	− 0·003	+ 0·038	
		" 21 " 22	− 0·09	+ 2·07	− 0·13	+ 2·13	" 21	− ·006	+ ·089	− ·003	+ ·038	
		" 22 " 23	− 0·04	+ 1·76	− 0·11	+ 1·70	" 22	− ·004	+ ·080	− ·002	+ ·034	
		" 23 " 24	− 0·03	+ 1·78	+ 0·05	+ 1·87	" 23	− ·002	+ ·074	− ·001	+ ·031	
		" 24 " 25	+ 0·08	+ 1·90	+ 0·13	+ 1·94	" 24	+ ·003	+ ·078	− ·001	+ ·033	
		......	...	...	...	...	" 25	+ ·004	+ ·082	− ·002	+ ·035	
Mangalore (E), and Bombay (W)	8ᵐ 7ˢ	March 22 to 24	+ 1·84	− 0·81	+ 1·91	− 0·71	March 22	+0·044	−0·015	+ 0·006	− 0·002	The rates between March 22nd and 24th, are adopted for the 22nd, and those between 24th and 26th, for the 26th.
		" 24 " 25	+ 1·14	− 0·43	+ 1·23	− 0·42	" 24	+ ·044	− ·015	+ ·006	− ·002	
		" 25 " 26	+ 1·20	− 0·39	+ 1·04	− 0·51	" 25	+ ·048	− ·018	+ ·006	− ·002	
		......	...	...	...	...	" 26	+ ·048	− ·018	+ ·006	− ·002	

TABLE XVIII. DEDUCTION OF CLOCK RATE CORRECTIONS BY THE COMBINATION OF STAR OBSERVATIONS WITH CLOCK COMPARISONS.

BOLARUM (E), AND BOMBAY (W).							
Astronomical Date	Hourly Clock Rate Correction Deduced from Star Observations, for E Clock = r_e „ W „ = r_w		Relative Hourly Clock Rate Correction deduced from Clock Comparisons	Adopted Hourly Clock Rate Correction, for E Clock = r_E „ W „ = r_W $2r_E = r_e - R + r_w$ $2r_W = r_w + R + r_e$		Correction to Observed Difference of Times of Transit for Rate of	
	r_e	r_w	R	r_E	r_W	E Clock	W Clock
1876	s	s	s	s	s	s	s
January 11	− 0·036	− 0·067	− 0·039	− 0·032	− 0·071	− 0·012	− 0·027
„ 12	·044	·075	− 0·029	·045	·074	·017	·028
„ 13	·057	·083	− 0·014	·063	·077	·024	·030
„ 14	·075	·075	+ 0·026	·088	·062	·033	·024
„ 16	·074	·075	− 0·008	·070	·078	·027	·030
„ 17	·080	·056	+ 0·032	·084	·052	·032	·020
„ 18	·090	·060	+ 0·050	·100	·050	·038	·019
„ 19	·086	·064	+ 0·021	·085	·064	·033	·024
„ 20	·115	·078	+ 0·017	·105	·088	·040	·033
„ 21	·182	·094	+ 0·041	·159	·118	·060	·045

TABLE XIX. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL, FROM OBSERVATIONS OF TRANSITS WITH LOCAL CLOCKS, COMBINED BY CLOCK COMPARISONS.

BOLARUM (E), AND BOMBAY (W).

Astronomical Date	Instrumental Position at E	Instrumental Position at W	Epoch by E Clock T_E	Corrected Difference of Observed Times M at Epoch T_E	Deduced Clock Difference D at Epoch T_E	Resulting Difference of Longitude ΔL = D + M	Mean Difference of Longitude by Observations I. P. E.	Mean Difference of Longitude by Observations I. P. W.	General Mean
1876			h m s	s	m s	m s			
January 11	*I. P. E.*	*I. P. E.*	5 59 34	− 14·212	+ 23 3·020	22 48·808	m s 22 48·847	22 48·849	22 48·848
" "	"	"	7 30 8	14·174	2·962	48·788			
" 12	*I. P. W.*	*I. P. W.*	6 4 16	13·485	2·302	48·817			
" "	"	"	7 37 50	13·430	2·257	48·827			
" 13	"	"	6 3 24	12·725	1·556	48·831			
" "	"	"	7 34 34	12·677	1·535	48·858			
" 16	*I. P. E.*	*I. P. E.*	7 6 1	13·258	2·123	48·865			
" 18	"	"	6 29 37	42·195	31·024	48·829			
" "	"	"	7 54 25	42·231	31·097	48·866			
" 19	"	"	6 34 51	42·861	31·741	48·880			
" "	"	"	7 59 27	42·879	31·770	48·891			
" 20	*I. P. W.*	*I. P. W.*	7 32 26	43·209	32·122	48·913			

Value of ΔL Bolarum–Bombay by General Mean found above	=	m s 22 48·848
" " " on next page	=	22 48·848
Whence value of ΔL Bolarum–Bombay finally adopted, being mean of last two values ...	=	22 48·848

TABLE XX. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL

AND THE RETARDATION OF SIGNALS, ρ

FROM THE OBSERVATIONS OF TRANSITS AT BOTH STATIONS WITH THE SAME CLOCK, SEASON 1875-76.

BOLARUM (E), AND BOMBAY (W)

Astronomical Date	Instrumental Position at E	Instrumental Position at W	Apparent Difference of Longitude by Observations with E Clock $= \Delta L - \rho$	Apparent Difference of Longitude by Observations with W Clock $= \Delta L + \rho$
1876			m s	m s
January 14	*I. P. E.*	*I. P. E.*	......	22 48·870
" "	"	"	......	48·787
" 16	"	"	22 48·807	......
" "	"	"	48·858	......
" 17	"	"	48·922	48·902
" "	"	"	48·886	48·925
" 20	*I. P. W.*	*I. P. W.*	......	48·905
			......	48·882
" 21	"	"	48·770	48·847
" "	"	"	48·785	48·867
Mean Values by Observations *I. P. E.*			22 48·868	22 48·871
" *I. P. W.*			48·778	48·875
General Means			22 48·823	22 48·873

Whence

$$\Delta L^* = 22^m\ 48^s{\cdot}848$$
$$\rho = +\ 0{\cdot}025$$

BELLARY (E), AND BOMBAY (W)

Astronomical Date	Instrumental Position at E	Instrumental Position at W	Apparent Difference of Longitude by Observations with E Clock $= \Delta L - \rho$	Apparent Difference of Longitude by Observations with W Clock $= \Delta L + \rho$
1876			m s	m s
January 28	*I. P. E.*	*I. P. E.*	16 26·958	16 26·943
" "	"	"	26·969	27·011
" 29	*I. P. W.*	*I. P. W.*	26·963	26·952
" "	"	"	26·950	26·917
" 30	"	"	27·052	27·101
" "	"	"	27·064	27·126
February 8	*I. P. E.*	*I. P. E.*	26·887	......
" 9	"	"	26·836	26·987
" "	"	"	26·797	26·962
" 10	*I. P. W.*	*I. P. W.*	26·860	26·915
" "	"	"	26·935	26·931
Mean Values by Observations *I. P. E.*			16 26·889	16 26·976
" *I. P. W.*			26·971	26·990
General Means			16 26·930	16 26·983

Whence

$$\Delta L = 16^m\ 26^s{\cdot}957$$
$$\rho = +\ 0{\cdot}027$$

* For finally adopted value of ΔL Bolarum–Bombay see last page.

TABLE XX. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL AND THE RETARDATION OF SIGNALS, ρ FROM THE OBSERVATIONS OF TRANSITS AT BOTH STATIONS WITH THE SAME CLOCK, SEASON 1875-76.

BOLARUM (E), AND BELLARY (W)

Astronomical Date	Instrumental Position at E	Instrumental Position at W	Apparent Difference of Longitude by Observations with E Clock = ΔL − ρ	Apparent Difference of Longitude by Observations with W Clock = ΔL + ρ
1876			m s	m s
February 19	*I. P. W.*	*I. P. W.*	6 21·873	6 21·854
„ „	„	„	21·855	21·907
„ 20	„	„	21·738	21·803
„ „	„	„	21·760	21·841
„ 21	„	„	21·797	21·819
„ „	„	„	21·804	21·797
„ 22	*I. P. E.*	*I. P. E.*	21·862	21·927
„ „	„	„	21·872	21·956
„ 23	„	„	22·044	21·982
„ „	„	„	22·024	22·001
„ 24	„	„	21·922	21·927
„ „	„	„	21·940	21·913
Mean Values by Observations *I. P. E.*			6 21·944	6 21·951
„ *I. P. W.*			21·804	21·837
General Means			6 21·874	6 21·894

Whence

$$\Delta L = \overset{m}{6}\ \overset{s}{21 \cdot 884}$$
$$\rho = +\ 0 \cdot 010$$

MADRAS (E), AND BOLARUM (W)

Astronomical Date	Instrumental Position at E	Instrumental Position at W	Apparent Difference of Longitude by Observations with E Clock = ΔL − ρ	Apparent Difference of Longitude by Observations with W Clock = ΔL + ρ
1876			m s	m s
March 3	*I. P. E.*	*I. P. E.*	6 54·681	6 54·649
„ „	„	„	54·632	54·647
„ 5	„	„	54·599	54·588
„ „	„	„	54·578	54·627
„ 6	„	„	54·657	54·754
„ „	„	„	54·706	54·737
„ 7	*I. P. W.*	*I. P. W.*	54·604	54·719
„ „	„	„	54·622	54·792
„ 8	„	„	54·775	54·862
„ „	„	„	54·813	54·850
„ 12	„	„	54·686	54·649
„ „	„	„	54·662	54·697
Mean Values by Observations *I. P. E.*			6 54·642	6 54·667
„ *I. P. W.*			54·694	54·761
General Means			6 54·668	6 54·714

Whence

$$\Delta L = \overset{m}{6}\ \overset{s}{54 \cdot 691}$$
$$\rho = +\ 0 \cdot 023$$

TABLE XX. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL AND THE RETARDATION OF SIGNALS, ρ

FROM THE OBSERVATIONS OF TRANSITS AT BOTH STATIONS WITH THE SAME CLOCK, SEASON 1875-76.

MADRAS (E), AND BELLARY (W)

Astronomical Date		Instrumental Position at E	Instrumental Position at W	Apparent Difference of Longitude by Observations with E Clock $= \Delta L - \rho$	Apparent Difference of Longitude by Observations with W Clock $= \Delta L + \rho$
1876				m s	m s
March	22	*I. P. W.*	*I. P. E.*	13 16·611	13 16·709
"	"	"	"	16·556	16·707
"	24	"	"	16·568	16·681
"	"	"	"	16·520	16·674
"	26	"	*I. P. W.*	16·595	16·655
"	"	"	"	16·617	16·667
"	29	*I. P. E.*	"	16·639	......
"	"	"	"	16·608	......
"	30	"	"	16·520	16·576
"	"	"	"	16·483	16·585
"	31	"	"	16·535	16·506
"	"	"	"	16·506	16·562
April	1	"	*I. P. E.*	......	16·408
"	"	"	"	......	16·392
"	2	"	"	16·497	16·472
"	"	"	"	16·462	16·463
Mean Values by Observations *I. P. E.*					
" *I. P. W.*					
General Means				13 16·551	13 16·576

Whence

$$\Delta L = 13^m\ 16^s{\cdot}564$$
$$\rho = +\ 0{\cdot}013$$

BANGALORE (E), AND BELLARY (W)

Astronomical Date		Instrumental Position at E	Instrumental Position at W	Apparent Difference of Longitude by Observations with E Clock $= \Delta L - \rho$	Apparent Difference of Longitude by Observations with W Clock $= \Delta L + \rho$
1876				m s	m s
April	11	*I. P. E.*	*I. P. E.*	2 37·304	2 37·336
"	"	"	"	37·343	37·358
"	12	"	"	37·275	37·344
"	"	"	"	37·267	37·328
"	13	"	"	37·185	......
"	"	"	"	37·184	37·250
"	14	*I. P. W.*	*I. P. W.*	37·362	37·531
"	"	"	"	37·374	37·528
"	17	"	"	37·351	37·383
"	"	"	"	37·381	37·402
"	18	"	"	37·435	37·490
"	"	"	"	37·482	37·454
Mean Values by Observations *I. P. E.*				2 37·260	2 37·323
" *I. P. W.*				37·398	37·465
General Means				2 37·329	2 37·394

Whence

$$\Delta L = 2^m\ 37^s{\cdot}362$$
$$\rho = +\ 0{\cdot}033$$

TABLE XXI. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL AND THE RETARDATION OF SIGNALS, ρ FROM THE OBSERVATIONS OF TRANSITS AT BOTH STATIONS WITH THE SAME CLOCK, SEASON 1876–77.

VIZAGAPATAM (E), AND MADRAS (W)

Astronomical Date	Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with	
		E Clock $= \delta L_N - \rho$	W Clock $= \delta L_N + \rho$
1877		m s	m s
January 22	*I. P. E.*	12 9·705	12 9·847
„ „	„	9·727	9·754
„ 23	„	9·743	9·849
„ „	„	9·674	9·795
„ 24	„	9·771	9·830
„ „	„	9·744	9·755
„ 25	„	9·786	9·981
„ „	„	...	9·833
„ 26	„	9·755	9·785
„ „	„	9·806	9·888
„ 27	*I. P. W.*	9·989	9·930
„ „	„	9·964	...
„ 29	„	9·935	9·951
„ „	„	9·923	9·979
„ 31	„	9·952	9·975
„ „	„	9·889	9·929
February 1	„	9·912	...
Mean Values by observations *I. P. E.*		12 9·746	12 9·832
„ *I. P. W.*		9·938	9·953
General Means		12 9·842	12 9·893

Whence ... ... $\delta L_N =$ 12^m 9^s·867
Correction for Relative Personal Equation, $H_N - C_N =$ − 0·083
$\Delta L_N =$ 12 9·784

Again ... ... $\delta L_S =$ 12 9·805
Correction for Relative Personal Equation, $H_S - C_S =$ − 0·019
$\Delta L_S =$ 12 9·786

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 12^m\ 9^s{\cdot}785$$
$$\rho = +\ 0{\cdot}025$$

VIZAGAPATAM (E), AND BELLARY (W)

Astronomical Date	Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with	
		E Clock $= \delta L_N - \rho$	W Clock $= \delta L_N + \rho$
1877		m s	m s
February 17	*I. P. W.*	25 26·402	25 26·511
„ „	„	26·488	26·513
„ 21	*I. P. E.*	26·422	26·548
„ „	„	26·356	...
„ 22	„	26·420	26·491
„ „	„	26·415	26·506
„ 23	*I. P. W.*	26·482	26·477
„ „	„	...	26·628
„ 24	„	26·368	26·440
„ „	„	26·446	26·466
„ 25	*I. P. E.*	26·297	26·408
„ „	„	26·395	26·447
Mean Values by observations *I. P. E.*		25 26·384	25 26·480
„ *I. P. W.*		26·437	26·506
General Means		25 26·411	25 26·493

Whence ... ... $\delta L_N =$ 25^m 26^s·452
Correction for Relative Personal Equation, $H_N - C_N =$ − 0·083
$\Delta L_N =$ 25 26·369

Again ... ... $\delta L_S =$ 25 26·428
Correction for Relative Personal Equation, $H_S - C_S =$ − 0·019
$\Delta L_S =$ 25 26·409

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 25^m\ 26^s{\cdot}389$$
$$\rho = +\ 0{\cdot}041$$

MANGALORE (E), AND BOMBAY (W)

Astronomical Date	Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with	
		E Clock $= \delta L_N - \rho$	W Clock $= \delta L_N + \rho$
1877		m s	m s
March 22	*I. P. E.*	8 7·376	8 7·433
„ „	„	7·459	7·541
„ 24	„	7·351	7·377
„ „	„	7·374	7·389
„ 25	„	7·279	7·331
„ „	„	7·299	7·431
„ 26	*I. P. W.*	7·403	7·488
„ „	„	7·463	7·537
Mean Values by observations *I. P. E.*		8 7·356	8 7·417
„ *I. P. W.*		7·433	7·513
General Means		8 7·395	8 7·465

Whence ... ... $\delta L_N =$ 8^m 7^s·430
Correction for Relative Personal Equation, $H_N - C_N =$ − 0·083
$\Delta L_N =$ 8 7·347

Again ... ... $\delta L_S =$ 8 7·410
Correction for Relative Personal Equation, $H_S - C_S =$ − 0·019
$\Delta E_S =$ 8 7·391

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 8^m\ 7^s{\cdot}369$$
$$\rho = +\ 0{\cdot}035$$

ABSTRACT OF THE OBSERVATIONS

AND

REDUCTION OF THE RESULTS

OF

1880-81.

ABSTRACT OF THE OBSERVATIONS

AND

REDUCTION OF THE RESULTS

OF

1880-81.

Astronomical Date	Station	Observer and Instrument	Instrumental Position	Collimation				Level		Remarks	Station	Observer and Instrument	Instrumental Position	Collimation				Level		Remarks
				C_0	C_s	c_1	c	M	b					C_0	C_s	c_1	c	M	b	
1880				*d*	*d*	*d*	*d*	*d*	*d*					*d*	*d*	*d*	*d*	*d*	*d*	
Dec. 11	At BOMBAY	By Campbell, with Telescope No. 2	*I. P. E.*	50·5						Mean C_0 *d* *I.P.E.* 48·8 *I.P.W.* 49·7	At DEESA	By Heaviside, with Telescope No. 1								Mean C_0 *d* *I.P.E.* 57·9 *I.P.W.* 55·2
" 13			"	47·9	75·0	−26·2	− 27·1	71·6	−22·8				*I. P. E.*	57·7	60·0	−2·1	−2·9	51·6	+ 6·3	
" 14			"	48·1	75·0	−26·2	− 27·1	69·6	−20·8				"	56·6	60·0	−2·1	−2·9	62·7	− 4·8	
" 16			"	48·5	50·0	− 1·2	− 2·1	46·4	+ 2·4				"	59·4	60·0	−2·1	−2·9	62·3	− 4·4	
" 17			*I. P. W.*	49·6	50·0	+ 0·3	− 0·6	57·3	+ 7·6				*I. P. W.*	54·6	60·0	+4·8	+4·0	59·4	+ 4·2	
" 18			"	50·4	50·0	+ 0·3	− 0·6	51·1	+ 1·4				"	54·8	55·0	−0·2	−1·0	60·5	+ 5·3	
" 19			"	49·0	50·0	+ 0·3	− 0·6	52·3	+ 2·6				"	56·1	55·0	−0·2	−1·0	60·7	+ 5·5	
1881																				
Jan. 1	At DEESA	By Heaviside, with Telescope No. 1	*I. P. W.*	56·4						Mean C_0 *d* *I.P.W.* 56·0 *I.P.E.* 55·3	At KURRACHEE	By Campbell, with Telescope No. 2								Mean C_0 *d* *I.P.W.* 65·1 *I.P.E.* 64·8
" 3			"	55·9																
" 5			"	56·6	55·0	− 1·0	− 1·8	57·5	+ 1·5				*I. P. W.*	66·1	70·0	+4·9	+4·1	80·7	+342·3*	
" 6			"	55·8	55·0	− 1·0	− 1·8	56·4	+ 0·4				"	63·0	65·0	−0·1	−0·9	65·7	+ 0·6	
" 7			"	55·1	55·0	− 1·0	− 1·8	56·3	+ 0·3				"	66·1	65·0	−0·1	−0·9	67·8	+ 2·7	
" 8			*I. P. E.*	55·8	55·0	+ 0·3	− 0·5	58·2	− 2·9				*I. P. E.*	64·1	65·0	−0·2	−1·0	69·7	− 4·9	
" 9			"	54·8	55·0	+ 0·3	− 0·5	56·7	− 1·4				"	65·5	65·0	−0·2	−1·0	65·9	− 1·1	
" 10			"	55·4	55·0	+ 0·3	− 0·5	58·8	− 3·5				"	64·7	65·0	−0·2	−1·0	67·1	− 2·3	
Jan. 17	At BOMBAY	By Heaviside, with Telescope No. 1	*I. P. E.*	5·7	10·0	− 4·3	− 5·2	10·9	− 5·2	Mean C_0 *d* *I.P.E.* 5·7 *I.P.W.* 7·0	At KURRACHEE	By Campbell, with Telescope No. 2	*I. P. E.*	65·1	65·0	0·0	−0·8	65·3	− 0·3	Mean C_0 *d* *I.P.E.* 65·0 *I.P.W.* 66·5
" 18			"	5·6	10·0	− 4·3	− 5·2	7·9	− 2·2				"	64·7	65·0	0·0	−0·8	63·8	+ 1·2	
" 19			"	5·8	10·0	− 4·3	− 5·2	3·9	+ 1·8				"	65·2	65·0	0·0	−0·8	63·6	+ 1·4	
" 20			*I. P. W.*	6·7	10·0	+ 3·0	+ 2·1	11·8	+ 4·8				*I. P. W.*	65·6	65·0	−1·5	−2·3	72·9	+ 6·4	
" 21			"	6·2	10·0	+ 3·0	+ 2·1	10·8	+ 3·8				"	67·3	65·0	−1·5	−2·3	66·4	− 0·1	
" 23			"	7·4	10·0	+ 3·0	+ 2·1	5·6	− 1·4				"	66·6	65·0	−1·5	−2·3	69·2	+ 2·7	
" 24			"	7·5																
Feb. 6	At JUBBULPORE	By Heaviside, with Telescope No. 1	*I. P. E.*	16·6	15·0	+ 4·6	+ 3·8	14·4	+ 5·2	Mean C_0 *d* *I.P.E.* 19·6 *I.P.W.* 22·3	At BOMBAY	By Campbell, with Telescope No. 2	*I. P. E.*	84·3	80·0	+3·2	+2·3	78·7	+ 4·5	Mean C_0 *d* *I.P.E.* 83·2 *I.P.W.* 87·3
" 7			"	20·4	15·0	+ 4·6	+203·8†	16·9	+ 2·7				"	81·7	80·0	+3·2	+2·3	81·0	+ 2·2	
" 8			"	21·5	15·0	+ 4·6	+ 3·8	17·2	+ 2·4				"	83·6	80·0	+3·2	+2·3	79·6	+ 3·6	
" 9			"	19·8	20·0	− 0·4	− 1·2	16·7	+ 2·9				"	83·1	80·0	+3·2	+2·3	80·2	+ 3·0	
" 10			*I. P. W.*	22·3	20·0	− 2·3	− 3·1	22·7	+ 0·4				*I. P. W.*	87·8	80·0	−7·3	−8·2	82·1	− 5·2	
" 13			"	21·7	20·0	− 2·3	− 3·1	21·8	− 0·5				"	86·3	80·0	−7·3	−8·2	91·8	+ 4·5	
" 14			"	22·8	20·0	− 2·3	− 3·1	20·6	− 1·7				"	87·8	80·0	−7·3	−8·2	90·8	+ 3·5	

* At Kurrachee on January 5th the reflection of the wrong wire in the mercury trough was observed by mistake, causing an abnormally large correction for dislevelment. † At Jubbulpore on February 7th the observations were accidentally made with a mistake of two revolutions in the setting of the micrometer.

NOTE.—For an explanation of the symbols used in this table, see page 2.

Astronomical Date	Station	Observer and Instrument	Instrumental Position	Collimation C_0	Collimation C_s	Collimation c_1	Collimation c	Level M	Level b	Remarks	Station	Observer and Instrument	Instrumental Position	Collimation C_0	Collimation C_s	Collimation c_1	Collimation c	Level M	Level b	Remarks
1881				d	d	d	d	d	d					d	d	d	d	d	d	
Feb. 23	At Jubbulpore	By Heaviside, with Telescope No. 1	I. P. W.	19·6	20·0	+0·1	− 0·7	17·6	−2·3	Mean C_0 d I.P.W. 19·9 I.P.E. 16·5	At Bolarum	By Campbell, with Telescope No. 2	I. P. W.	19·6	20·0	+1·9	+1·0	20·2	+ 2·1	Mean C_0 d I.P.W. 18·1 I.P.E. 13·8
" 24			"	20·6	20·0	+0·1	− 0·7	17·0	−2·9				"	17·3	20·0	+1·9	+1·0	21·4	+ 3·3	
" 25			"	19·5	20·0	+0·1	− 0·7	22·6	+2·7				"	17·4	20·0	+1·9	+1·0	22·3	+ 4·2	
" 28			I. P. E.	16·5	20·0	−3·5	− 4·3	20·7	−4·2				I. P. E.	14·2	20·0	−6·2	−7·1	17·2	− 3·4	
Mar. 2			"	15·9	20·0	−3·5	− 4·3	19·7	−3·2				"	13·4	20·0	−6·2	−7·1	14·6	− 0·8	
" 8			"	16·9	20·0	−3·5	− 4·3	19·3	−2·8				"	13·7	20·0	−6·2	−7·1	13·1	+ 0·7	
Mar. 11	At Jubbulpore	By Campbell, with Telescope No. 2	I. P. E.	8·5	10·0	−0·8	− 1·6	8·1	+1·1	Mean C_0 d I.P.E. 9·2 I.P.W. 9·1	At Agra	By Heaviside, with Telescope No. 1	I. P. E.	35·4	35·0	−0·6	−1·4	35·3	− 0·9	Mean C_0 d I.P.E. 34·4 I.P.W. 35·5
" 12			"	9·5	10·0	−0·8	− 1·6	9·0	+0·2				"	34·7	35·0	−0·6	−1·4	35·8	− 1·4	
" 13			"	9·7	10·0	−0·8	− 1·6	10·0	−0·8				"	33·2	35·0	−0·6	−1·4	35·6	− 1·2	
" 15			I. P. W.	10·3	10·0	+0·9	+ 0·1	10·6	+1·5				I. P. W.	35·0	35·0	−0·5	−1·3	35·0	− 0·5	
" 17			"	10·0	10·0	+0·9	+ 0·1	10·8	+1·7				"	35·0	35·0	−0·5	−1·3	35·3	− 0·2	
" 20			"	8·0	10·0	+0·9	+ 0·1	5·9	−3·2				"	34·7	35·0	−0·5	−1·3	33·8	− 1·7	
" 21			"	8·0	10·0	+0·9	+ 0·1	5·2	−3·9				"	37·1	35·0	−0·5	−1·3	35·2	− 0·3	
Mar. 28	At Jubbulpore	By Campbell, with Telescope No. 2	I. P. W.	8·1	10·0	+1·7	+ 0·9	10·6	+2·3	Mean C_0 d I.P.W. 8·3 I.P.E. 2·3	At Deesa	By Heaviside, with Telescope No. 1	I. P. W.	23·9	20·0	−3·2	−4·0	20·8	− 2·4	Mean C_0 d I.P.W. 23·2 I.P.E. 20·3
" 29			"	8·1	10·0	+1·7	+ 0·9	11·0	+2·7				"	22·6	20·0	−3·2	−4·0	21·2	− 2·0	
" 30			"	8·8	10·0	+1·7	+ 0·9	10·4	+2·1				"	23·2	20·0	−3·2	−4·0	18·9	− 4·3	
" 31			I. P. E.	2·1	10·0	−7·7	− 8·5	4·5	−2·2				I. P. E.	19·7	20·0	+0·3	−0·5	21·0	− 0·7	
Apr. 1			"	2·5	10·0	−7·7	− 8·5	8·9	−6·6				"	20·5	20·0	+0·3	−0·5	21·6	− 1·3	
" 8			"	2·2	10·0	−7·7	− 8·5	6·8	−4·5				"	20·8	20·0	+0·3	−0·5	22·8	− 2·5	
Apr. 10	At Agra	By Campbell, with Telescope No. 2	I. P. E.	74·3	75·0	−0·4	− 1·2	74·5	+0·1	Mean C_0 d I.P.E. 74·6 I.P.W. 80·1	At Deesa	By Heaviside, with Telescope No 1	I. P. E.	29·7	30·0	−1·2	−2·0	29·7	− 0·9	Mean C_0 d I.P.E. 28·8 I.P.W. 28·6
" 11			"	74·8	75·0	−0·4	− 1·2	74·4	+0·2				"	27·2	30·0	−1·2	−2·0	28·6	+ 0·2	
" 13			"	74·8	75·0	−0·4	− 1·2	69·0	+5·6				"	29·5	30·0	−1·2	−2·0	27·9	+ 0·9	
" 14			I. P. W.	79·9	80·0	−0·1	− 0·9	79·4	−0·7				I. P. W.	28·5	30·0	+1·4	+0·6	20·5	− 8·1	
" 15			"	80·3	80·0	−0·1	− 0·9	80·0	−0·1				"	29·6	30·0	+1·4	+0·6	31·9	+ 3·3	
" 16			"	80·0	80·0	−0·1	− 0·9	82·1	+2·0				"	27·7	30·0	+1·4	+0·6	30·8	+ 2·2	

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
BOMBAY (E), AND DEESA (W)	BOMBAY (Latitude 18° 54′)	1880 Dec. 13	*I. P. E.*	E	R. P. L.* 116	L	2	+0·286	3 57 41·9	+ 8·0	+1·7	+1·9		53·5	4 0 53·2	+ 2 59·7	−27·2
					R. P. L. 37	U	3	−0·283	4 46 68·5	− 8·3	−2·8	−1·9	−0·4	55·1	4 50 10·3	+ 3 15·2	
		" "	"	"	δ Ursæ Minoris	L	3	+0·367	6 7 5·4	+10·4	+2·3	+1·9		20·0	6 10 15·1	+ 2 55·1	−30·2
					51 Cephei	U	3	−0·432	6 41 51·5	−12·6	−3·9	−1·9	−0·3	32·8	6 44 52·0	+ 3 19·2	
		" 14	"	"	R. P. L. 116	L	3	+0·286	3 57 54·4	+ 8·0	+1·5	+1·9		65·8	4 0 53·2	+ 2 47·4	−25·5
					R. P. L. 37	U	2	−0·283	4 47 21·5	− 8·3	−2·5	−1·9	−0·4	8·4	4 50 10·3	+ 3 1·9	
		" "	"	"	δ Ursæ Minoris	L	3	+0·367	6 7 17·8	+10·4	+2·1	+1·9		32·2	6 10 14·9	+ 2 42·7	−30·1
					51 Cephei	U	3	−0·432	6 41 60·2	−12·6	−3·6	+1·9	−0·3	45·6	6 44 52·3	+ 3 6·7	
		" 16	"	"	R. P. L. 116	L	4	+0·286	3 58 29·0	+ 0·6	−0·2	+1·9		31·3	4 0 53·3	+ 2 22·0	−22·3
					R. P. L. 37	U	3	−0·283	4 47 38·3	− 0·6	+0·3	−1·9	−0·4	35·7	4 50 10·4	+ 2 34·7	
		" "	"	"	δ Ursæ Minoris	L	3	+0·367	6 7 53·6	+ 0·8	−0·2	+1·9		56·1	6 10 14·6	+ 2 18·5	−26·8
					51 Cephei	U	3	−0·432	6 42 11·9	− 1·0	+0·4	+1·9	−0·3	12·9	6 44 52·8	+ 2 39·9	
		" 17	*I. P. W.*	"	R. P. L. 116	L	3	+0·286	3 58 56·9	+ 0·2	−0·6	+1·9		58·4	4 0 53·4	+ 1 55·0	−74·7
					R. P. L. 37	U	3	−0·283	4 47 34·5	− 0·2	+0·9	−1·9	−0·4	32·9	4 50 10·4	+ 2 37·5	
		" "	"	"	δ Ursæ Minoris	L	4	+0·367	6 8 26·2	+ 0·2	−0·8	+1·9		27·5	6 10 14·5	+ 1 47·0	−78·1
					51 Cephei	U	3	−0·432	6 42 1·1	− 0·3	+1·3	+1·9	−0·3	3·7	6 44 53·1	+ 2 49·4	
		" 18	"	"	R. P. L. 116	L	3	+0·286	3 59 7·5	+ 0·2	−0·1	+1·9		9·5	4 0 53·5	+ 1 44·0	−67·3
					R. P. L. 37	U	4	−0·283	4 47 50·4	− 0·2	+0·2	−1·9	−0·4	48·1	4 50 10·4	+ 2 22·3	
		" "	"	"	δ Ursæ Minoris	L	5	+0·367	6 8 36·3	+ 0·2	−0·1	+1·9		38·3	6 10 14·3	+ 1 36·0	−72·0
					51 Cephei	U	3	−0·432	6 42 18·4	− 0·3	+0·2	+1·9	−0·3	19·9	6 44 53·4	+ 2 33·5	
		" 19	"	"	R. P. L. 116	L	2	+0·286	3 59 19·3	+ 0·2	−0·2	+1·9		21·2	4 0 53·6	+ 1 32·4	−65·6
					R. P. L. 37	U	4	−0·283	4 48 2·9	− 0·2	+0·3	−1·9	−0·4	0·7	4 50 10·4	+ 2 9·7	
		" "	"	"	δ Ursæ Minoris	L	3	+0·367	6 8 46·9	+ 0·2	−0·3	+1·9		48·7	6 10 14·2	+ 1 25·5	−68·2
					51 Cephei	U	2	−0·432	6 42 31·9	− 0·3	+0·4	+1·9	−0·3	33·6	6 44 53·6	+ 2 20·0	
	DEESA (Latitude 24° 16′)	1880 Dec. 13	*I. P. E.*	W	δ Ursæ Minoris	L	4	+0·354	6 10 31·2	+ 1·1	−0·8	+1·9		33·4	6 10 15·1	− 0 18·3	−14·2
					51 Cephei	U	4	−0·412	6 44 62·3	− 1·3	+1·3	−1·9	−1·0	59·4	6 44 52·0	− 0 7·4	
		" 14	"	"	δ Ursæ Minoris	L	4	+0·354	6 11 7·1	+ 1·1	+0·8	+1·9		10·9	6 10 14·9	− 0 56·0	−11·7
					51 Cephei	U	5	−0·412	6 45 44·9	− 1·3	−1·3	−1·9	−1·0	39·4	6 44 52·3	− 0 47·1	
		" 16	"	"	δ Ursæ Minoris	L	6	+0·354	6 12 28·6	+ 1·1	+0·4	+2·0		32·1	6 10 14·6	− 2 17·5	−11·2
					51 Cephei	U	5	−0·412	6 47 6·6	− 1·3	−0·6	−2·0	−1·0	1·7	6 44 52·8	− 2 8·9	

* The letters R. P. L. indicate "Radcliffe Polar List".

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
BOMBAY (E), AND DEESA (W)	DEESA (Latitude 24° 16′)	1880 Dec. 17	*I. P. W.*	W	δ Ursæ Minoris	L	5	+0·354	6 13 9·1	−1·5	− 0·7	+1·9		8·8	6 10 14·5	− 2 54·3	− 0·4
					51 Cephei	U	4	−0·412	6 47 47·1	+1·9	+ 1·0	−1·9	−1·0	47·1	6 44 53·1	− 2 54·0	
		„ 18	„	„	δ Ursæ Minoris	L	7	+0·354	6 13 47·1	+0·4	− 0·8	+1·4		48·1	6 10 14·3	− 3 33·8	− 1·4
					51 Cephei	U	7	−0·412	6 48 27·8	−0·5	+ 1·2	−1·4	−1·0	26·1	6 44 53·4	− 3 32·7	
		„ 19	„	„	δ Ursæ Minoris	L	8	+0·354	6 14 26·7	+0·4	− 0·6	+1·4		27·9	6 10 14·2	− 4 13·7	− 0·4
					51 Cephei	U	5	−0·412	6 49 8·9	−0·5	+ 1·0	−1·4	−1·0	7·0	6 44 53·6	− 4 13·4	
DEESA (E), AND KURRACHEE (W)	DEESA (Latitude 24° 16′)	1881 Jan. 5	*I. P. W.*	E	R. P. L. 37	U	5	−0·269	4 50 48·3	−0·5	+ 0·1	+1·6		49·5	4 50 9·4	− 0 40·1	− 7·9
					δ Ursæ Minoris	L	5	+0·354	6 10 59·1	+0·7	− 0·1	−1·6	+0·5	58·6	6 10 13·6	− 0 45·0	− 12·3
					51 Cephei	U	5	−0·412	6 45 29·7	−0·8	+ 0·2	+1·6	+0·7	31·4	6 44 53·8	− 0 35·6	
					R. P. L. 37	U	2	−0·269	4 50 37·7	−0·5	+ 0·1	+1·6		38·9	4 50 9·3	− 0 29·6	− 13·6
		„ 6	„	„	δ Ursæ Minoris	L	5	+0·354	6 10 52·3	+0·7	− 0·1	−1·6	+0·5	51·8	6 10 13·7	− 0 38·1	− 14·2
					51 Cephei	U	5	−0·412	6 45 21·4	−0·8	+ 0·1	+1·6	+0·7	23·0	6 44 55·8	− 0 27·2	
					R. P. L. 37	U	8	−0·269	4 50 31·1	−0·5	+ 0·2	+1·4		32·2	4 50 9·2	− 0 23·0	− 10·4
		„ 7	„	„	δ Ursæ Minoris	L	7	+0·354	6 10 43·7	+0·7	− 0·2	−1·4	+0·5	43·3	6 10 13·8	− 0 29·5	− 10·2
					51 Cephei	U	6	−0·412	6 45 16·0	−0·8	+ 0·2	+1·4	+0·7	17·5	6 44 55·8	− 0 21·7	
		„ 8	*I. P. E.*	„	δ Ursæ Minoris	L	5	+0·354	6 10 33·6	+0·2	+ 0·3	−1·3		32·8	6 10 13·8	− 0 19·0	− 5·7
					51 Cephei	U	6	−0·412	6 45 9·6	−0·2	− 0·5	+1·3	+0·2	10·4	6 44 55·8	− 0 14·6	
					R. P. L. 37	U	5	−0·269	4 50 14·2	−0·2	− 0·3	+1·3		15·0	4 50 8·9	− 0 6·1	− 10·3
		„ 9	„	„	δ Ursæ Minoris	L	4	+0·354	6 10 26·7	+0·2	+ 0·[illegible]	−1·3	+0·5	26·4	6 10 13·9	− 0 12·5	− 12·5
					51 Cephei	U	6	−0·412	6 44 57·3	−0·2	− 0·4	+1·3	+0·7	58·7	6 44 55·8	− 0 2·9	
					R. P. L. 37	U	7	−0·269	4 50 5·9	−0·2	− 0·5	+1·3		6·5	4 50 8·8	+ 0 2·3	− 8·3
		„ 10	„	„	δ Ursæ Minoris	L	5	+0·354	6 10 17·0	+0·2	+ 0·5	−1·3	+0·5	16·9	6 10 14·0	− 0 2·9	− 12·0
					51 Cephei	U	4	−0·412	6 44 48·5	−0·2	− 0·7	+1·3	+0·7	49·6	6 44 55·9	+ 0 6·3	
	KURRACHEE (Latitude 24° 51′)	1881 Jan. 5	*I. P. W.*	W	δ Ursæ Minoris	L	3	+0·356	6 6 76·7	−1·6	−47·9*	+1·3		28·6	6 10 13·6	+ 3 45·0	+177·9
					51 Cephei	U	3	−0·412	6 42 12·9	+1·9	+73·9	−1·3	+0·1	27·4	6 44 55·8	+ 1 28·4	+173·2
					R. P. L. 131	L	2	+0·349	6 49 79·6	−1·5	−46·9	−1·3		29·9	6 53 10·1	+ 3 40·2	
		„ 6	„	„	R. P. L. 37	U	3	−0·269	4 48 8·2	−0·3	+ 0·1	+1·3		9·3	4 50 9·3	+ 2 0·0	+145·2
					R. P. L. 131	L	3	+0·349	6 49 41·7	+0·3	− 0·1	−1·3	−0·2	40·4	6 53 10·1	+ 3 29·7	
		„ „	„	„	δ Ursæ Minoris	L	3	+0·356	6 6 41·2	+0·3	− 0·1	+1·3		42·7	6 10 13·7	+ 3 31·0	+146·9
					51 Cephei	U	2	−0·412	6 43 19·3	−0·4	+ 0·1	−1·3	−0·1	17·6	6 44 55·8	+ 1 38·2	

* The level corrections on January 5th at Kurrachee were abnormally high, owing to a mistake in observing the reflection of the wrong wire in the mercury trough.

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
BOMBAY (E), AND DEESA (W)	BOMBAY (Latitude 18° 54′)	1880 Dec. 13	*I. P. E.*	E	R. P. L.* 116	L	2	+0·286	3 57 41·9	+ 8·0	+1·7	+1·9		53·5	4 0 53·2	+ 2 59·7	−27·2
					R. P. L. 37	U	3	−0·283	4 46 68·5	− 8·3	−2·8	−1·9	−0·4	55·1	4 50 10·3	+ 3 15·2	
		,, ,,	,,	,,	δ Ursæ Minoris	L	3	+0·367	6 7 5·4	+10·4	+2·3	+1·9		20·0	6 10 15·1	+ 2 55·1	−30·2
					51 Cephei	U	3	−0·432	6 41 51·5	−12·6	−3·9	−1·9	−0·3	32·8	6 44 52·0	+ 3 19·2	
		,, 14	,,	,,	R. P. L. 116	L	3	+0·286	3 57 54·4	+ 8·0	+1·5	+1·9		65·8	4 0 53·2	+ 2 47·4	−25·5
					R. P. L. 37	U	2	−0·283	4 47 21·5	− 8·3	−2·5	−1·9	−0·4	8·4	4 50 10·3	+ 3 1·9	
		,, ,,	,,	,,	δ Ursæ Minoris	L	3	+0·367	6 7 17·8	+10·4	+2·1	+1·9		32·2	6 10 14·9	+ 2 42·7	−30·1
					51 Cephei	U	3	−0·432	6 41 60·2	−12·6	−3·6	+1·9	−0·3	45·6	6 44 52·3	+ 3 6·7	
		,, 16	,,	,,	R. P. L. 116	L	4	+0·286	3 58 29·0	+ 0·6	−0·2	+1·9		31·3	4 0 53·3	+ 2 22·0	−22·3
					R. P. L. 37	U	3	−0·283	4 47 38·3	− 0·6	+0·3	−1·9	−0·4	35·7	4 50 10·4	+ 2 34·7	
		,, ,,	,,	,,	δ Ursæ Minoris	L	3	+0·367	6 7 53·6	+ 0·8	−0·2	+1·9		56·1	6 10 14·6	+ 2 18·5	−26·8
					51 Cephei	U	3	−0·432	6 42 11·9	− 1·0	+0·4	+1·9	−0·3	12·9	6 44 52·8	+ 2 39·9	
		,, 17	*I. P. W.*	,,	R. P. L. 116	L	3	+0·286	3 58 56·9	+ 0·2	−0·6	+1·9		58·4	4 0 53·4	+ 1 55·0	−74·7
					R. P. L. 37	U	3	−0·283	4 47 34·5	− 0·2	+0·9	−1·9	−0·4	32·9	4 50 10·4	+ 2 37·5	
		,, ,,	,,	,,	δ Ursæ Minoris	L	4	+0·367	6 8 26·2	+ 0·2	−0·8	+1·9		27·5	6 10 14·5	+ 1 47·0	−78·1
					51 Cephei	U	3	−0·432	6 42 1·1	− 0·3	+1·3	+1·9	−0·3	3·7	6 44 53·1	+ 2 49·4	
		,, 18	,,	,,	R. P. L. 116	L	3	+0·286	3 59 7·5	+ 0·2	−0·1	+1·9		9·5	4 0 53·5	+ 1 44·0	−67·3
					R. P. L. 37	U	4	−0·283	4 47 50·4	− 0·2	+0·2	−1·9	−0·4	48·1	4 50 10·4	+ 2 22·3	
		,, ,,	,,	,,	δ Ursæ Minoris	L	5	+0·367	6 8 36·3	+ 0·2	−0·1	+1·9		38·3	6 10 14·3	+ 1 36·0	−72·0
					51 Cephei	U	3	−0·432	6 42 18·4	− 0·3	+0·2	+1·9	−0·3	19·9	6 44 53·4	+ 2 33·5	
		,, 19	,,	,,	R. P. L. 116	L	2	+0·286	3 59 19·3	+ 0·2	−0·2	+1·9		21·2	4 0 53·6	+ 1 32·4	−65·6
					R. P. L. 37	U	4	−0·283	4 48 2·9	− 0·2	+0·3	−1·9	−0·4	0·7	4 50 10·4	+ 2 9·7	
		,, ,,	,,	,,	δ Ursæ Minoris	L	3	+0·367	6 8 46·9	+ 0·2	−0·3	+1·9		48·7	6 10 14·2	+ 1 25·5	−68·2
					51 Cephei	U	2	−0·432	6 42 31·9	− 0·3	+0·4	+1·9	−0·3	33·6	6 44 53·6	+ 2 20·0	
	DEESA (Latitude 24° 16′)	1880 Dec. 13	*I. P. E.*	W	δ Ursæ Minoris	L	4	+0·354	6 10 31·2	+ 1·1	−0·8	+1·9		33·4	6 10 15·1	− 0 18·3	−14·2
					51 Cephei	U	4	−0·412	6 44 62·3	− 1·3	+1·3	−1·9	−1·0	59·4	6 44 52·0	− 0 7·4	
		,, 14	,,	,,	δ Ursæ Minoris	L	4	+0·354	6 11 7·1	+ 1·1	+0·8	+1·9		10·9	6 10 14·9	− 0 56·0	−11·7
					51 Cephei	U	5	−0·412	6 45 44·9	− 1·3	−1·3	−1·9	−1·0	39·4	6 44 52·3	− 0 47·1	
		,, 16	,,	,,	δ Ursæ Minoris	L	6	+0·354	6 12 28·6	+ 1·1	+0·4	+2·0		32·1	6 10 14·6	− 2 17·5	−11·2
					51 Cephei	U	5	−0·412	6 47 6·6	− 1·3	−0·6	−2·0	−1·0	1·7	6 44 52·8	− 2 8·9	

* The letters R. P. L. indicate "Radcliffe Polar List".

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
BOMBAY (E), AND DEESA (W)	DEESA (Latitude 24° 16′)	1880 Dec. 17	I. P. W.	W	δ Ursæ Minoris	L	5	+0·354	6 13 9·1	−1·5	− 0·7	+1·9		8·8	6 10 14·5	− 2 54·3	− 0·4
					51 Cephei	U	4	−0·412	6 47 47·1	+1·9	+ 1·0	−1·9	−1·0	47·1	6 44 53·1	− 2 54·0	
		„ 18	„	„	δ Ursæ Minoris	L	7	+0·354	6 13 47·1	+0·4	− 0·8	+1·4		48·1	6 10 14·3	− 3 33·8	− 1·4
					51 Cephei	U	7	−0·412	6 48 27·8	−0·5	+ 1·2	−1·4	−1·0	26·1	6 44 53·4	− 3 32·7	
		„ 19	„	„	δ Ursæ Minoris	L	8	+0·354	6 14 26·7	+0·4	− 0·6	+1·4		27·9	6 10 14·2	− 4 13·7	− 0·4
					51 Cephei	U	5	−0·412	6 49 8·9	−0·5	+ 1·0	−1·4	−1·0	7·0	6 44 53·6	− 4 13·4	
DEESA (E), AND KURRACHEE (W)	DEESA (Latitude 24° 16′)	1881 Jan. 5	I. P. W.	E	R. P. L. 37	U	5	−0·269	4 50 48·3	−0·5	+ 0·1	+1·6		49·5	4 50 9·4	− 0 40·1	− 7·9
					δ Ursæ Minoris	L	5	+0·354	6 10 59·1	+0·7	− 0·1	−1·6	+0·5	58·6	6 10 13·6	− 0 45·0	− 12·3
					51 Cephei	U	5	−0·412	6 45 29·7	−0·8	+ 0·2	+1·6	+0·7	31·4	6 44 53·8	− 0 35·6	
		„ 6	„	„	R. P. L. 37	U	2	−0·269	4 50 37·7	−0·5	+ 0·1	+1·6		38·9	4 50 9·3	− 0 29·6	− 13·6
					δ Ursæ Minoris	L	5	+0·354	6 10 52·3	+0·7	− 0·1	−1·6	+0·5	51·8	6 10 13·7	− 0 38·1	− 14·2
					51 Cephei	U	5	−0·412	6 45 21·4	−0·8	+ 0·1	+1·6	+0·7	23·0	6 44 55·8	− 0 27·2	
		„ 7	„	„	R. P. L. 37	U	8	−0·269	4 50 31·1	−0·5	+ 0·2	+1·4		32·2	4 50 9·2	− 0 23·0	− 10·4
					δ Ursæ Minoris	L	7	+0·354	6 10 43·7	+0·7	− 0·2	−1·4	+0·5	43·3	6 10 13·8	− 0 29·5	− 10·2
					51 Cephei	U	6	−0·412	6 45 16·0	−0·8	+ 0·2	+1·4	+0·7	17·5	6 44 55·8	− 0 21·7	
		„ 8	I. P. E.	„	δ Ursæ Minoris	L	5	+0·354	6 10 33·6	+0·2	+ 0·3	−1·3		32·8	6 10 13·8	− 0 19·0	− 5·7
					51 Cephei	U	6	−0·412	6 45 9·6	−0·2	− 0·5	+1·3	+0·2	10·4	6 44 55·8	− 0 14·6	
		„ 9	„	„	R. P. L. 37	U	5	−0·269	4 50 14·2	−0·2	− 0·3	+1·3		15·0	4 50 8·9	− 0 6·1	− 10·3
					δ Ursæ Minoris	L	4	+0·354	6 10 26·7	+0·2	+ 0·[illegible]	−1·3	+0·5	26·4	6 10 13·9	− 0 12·5	− 12·5
					51 Cephei	U	6	−0·412	6 44 57·3	−0·2	− 0·4	+1·3	+0·7	58·7	6 44 55·8	− 0 2·9	
		„ 10	„	„	R. P. L. 37	U	7	−0·269	4 50 5·9	−0·2	− 0·5	+1·3		6·5	4 50 8·8	+ 0 2·3	− 8·3
					δ Ursæ Minoris	L	5	+0·354	6 10 17·0	+0·2	+ 0·5	−1·3	+0·5	16·9	6 10 14·0	− 0 2·9	− 12·0
					51 Cephei	U	4	−0·412	6 44 48·5	−0·2	− 0·7	+1·3	+0·7	49·6	6 44 55·9	+ 0 6·3	
	KURRACHEE (Latitude 24° 51′)	1881 Jan. 5	I. P. W.	W	δ Ursæ Minoris	L	3	+0·356	6 6 76·7	−1·6	−47·9*	+1·3		28·6	6 10 13·6	+ 3 45·0	+177·9
					51 Cephei	U	3	−0·412	6 42 12·9	+1·9	+73·9	−1·3	+0·1	27·4	6 44 55·8	+ 1 28·4	+173·2
					R. P. L. 131	L	2	+0·349	6 49 79·6	−1·5	−46·9	−1·3		29·9	6 53 10·1	+ 3 40·2	
		„ 6	„	„	R. P. L. 37	U	3	−0·269	4 48 8·2	−0·3	+ 0·1	+1·3		9·3	4 50 9·3	+ 2 0·0	+145·2
					R. P. L. 131	L	3	+0·349	6 49 41·7	+0·3	− 0·1	−1·3	−0·2	40·4	6 53 10·1	+ 3 29·7	
		„ „	„	„	δ Ursæ Minoris	L	3	+0·356	6 6 41·2	+0·3	− 0·1	+1·3		42·7	6 10 13·7	+ 3 31·0	+146·9
					51 Cephei	U	2	−0·412	6 43 19·3	−0·4	+ 0·1	−1·3	−0·1	17·6	6 44 55·8	+ 1 38·2	

* The level corrections on January 5th at Kurrachee were abnormally high, owing to a mistake in observing the reflection of the wrong wire in the mercury trough.

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
DEESA (E), AND KURRACHEE (W)	KURRACHEE (Latitude 24° 51′)	1881 Jan. 7	*I. P. W.*	W	δ Ursæ Minoris	L	3	+0·356	6 6 43·4	+0·3	−0·4	+1·3		44·6	6 10 13·8	+ 3 29·2	+149·7
					51 Cephei	U	2	−0·412	6 43 22·7	−0·4	+0·6	−1·3	−0·1	21·5	6 44 55·8	+ 1 34·3	
		„ 8	*I. P. E.*	„	R. P. L. 37	U	3	−0·269	4 47 26·2	−0·3	−0·7	+1·3		26·5	4 50 9·0	+ 2 42·5	− 34·6
					R. P. L. 131	L	3	+0·349	6 50 49·4	+0·4	+0·7	−1·3	−0·2	49·0	6 53 10·1	+ 2 21·1	
		„ „	„	„	δ Ursæ Minoris	L	3	+0·356	6 7 48·6	+0·4	+0·7	+1·3		51·0	6 10 13·8	+ 2 22·8	− 36·1
					51 Cephei	U	2	−0·412	6 42 8·3	−0·5	−1·1	−1·3	−0·1	5·3	6 44 55·8	+ 2 50·5	
		„ 9	„	„	R. P. L. 37	U	2	−0·269	4 47 27·7	−0·3	−0·2	+1·3		28·5	4 50 8·9	+ 2 40·4	− 27·7
					R. P. L. 131	L	3	+0·349	6 50 47·8	+0·4	+0·1	−1·3	−0·2	46·8	6 53 10·1	+ 2 23·3	
		„ „	„	„	δ Ursæ Minoris	L	3	+0·356	6 7 48·0	+0·4	+0·1	+1·3		49·8	6 10 13·9	+ 2 24·1	− 28·0
					51 Cephei	U	3	−0·412	6 42 12·3	−0·5	−0·2	−1·3	−0·1	10·2	6 44 55·8	+ 2 45·6	
		„ 10	„	„	R. P. L. 37	U	3	−0·269	4 47 30·7	−0·3	−0·3	−1·3		28·8	4 50 8·8	+ 2 40·0	− 23·3
					R. P. L. 131	L	3	+0·349	6 50 45·3	+0·4	+0·3	−1·3	−0·2	44·5	6 53 10·1	+ 2 25·6	
		„ „	„	„	δ Ursæ Minoris	L	3	+0·356	6 7 46·9	+0·4	+0·3	+1·3		48·9	6 10 14·0	+ 2 25·1	− 21·0
					51 Cephei	U	3	−0·412	6 42 17·1	−0·5	−0·5	−1·3	−0·1	14·7	6 44 55·9	+ 2 41·2	
BOMBAY (E), AND KURRACHEE (W)	BOMBAY (Latitude 18° 54′)	1881 Jan. 17	*I. P. E.*	E	δ Ursæ Minoris	L	6	+0·366	6 12 5·6	+2·0	+0·5	−1·7		6·4	6 10 14·4	− 1 52·0	− 7·3
					51 Cephei	U	6	−0·433	6 46 43·3	−2·4	−0·9	+1·7	+0·5	42·2	6 44 56·0	− 1 46·2	
		„ 18	„	„	δ Ursæ Minoris	L	6	+0·366	6 11 42·7	+2·0	+0·2	−1·7		43·2	6 10 14·6	− 1 28·6	+ 2·1
					51 Cephei	U	5	−0·433	6 46 26·8	−2·4	−0·4	+1·7	+0·5	26·2	6 44 55·9	− 1 30·3	
		„ 19	„	„	δ Ursæ Minoris	L	7	+0·366	6 11 20·0	+2·0	−0·2	−1·7		20·1	6 10 14·7	− 1 5·4	+ 10·0
					51 Cephei	U	6	−0·433	6 46 9·1	−2·4	+0·3	+1·7	+0·5	9·2	6 44 55·8	− 1 13·4	
		„ 20	*I. P. W.*	„	δ Ursæ Minoris	L	6	+0·366	6 10 60·1	−0·8	−0·5	−1·7		57·1	6 10 14·9	− 0 42·2	+ 20·7
					51 Cephei	U	3	−0·433	6 45 50·3	+1·0	+0·9	+1·7	+0·5	54·4	6 44 55·7	− 0 58·7	
		„ 21	„	„	δ Ursæ Minoris	L	6	+0·366	6 10 40·1	−0·8	−0·5	−1·7		37·1	6 10 15·0	− 0 22·1	+ 22·0
					51 Cephei	U	6	−0·433	6 45 31·2	+1·0	+0·8	+1·7	+0·5	35·2	6 44 55·5	− 0 39·7	+ 20·8
					R. P. L. 131	L	4	+0·361	6 53 32·7	−0·8	−0·5	+1·7	+0·6	33·7	6 53 10·5	− 0·23·2	
		„ 23	„	„	δ Ursæ Minoris	L	5	+0·366	6 9 55·3	−0·8	+0·2	−1·7		53·0	6 10 15·4	+ 0 22·4	+ 37·1
					51 Cephei	U	5	−0·433	6 44 59·6	+1·0	−0·3	+1·7	+0·5	2·5	6 44 55·3	− 0 7·2	
		„ „	„	„	R. P. L. 131	L	4	+0·361	6 52 47·3	−0·8	+0·2	+1·7		48·4	6 53 10·6	+ 0 22·2	+ 36·3
					R. P. L. 49	U	7	−0·210	7 48 34·5	+0·5	−0·2	−1·7	+0·8	33·9	7 48 35·4	+ 0 1·5	

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
BOMBAY (E), AND KURRACHEE (W)	KURRACHEE (Latitude 24° 51′)	1881 Jan. 17	*I. P. E.*	W	δ Ursæ Minoris	L	3	+0·356	6 7 37·6	+0·3	0·0	+1·4		39·3	6 10 14·4	+ 2 35·1	− 1·4
					51 Cephei	U	3	−0·412	6 42 18·9	−0·4	−0·1	+1·4		19·8	6 44 56·0	+ 2 36·2	
		„ „	„	„	R. P. L. 131	L	2	+0·349	6 50 36·3	+0·3	0·0	+1·4		38·0	6 53 10·2	+ 2 32·2	− 4·6
					R. P. L. 49	U	2	−0·199	7 45 59·4	−0·2	0·0	+1·4		60·6	7 48 35·3	+ 2 34·7	
		„ 18	„	„	R. P. L. 128	L	3	+0·397	6 11 39·6	+0·3	−0·2	+1·4		41·1	6 14 18·5	+ 2 37·4	+ 7·5
					51 Cephei	U	3	−0·412	6 42 23·3	−0.4	+0·3	+1·4		24·6	6 44 55·9	+ 2 31·3	
		„ „	„	„	R. P. L. 131	L	1	+0·349	6 50 33·0	+0·3	−0·2	+1·4		34·5	6 53 10·3	+ 2 35·8	+ 6·4
					R. P. L. 49	U	3	−0·199	7 46 1·7	−0·2	+0·1	+1·4		3·0	7 48 35·3	+ 2 32·3	
		„ 19	„	„	δ Ursæ Minoris	L	3	+0·356	6 7 33·4	+0·3	−0·2	+1·4		34·9	6 10 14·7	+ 2 39·8	+13·3
					51 Cephei	U	3	−0·412	6 42 24·9	−0·4	+0·3	+1·4		26·2	6 44 55·8	+ 2 29·6	+11·4
					R. P. L. 131	L	3	+0·349	6 50 30·6	+0·3	−0·2	+1·4		32·1	6 53 10·4	+ 2 38·3	
		„ 20	*I. P. W.*	„	R. P. L. 128	L	3	+0·397	6 11 33·9	+1·0	−1·0	+1·4		35·3	6 14 18·8	+ 2 43·5	+22·5
					51 Cephei	U	3	−0·412	6 42 28·7	−1·1	+1·4	+1·4		30·4	6 44 55·7	+ 2 25·3	
		„ „	„	„	R. P. L. 131	L	3	+0·349	6 50 27·2	+0·9	−0·9	+1·4		28·6	6 53 10·4	+ 2 41·8	+22·1
					R. P. L. 49	U	3	−0·199	7 46 4·1	−0·5	+0·7	+1·4		5·7	7 48 35·4	+ 2 29·7	
		„ 21	„	„	δ Ursæ Minoris	L	1	+0·356	6 7 29·9	+0·9	0·0	+1·4		32·2	6 10 15·0	+ 2 42·8	+19·9
					51 Cephei	U	3	−0·412	6 42 27·7	−1·1	0·0	+1·4		28·0	6 44 55·5	+ 2 27·5	+16·7
					R. P. L. 128	L	3	+0·397	6 11 35·5	+1·0	0·0	+1·4		37·9	6 14 18·9	+ 2 41·0	
		„ „	„	„	R. P. L. 131	L	3	+0·349	6 50 28·2	+0·9	0·0	+1·4		30·5	6 53 10·5	+ 2 40·0	+16·2
					R. P. L. 49	U	3	−0·199	7 46 3·4	−0·5	0·0	+1·4		4·3	7 48 35·4	+ 2 31·1	
		„ 23	„	„	R. P. L. 128	L	3	+0·397	6 11 30·9	+1·0	−0·4	+1·3		32·8	6 14 19·2	+ 2 46·4	+31·0
					51 Cephei	U	3	−0·412	6 42 33·2	−1·1	+0·6	+1·3		34·0	6 44 55·3	+ 2 21·3	+29·9
					R. P. L. 131	L	2	+0·349	6 50 24·7	+0·9	−0·4	+1·3		26·5	6 53 10·6	+ 2 44·1	
JUBBULPORE (E), AND BOMBAY (W)	JUBBULPORE (Latitude 23° 10′)	1881 Feb. 6	*I P. E.*	E	R. P. L. 143	L	3	+0·233	8 28 51·3	− 0·9	−0·2	+1·4		51·6	8 27 0·8	− 1 50·8	+ 7·7
				„	R. P. L. 60	U	6	−0·211	8 52 30·6	+ 0·9	+0·3	−1·4	+0·3	30·7	8 50 36·5	− 1 54·2	+ 4·1
				W	R. P. L. 70	U	8	−0·205	*(9 22 1·9) 9 51 27·0	+ 0·9	+0·2	+1·4	+0·9	30·4	9 49 37·8	− 1 52·6	
		„ 7	„	E	R. P. L. 143	L	5	+0·233	8 28 84·0	−49·9	−0·3	+1·4		35·2	8 27 0·9	− 1 34·3	+ 7·0
				„	R. P. L. 60	U	4	−0·211	8 51 25·6	+49·0	+0·4	−1·4	+0·3	73·9	9 50 36·5	− 1 37·4	+ 1·4
				W	R. P. L. 70	U	7	−0·205	*(9 21 0·1) 9 50 22·5	+47·5	+0·4	+1·4	+0·9	72·7	9 49 37·8	− 1 34·9	

* The "Observed Time of Transit" in brackets is that by W Clock, and the corresponding time by E Clock, as deduced from clock comparisons, is given below it.

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
JUBBULPORE (E), AND BOMBAY (W)	JUBBULPORE (Latitude 23° 10′)	1881		E	R. P. L. 143	L	4	+0·233	8 28 17·8	− 0·9	−0·3	+1·4		18·0	8 27 0·9	− 1 17·1	+ 5·9
		Feb. 8	*I. P. E.*	„	R. P. L. 60	U	6	−0·211	8 51 55·9	+ 0·9	+0·5	−1·4	+0·3	56·2	8 50 36·5	− 1 19·7	+ 2·1
				W	R. P. L. 70	U	6	−0·205	*(9 21 32·1) 9 50 52·2	+ 0·9	+0·5	+1·4	+0·9	55·9	9 49 37·9	− 1 18·0	
				E	R. P. L. 143	L	4	+0·233	8 28 0·4	+ 0·3	−0·2	+1·3		1·8	8 27 1·0	− 1 0·8	+ 3·2
		„ 9	„	„	R. P. L. 60	U	6	−0·211	8 51 39·6	− 0·3	+0·4	−1·3	+0·3	38·7	8 50 36·5	− 1 2·2	+ 0·9
				W	R. P. L. 70	U	6	−0·205	*(9 21 19·1) 9 50 36·8	− 0·3	+0·4	+1·3	+0·9	39·1	9 49 37·9	− 1 1·2	
		„ 10†	...	...	......	...	...	...	...	...	...	...	...	...	...	...	...
		„ 13†	...	...	......	...	...	...	...	...	...	...	...	...	...	...	...
				E	R. P. L. 143	L	5	+0·233	8 26 37·8	+ 0·8	+0·2	+1·2		40·0	8 27 1·2	+ 0 21·2	−14·6
		„ 14	*I. P. W.*	„	R. P. L. 60	U	6	−0·211	8 50 10·6	− 0·8	−0·2	−1·2	+0·3	8·7	8 50 36·4	+ 0 27·7	−17·6
				W	R. P. L. 70	U	8	−0·205	*(9 20 3·5) 9 49 8·0	− 0·7	−0·2	+1·2	+0·9	9·2	9 49 38·1	+ 0 28·9	
	BOMBAY (Latitude 18° 54′)	1881			R. P. L. 143	L	3	+0·239	8 27 52·3	− 0·6	−0·3	+1·4		52·8	8 27 0·8	− 0 52·0	+24·6
		Feb. 6	*I. P. E.*	W	R. P. L. 70	U	3	+0·278	9 23 12·7	− 0·7	−0·3	−1·4	+0·5	10·8	9 22 17·1	− 0 53·7	+19·1
					R. P. L. 150	L	3	−0·213	9 50 37·8	+ 0·5	+0·4	+1·4	+0·8	40·9	9 49 37·8	− 1 3·1	
		„ 7	„	„	R. P. L. 143	L	5	+0·239	8 27 34·5	− 0·6	−0·1	+1·4		35·2	8 27 0·9	− 0 34·3	+40·5
					R. P. L. 60	U	4	−0·220	8 51 27·0	+ 0·6	+0·2	+1·4	+0·2	29·4	8 50 36·5	− 0 52·9	
		„ „	„	„	R. P. L. 70	U	3	−0·213	9 50 27·2	+ 0·5	+0·2	+1·4		29·3	9 49 37·8	− 0 51·5	+36·0
					R. P. L. 150	L	3	+0·278	10 22 52·9	− 0·7	−0·2	−1·4	+0·3	50·9	10 22 17·1	− 0 33·8	
		„ 8	„	„	R. P. L. 143	L	3	+0·239	8 27 18·8	− 0·6	−0·2	+1·4		19·4	8 27 0·9	− 0 18·5	+46·4
					R. P. L. 60	U	5	−0·220	8 51 13·7	+ 0·6	+0·4	+1·4	+0·2	16·3	8 50 36·5	− 0 39·8	
		„ „	„	„	R. P. L. 70	U	3	−0·213	9 50 13·5	+ 0·5	+0·3	+1·4		15·7	9 49 37·9	− 0 37·8	+42·2
					R. P. L. 150	L	3	+0·278	10 22 36·2	− 0·7	−0·3	−1·4	+0·3	34·1	10 22 17·0	− 0 17·1	
		„ 9	„	„	R. P. L. 143	L	3	+0·239	8 27 1·5	− 0·6	−0·2	+1·4		2·1	8 27 1·0	− 0 1·1	+54·9
					R. P. L. 60	U	4	−0·220	8 51 0·3	+ 0·6	+0·3	+1·4	+0·2	2·8	8 50 36·5	− 0 26·3	
		„ „	„	„	R. P. L. 70	U	3	−0·213	9 49 59·8	+ 0·5	+0·3	+1·4		62·0	9 49 37·9	− 0 24·1	+45·6
					R. P. L. 150	L	3	+0·278	10 22 20·6	− 0·7	−0·2	−1·4	+0·3	18·6	10 22 16·9	− 0 1·7	
		„ 10	*I. P. W.*	„	R. P. L. 143	L	2	+0·239	8 26 36·2	+ 2·0	+0·3	+1·4		39·9	8 27 1·0	+ 0 21·1	+88·2
					R. P. L. 60	U	4	−0·220	8 50 56·8	− 2·0	−0·5	+1·4	+0·2	55·9	8 50 36·5	− 0 19·4	
		„ „	„	„	R. P. L. 70	U	4	−0·213	9 49 55·3	− 1·9	−0·5	+1·4		54·3	9 49 38·0	− 0 16·3	+78·0
					R. P. L. 150	L	4	+0·278	10 21 53·1	+ 2·4	+0·4	−1·4	+0·3	54·8	10 22 16·8	+ 0 22·0	

* The "Observed Time of Transit" in brackets is that by W Clock, and the corresponding time by E Clock, as deduced from clock comparisons, is given below it.

† For the deduction of deviation correction on 10th and 13th February, see *TABLE XXIV.*

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
		1881							h m s	s	s	s	s	s	h m s	m s	d
JUBBULPORE (E), AND BOMBAY (W)	BOMBAY (Latitude 18° 54′)	Feb. 13	I. P. W.	W	R. P. L. 143	L	3	+0·239	8 25 51·6	+2·0	−0·3	+1·4		54·7	8 27 1·2	+ 1 6·5	+94·1
					R. P. L. 60	U	4	−0·220	8 50 13·1	−2·0	+0·4	+1·4	+0·2	13·1	8 50 36·4	+ 0 23·3	
		" "	"	"	R. P. L. 70	U	4	−0·213	9 49 12·4	−1·9	+0·4	+1·4		12·3	9 49 38·1	+ 0 25·8	+87·2
					R. P. L. 150	L	4	+0·278	10 21 7·0	+2·4	−0·3	−1·4	+0·3	8·0	10 22 16·6	+ 1 8·6	
		" 14	"	"	R. P. L. 60	U	3	−0·220	8 49 58·1	−2·0	+0·3	+1·4		57·8	8 50 36·4	+ 0 38·6	+92·4
					R. P. L. 150	L	2	+0·278	10 20 50·3	+2·4	−0·3	−1·4	+0·9	51·9	10 22 16·5	+ 1 24·6	
		1881															
JUBBULPORE (E), AND BOLARUM (W)	JUBBULPORE (Latitude 23° 10′)	Feb. 23	I.P.W.	E	R. P. L. 70	U	5	−0·205	9 46 32·2	−0·2	−0·2	+1·2		33·0	9 49 38·2	+ 3 5·2	−38·4
					R. P. L. 150	L	4	+0·271	10 19 29·7	+0·2	+0·2	−1·1	+0·4	29·4	10 22 16·3	+ 2 46·9	
		" "	"	W	R. P. L. 158	L	4	+0·363	*(11 20 26·4) 11 24 47·3	+0·3	+0·3	−1·1		46·8	11 27 30·0	+ 2 43·2	−42·6
				E	R. P. L. 89	U	4	−0·306	11 55 52·4	−0·2	−0·3	+1·1	+0·3	53·3	11 59 5·0	+ 3 11·7	
		" 24	"	E	R. P. L. 70	U	5	−0·205	9 46 22·5	−0·2	−0·4	+1·1		23·0	9 49 38·1	+ 3 15·1	− 1·3
					R. P. L. 150	L	6	+0·271	10 19 2·0	+0·2	+0·3	−1·1	+0·4	1·8	10 22 16·3	+ 3 14·5	
		" "	"	W	R. P. L. 158	L	5	+0·363	11 19 46·7	+0·3	+0·5	−1·1		46·4	11 27 29·9	+ 7 43·5	− 6·4
					R. P. L. 89	U	4	−0·306	11 51 18·7	−0·2	−0·6	−1·1	+0·6	17·4	11 59 5·2	+ 7 47·8	
		" 25	"	E	R. P. L. 70	U	6	−0·205	9 46 3·7	−0·2	+0·4	+1·1		5·0	9 49 38·1	+ 3 33·1	− 3·4
					R. P. L. 150	L	5	+0·271	10 18 45·6	+0·2	−0·3	−1·1	+0·4	44·8	10 22 16·3	+ 3 31·5	
		" "	"	W	R. P. L. 158	L	3	+0·363	11 19 20·4	+0·3	−0·4	−1·1		19·2	11 27 29·9	+ 8 10·7	− 7·6
					R. P. L. 89	U	4	−0·306	11 50 49·7	−0·2	+0·5	−1·1	+0·6	49·5	11 59 5·3	+ 8 15·8	
		" 28	I.P.E.	E	R. P. L. 70	U	5	−0·205	9 45 11·4	−1·0	−0·5	+1·0		10·9	9 49 38·0	+ 4 27·1	−11·8
					R. P. L. 150	L	5	+0·271	10 17 53·9	+1·2	+0·4	−1·0	+0·4	54·9	10 22 16·4	+ 4 21·5	
		" "	"	W	R. P. L. 158	L	4	+0·363	11 18 1·5	+1·7	+0·6	−1·0		2·8	11 27 29·6	+ 9 26·8	−16·3
					R. P. L. 89	U	4	−0·306	11 49 30·4	−1·5	−0·6	−1·0	+0·6	27·9	11 59 5·6	+ 9 37·7	
		Mar. 2	"	E	R. P. L. 70	U	5	−0·205	9 44 33·9	−1·0	−0·4	+1·0		33·5	9 49 37·9	+ 5 4·4	−19·3
					R. P. L. 150	L	5	+0·271	10 17 20·2	+1·2	+0·4	−1·0	+0·4	21·2	10 22 16·4	+ 4 55·2	
		" "	"	W	R. P. L. 158	L	3	+0·363	11 17 10·5	+1·7	+0·5	−1·0		11·7	11 27 29·5	+10 17·8	−22·4
					R. P. L. 89	U	4	−0·306	11 48 35·6	−1·5	−0·6	−1·0	+0·6	33·1	11 59 5·9	+10 32·8	
		" 3	"	E	ι Argûs	U	14	+0·0430	9 8 39·93	−0·19	−0·01	+0·85		40·58	9 13 57·34	+5 16·76	−11·2
					θ Ursæ Majoris	U	9	−0·0178	9 19 39·19	−0·16	−0·08	+0·85	+0·14	39·94	9 24 57·38	+5 17·44	

* The "Observed Time of Transit" in brackets is that by W Clock, and the corresponding time by E Clock, as deduced from clock comparisons, is given below it.

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
JUBBULPORE (E), and BOLARUM (W)	Bolarum (Latitude 17° 30')	1881 Feb. 23	*I. P. W.*	W	R. P. L. 70	U	4	−0·216	9 47 50·4	+0·2	+0·2	+1·3		52·1	9 49 38·2	+ 1 46·1	−57·1
					R. P. L. 150	L	3	+0·280	10 20 56·9	−0·2	−0·1	+1·3	+0·6	58·5	10 22 16·3	+ 1 17·8	
		„ „	„	„	R. P. L. 158	L	3	+0·374	11 26 15·7	−0·3	−0·2	−1·3		13·9	11 27 30·0	+ 1 16·1	−55·5
					R. P. L. 89	U	3	−0·320	11 57 8·1	+0·2	+0·2	+1·3	+0·6	10·4	11 59 5·0	+ 1 54·6	
		„ 24	„	„	R. P. L. 70	U	4	−0·216	9 47 23·3	+0·2	+0·3	+1·3		25·1	9 49 38·1	+ 2 13·0	−57·9
					R. P. L. 150	L	3	+0·280	10 20 30·5	−0·2	−0·2	+1·3	+0·6	32·0	10 22 16·3	+ 1 44·3	
		„ „	„	„	R. P. L. 158	L	3	+0·374	11 25 50·8	−0·3	−0·3	−1·3		48·9	11 27 29·9	+ 1 41·0	−59·9
					R. P. L. 89	U	3	−0·320	11 56 40·1	+0·2	+0·4	+1·3	+0·6	42·6	11 59 5·2	+ 2 22·6	
		„ 25	„	„	R. P. L. 70	U	3	−0·216	9 47 8·8	+0·2	+0·4	+1·4		10·8	9 49 38·1	+ 2 27·3	+ 0·4
					R. P. L. 150	L	3	+0·280	10 19 47·2	−0·2	−0·2	+1·4	+0·6	48·8	10 22 16·3	+ 2 27·5	
		„ „	„	„	R. P. L. 158	L	3	+0·374	11 25 2·8	−0·3	−0·4	−1·4		0·7	11 27 29·9	+ 2 29·2	− 1·9
					R. P. L. 89	U	3	−0·320	11 56 32·1	+0·2	+0·5	+1·4	+0·6	34·8	11 59 5·3	+ 2 30·5	
		„ 28	*I. P. E.*	„	R. P. L. 70	U	4	−0·216	9 45 47·6	−1·7	−0·3	+1·4		47·0	9 49 38·0	+ 3 51·0	−16·7
					R. P. L. 150	L	3	+0·280	10 18 29·5	+2·0	+0·2	+1·4	+0·6	33·7	10 22 16·4	+ 3 42·7	
		„ „	„	„	R. P. L. 158	L	3	+0·374	11 23 46·0	+2·7	+0·3	−1·4		47·6	11 27 29·6	+ 3 42·0	−20·0
					R. P. L. 89	U	3	−0·320	11 55 10·5	−2·4	−0·4	+1·4	+0·6	9·7	11 59 5·6	+ 3 55·9	
		Mar. 2	„	„	R. P. L. 70	U	3	−0·216	9 44 53·5	−1·7	−0·1	+1·4		53·1	9 49 37·9	+ 4 44·8	−17·9
					R. P. L. 150	L	3	+0·280	10 17 36·4	+2·0	+0·1	+1·4	+0·6	40·5	10 22 16·4	+ 4 35·9	
		„ „	„	„	R. P. L. 158	L	2	+0·374	11 22 52·7	+2·7	+0·1	−1·4		54·1	11 27 29·5	+ 4 35·4	−19·0
					R. P. L. 89	U	3	−0·320	11 54 20·6	−2·4	−0·1	−1·4	+0·6	17·3	11 59 5·9	+ 4 48·6	
		„ 3	„	„	R. P. L. 70	U	3	−0·216	9 44 26·3	−1·7	+0·1	+1·4		26·1	9 49 37·8	+ 5 11·7	−19·8
					R. P. L. 150	L	3	+0·280	10 17 10·5	+2·0	0·0	+1·4	+0·6	14·5	10 22 16·4	+ 5 1·9	
		„ „	„	„	R. P. L. 158	L	3	+0·374	11 22 26·1	+2·7	−0·1	−1·4		27·3	11 27 29·4	+ 5 2·1	−21·0
					R. P. L. 89	U	3	−0·320	11 53 49·6	−2·4	+0·1	+1·4	+0·6	49·3	11 59 6·0	+ 5 16·7	
JUBBULPORE (E), and AGRA (W)	Jubbulpore (Latitude 23° 10')	1881 Mar. 11	*I. P. E.*	E	R. P. L. 150	L	3	+0·272	10 21 46·0	+0·5	−0·1	+1·5		47·9	10 22 16·9	+ 0 29·0	− 2·6
					R. P. L. 89	U	3	−0·306	11 58 34·4	−0·6	+0·2	+1·5	+0·6	36·1	11 59 6·6	+ 0 30·5	
		„ „	„	„	R. P. L. 98	U	5	−0·190	12 47 48·6	−0·3	+0·1	+1·5		49·9	12 48 19·9	+ 0 30·0	+ 1·5
					R. P. L. 99	U	5	−0·190	12 47 56·4	−0·3	+0·1	+1·5		57·7	12 48 27·1	+ 0 29·4	+ 2·8
					R. P. L. 12	L	4	+0·279	12 51 59·8	+0·5	−0·1	+1·5		61·7	12 52 32·4	+ 0 30·7	

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
JUBBULPORE (E), AND AGRA (W)	JUBBULPORE (Latitude 23° 10′)	1881 Mar. 12	I. P. E.	E	R. P. L. 150	L	3	+0·272	10 21 37·1	+0·5	0·0	+1·5		39·1	10 22 17·0	+ 0 37·9	− 1·4
					R. P. L. 89	U	3	−0·306	11 58 26·5	−0·6	0·0	+1·5	+0·6	28·0	11 59 6·7	+ 0 38·7	
		" "	"	"	R. P. L. 98	U	3	−0·190	12 47 40·9	−0·3	0·0	+1·5		42·1	12 48 19·9	+ 0 37·8	+ 4·5
					R. P. L. 99	U	3	−0·190	12 47 48·2	−0·3	0·0	+1·5		49·4	12 48 27·2	+ 0 37·8	+ 4·5
					R. P. L. 12	L	4	+0·279	12 51 50·5	+0·5	0·0	+1·5		52·5	12 52 32·4	+ 0 39·9	
		" 13	"	"	R. P. L. 150	L	3	+0·272	10 21 26·1	+0·5	+0·1	+1·5		28·2	10 22 17·1	+ 0 48·9	+ 2·4
					R. P. L. 89	U	3	−0·306	11 58 17·8	−0·6	−0·1	+1·5	+0·6	19·2	11 59 6·7	+ 0 47·5	
		" "	"	"	R. P. L. 98	U	3	−0·190	12 47 31·4	−0·3	−0·1	+1·5		32·5	12 48 20·0	+ 0 47·5	+ 4·9
					R. P. L. 99	U	3	−0·190	12 47 38·9	−0·3	−0·1	+1·5		40·0	12 48 27·3	+ 0 47·3	+ 5·3
					R. P. L. 12	L	3	+0·279	12 51 40·4	+0·5	+0·1	+1·5		42·5	12 52 32·3	+ 0 49·8	
		" 15	I. P. W.	"	R. P. L. 89	U	3	−0·306	11 58 2·7	0·0	+0·2	+1·5		4·4	11 59 6·7	+ 1 2·3	+11·6
					R. P. L. 98	U	3	−0·190	12 47 15·1	0·0	+0·2	+1·5	+0·3	17·1	12 48 20·1	+ 1 3·0	+13·0
					R. P. L. 99	U	3	−0·190	12 47 23·4	0·0	+0·2	+1·5	+0·3	25·4	12 48 27·4	+ 1 2·0	+15·1
					R. P. L. 12	L	4	+0·279	12 51 21·4	0·0	−0·1	+1·5	+0·3	23·1	12 52 32·2	+ 1 9·1	
		" 17	"	"	R. P. L. 89	U	3	−0·306	11 57 46·5	0·0	+0·3	+1·5		48·3	11 59 6·8	+ 1 18·5	+17·6
					R. P. L. 98	U	2	−0·190	12 46 59·3	0·0	+0·2	+1·5	+0·3	61·3	12 48 20·2	+ 1 18·9	+21·1
					R. P. L. 99	U	2	−0·190	12 47 6·7	0·0	+0·2	+1·5	+0·3	8·7	12 48 27·5	+ 1 18·8	+21·3
					R. P. L. 12	L	4	+0·279	12 51 1·6	0·0	−0·2	+1·5	+0·3	3·2	12 52 32·0	+ 1 28·8	
		" 20	"	"	R. P. L. 150	L	3	+0·272	10 20 25·7	0·0	+0·3	+1·6		27·6	10 22 17·8	+ 1 50·2	+11·8
					R. P. L. 89	U	3	−0·306	11 57 21·7	0·0	−0·5	+1·6	+0·6	23·4	11 59 6·8	+ 1 43·4	
		" "	"	"	R. P. L. 98	U	3	−0·190	12 46 34·9	0·0	−0·3	+1·6		36·2	12 48 20·4	+ 1 44·2	+14·3
					R. P. L. 99	U	4	−0·190	12 46 42·6	0·0	−0·3	+1·6		43·9	12 48 27·7	+ 1 43·8	+15·1
					R. P. L. 12	L	4	+0·279	12 50 39·0	0·0	+0·3	+1·6		40·9	12 52 31·8	+ 1 50·9	
		" 21	"	"	R. P. L. 89	U	3	−0·306	11 57 13·9	0·0	−0·6	+1·5		14·8	11 59 6·8	+ 1 52·0	+11·3
					R. P. L. 98	U	3	−0·190	12 46 27·2	0·0	−0·4	+1·5	+0·3	28·6	12 48 20·5	+ 1 51·9	+14·3
					R. P. L. 99	U	3	−0·190	12 46 35·1	0·0	−0·4	+1·5	+0·3	36·5	12 48 27·7	+ 1 51·2	+15·8
					R. P. L. 12	L	4	+0·279	12 50 30·9	0·0	+0·4	+1·5	+0·3	33·1	12 52 31·7	+ 1 58·6	
	AGRA (Latitude 27° 10′)	1881 Mar. 11	I. P. E.	W	R. P. L. 89	U	3	−0·294	11 57 24·6	−0·5	0·0	+1·8		25·9	11 59 6·6	+ 1 40·7	+63·1
					R. P. L. 98	U	4	−0·182	12 46 34·1	−0·3	0·0	−1·8	+0·1	32·1	12 48 19·9	+ 1 47·8	+63·0
					R. P. L. 99	U	4	−0·182	12 46 41·9	−0·3	0·0	−1·8	+0·1	39·9	12 48 27·1	+ 1 47·2	+64·3
					R. P. L. 12	L	3	+0·272	12 50 17·3	+0·4	0·0	−1·8	+0·1	16·0	12 52 32·4	+ 2 16·4	

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
JUBBULPORE (E), and AGRA (W)	Agra (Latitude 27° 10′)	1881			R. P. L. 89	U	5	−0·294	11 57 2·2	−0·5	−0·2	+1·8		3·3	11 59 6·7	+ 2 3·4	− 2·7
		Mar. 12	*I. P. E.*	W	R. P. L. 98	U	5	−0·182	12 46 15·2	−0·3	−0·1	+1·8	+0·1	16·7	12 48 19·9	+ 2 3·2	− 2·9
					R. P. L. 99	U	5	−0·182	12 46 22·7	−0·3	−0·1	+1·8	+0·1	24·2	12 48 27·2	+ 2 3·0	− 2·4
					R. P. L. 12	L	4	+0·272	12 50 28·1	+0·4	+0·1	+1·8	+0·1	30·5	12 52 32·4	+ 2 1·9	
		" 13	"	"	R. P. L. 150	L	7	+0·265	10 20 6·1	+0·4	+0·3	+1·8		8·6	10 22 17·1	+ 2 8·5	+11·3
					R. P. L. 89	U	5	−0·294	11 57 3·4	−0·5	−0·4	+1·8	+0·2	4·5	11 59 6·7	+ 2 2·2	
					R. P. L. 98	U	5	−0·182	12 46 14·6	−0·3	−0·3	+1·8		15·8	12 48 20·0	+ 2 4·2	+ 9·9
		" "	"	"	R. P. L. 99	U	5	−0·182	12 46 22·2	−0·3	−0·3	+1·8		23·4	12 48 27·3	+ 2 3·9	+10·6
					R. P. L. 12	L	4	+0·272	12 50 21·1	+0·4	+0·3	+1·8		23·6	12 52 32·3	+ 2 8·7	
		" 15	*I. P. W.*	"	R. P. L. 150	L	5	+0·265	10 19 58·2	+0·4	0·0	+1·8		60·4	10 22 17·3	+ 2 16·9	+15·6
					R. P. L. 89	U	3	−0·294	11 56 57·0	−0·5	0·0	+1·8	+0·2	58·5	11 59 6·7	+ 2 8·2	
					R. P. L. 98	U	4	−0·182	12 46 7·0	−0·3	0·0	+1·8		8·5	12 48 20·1	+ 2 11·6	+15·4
		" "	"	"	R. P. L. 99	U	4	−0·182	12 46 15·1	−0·3	0·0	+1·8		16·6	12 48 27·4	+ 2 10·8	+17·2
					R. P. L. 12	L	5	+0·272	12 50 11·4	+0·4	0·0	+1·8		13·6	12 52 32·2	+ 2 18·6	
		" 17	"	"	R. P. L. 150	L	5	+0·265	10 19 42·3	+0·4	0·0	+1·4		44·1	10 22 17·5	+ 2 33·4	+47·8
					R. P. L. 89	U	4	−0·294	11 56 58·9	−0·5	+0·1	+1·4	+0·2	60·1	11 59 6·8	+ 2 6·7	
					R. P. L. 98	U	4	−0·182	12 46 6·2	−0·3	0·0	+1·4		7·3	12 48 20·2	+ 2 12·9	+48·0
		" "	"	"	R. P. L. 99	U	4	−0·182	12 46 13·7	−0·3	0·0	+1·4		14·8	12 48 27·5	+ 2 12·7	+48·5
					R. P. L. 12	L	4	+0·272	12 49 55·5	+0·4	0·0	+1·4		57·3	12 52 32·0	+ 2 34·7	
					R. P. L. 72	U	5	−0·212	10 9 56·2	−0·4	−0·1	+1·4		57·1	10 12 26·0	+ 2 28·9	+ 1·9
		" 20	"	"	R. P. L. 150	L	6	+0·265	10 19 46·1	+0·4	+0·1	+1·4		48·0	10 22 17·8	+ 2 29·8	+ 3·2
					R. P. L. 89	U	5	−0·294	11 56 37·9	−0·5	−0·2	+1·4	+0·2	38·8	11 59 6·8	+ 2 28·0	
					R. P. L. 98	U	4	−0·182	12 45 50·7	−0·3	−0·1	+1·4		51·7	12 48 20·4	+ 2 28·7	+ 3·7
		" "	"	"	R. P. L. 99	U	4	−0·182	12 45 58·5	−0·3	−0·1	+1·4		59·5	12 48 27·7	+ 2 28·2	+ 4·8
					R. P. L. 12	L	4	+0·272	12 49 59·5	+0·4	+0·1	+1·4		1·4	12 52 31·8	+ 2 30·4	
					R. P. L. 72	U	5	−0·212	10 9 53·6	−0·4	−0·2	+1·4		54·4	10 12 25·9	+ 2 31·5	− 0·6
		" 21	"	"	R. P. L. 150	L	4	+0·265	10 19 44·7	+0·4	+0·2	+1·4		46·7	10 22 17·9	+ 2 31·2	+ 1·3
					R. P. L. 89	U	6	−0·294	11 56 35·5	−0·5	−0·3	+1·4	+0·2	36·3	11 59 6·8	+ 2 30·5	
					R. P. L. 98	U	5	−0·182	12 45 48·0	−0·3	−0·2	+1·4		48·9	12 48 20·5	+ 2 31·6	+ 2·4
		" "	"	"	R. P. L. 99	U	5	−0·182	12 45 56·1	−0·3	−0·2	+1·4		57·0	12 48 27·7	+ 2 30·7	+ 4·4
					R. P. L. 12	L	5	+0·272	12 49 57·0	+0·4	+0·2	+1·4		59·0	12 52 31·7	+ 2 32·7	

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
JUBBULPORE (E), AND DEESA (W)	JUBBULPORE (Latitude 23° 10')	1881 Mar. 28	I. P. W.	E	R. P. L. 158	L	3	+0·362	11 24 44·6	−0·4	−0·3	+1·5		45·4	11 27 30·3	+ 2 44·9	−11·7
					R. P. L. 89	U	4	−0·306	11 56 14·5	+0·3	+0·4	−1·5	+0·2	13·9	11 59 6·6	+ 2 52·7	
		" "	"	W	R. P. L. 98	U	3	−0·190	12 17 52·0	+0·2	+0·2	+1·5		53·9	12 48 20·6	+30 26·7	−10·7
					R. P. L. 99	U	3	−0·190	12 17 59·6	+0·2	+0·2	+1·5		1·5	12 48 27·9	+30 26·4	−10·2
					R. P. L. 12	L	4	+0·279	12 22 9·3	−0·3	−0·2	+1·5		10·3	12 52 31·8	+30 21·5	
					Polaris	L	2	+0·905	12 44 11·7	−0·9	−0·8	+1·5	+0·2	11·7	13 14 27·1	+30 15·4	
		" 29	"	E	R. P. L. 158	L	3	+0·362	11 24 39·0	−0·4	−0·3	+1·5		39·8	11 27 30·4	+ 2 50·6	−16·0
					R. P. L. 89	U	4	−0·306	11 56 5·8	+0·3	+0·4	−1·5	+0·2	5·2	11 59 6·5	+ 3 1·3	
		" "	"	W	R. P. L. 98	U	3	−0·190	12 17 38·9	+0·2	+0·3	+1·5		40·9	12 48 20·6	+30 39·7	−14·3
					R. P. L. 99	U	3	−0·190	12 17 45·7	+0·2	+0·3	+1·5		47·7	12 48 27·9	+30 40·2	−15·0
					R. P. L. 12	L	3	+0·279	12 21 58·5	−0·3	−0·3	+1·5		59·4	12 52 31·8	+30 32·4	
					Polaris	L	1	+0·905	12 44 4·7	−0·9	−1·0	−1·5	+0·2	1·5	13 14 27·0	+30 25·5	
		" 30	"	E	R. P. L. 158	L	3	+0·362	11 24 33·4	−0·4	−0·3	+1·5		34·2	11 27 30·6	+ 2 56·4	−19·8
					R. P. L. 89	U	4	−0·306	11 55 57·5	+0·3	+0·3	−1·5	+0·2	56·8	11 59 6·4	+ 3 9·6	
		" "	"	W	R. P. L. 98	U	3	−0·190	12 17 26·0	+0·2	+0·2	+1·5		27·9	12 48 20·6	+30 52·7	−19·0
					R. P. L. 99	U	3	−0·190	12 17 33·6	+0·2	+0·2	+1·5		35·5	12 48 27·9	+30 52·4	−18·6
					R. P. L. 12	L	3	+0·279	12 21 47·2	−0·3	−0·2	+1·5		48·2	12 52 31·8	+30 43·6	
					Polaris	L	1	+0·905	12 43 57·5	−0·9	−0·8	−1·5	+0·2	54·5	13 14 26·9	+30 32·4	
		" 31	I. P. E.	E	R. P. L. 158	L	4	+0·362	11 24 24·8	+3·3	+0·3	+1·4		29·8	11 27 30·7	+ 3 0·9	−27·2
					P. P. L. 89	U	4	−0·306	11 55 51·6	−2·9	−0·3	−1·4	+0·2	47·2	11 59 6·3	+ 3 19·1	
		" "	"	W	R. P. L. 98	U	3	−0·190	12 17 17·1	−1·8	−0·2	+1·4		16·5	12 48 20·6	+31 4·1	−18·3
					R. P. L. 99	U	3	−0·190	12 17 23·9	−1·8	−0·2	+1·4		23·3	12 48 27·9	+31 4·6	−19·1
					R. P. L. 12	L	3	+0·279	12 21 32·1	+2·5	+0·2	+1·4		36·2	12 52 31·8	+30 55·6	
					Polaris	L	1	+0·905	12 43 35·2	+8·3	+0·8	−1·4	+0·2	43·1	13 14 26·9	+30 43·8	
		Apr. 1	"	E	R. P. L. 158	L	3	+0·362	11 24 17·4	+3·3	+0·9	+1·4		23·0	11 27 30·9	+ 3 7·9	−27·2
					R. P. L. 89	U	4	−0·306	11 55 45·3	−2·9	−1·0	−1·4	+0·2	40·2	11 59 6·3	+ 3 26·1	
		" "	"	W	R. P. L. 98	U	3	−0·190	12 17 5·8	−1·8	−0·7	+1·4		4·7	12 48 20·6	+31 15·9	−22·5
					R. P. L. 99	U	3	−0·190	12 17 13·3	−1·8	−0·7	+1·4		12·2	12 48 27·9	+31 15·7	−22·2
					R. P. L. 12	L	3	+0·279	12 21 22·5	+2·5	+0·6	+1·4		27·0	12 52 31·9	+31 4·9	
					Polaris	L	1	+0·905	12 43 25·0	+8·3	+2·4	−1·4	+0·2	34·5	13 14 26·9	+30 52·4	
		" 3	"	E	R. P. L. 158	L	3	+0·362	11 24 3·5	+3·3	+0·6	+1·4		8·8	11 27 31·2	+ 3 22·4	−28·9
					R. P. L. 89	U	3	−0·306	11 55 29·2	−2·9	−0·7	−1·4	+0·2	24·4	11 59 6·1	+ 3 41·7	

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for: Collimation	Level	Pen Equation Q	Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
JUBBULPORE (E), AND DEESA (W)	JUBBULPORE (Latitude 23° 10′)	1881 Apr. 8	*I. P. E.*	W	R. P. L. 98	U	3	−0·190	12 17 42·7	−1·8	−0·5	+1·4		41·8	12 48 20·6	+30 38·8	−27·2
					R. P. L. 99	U	3	−0·190	12 17 50·3	−1·8	−0·5	+1·4		49·4	12 48 27·9	+30 38·5	−26·8
					R. P. L. 12	L	3	+0·279	12 22 1·7	+2·5	+0·4	+1·4		6·0	12 52 31·9	+30 25·9	
					Polaris	L	1	+0·905	12 44 9·0	+8·3	+1·6	−1·4	+0·2	17·7	13 14 27·1	+30 9·4	
	DEESA (Latitude 24° 16′)	1881 Mar. 28	*I. P. W.*	E	R. P. L. 158	L	5	+0·360	11 55 41·9	+1·5	+0·4	+1·5		45·3	11 27 30·3	−28 15·0	+ 0·8
					R. P. L. 89	U	5	−0·303	12 27 25·3	−1·4	−0·5	−1·5	+0·2	22·1	11 59 6·6	−28 15·5	
		" "	"	W	R. P. L. 98	U	3	−0·188	12 49 1·0	−0·9	−0·3	+1·5		1·3	12 48 20·6	− 0 40·7	+ 9·0
					R. P. L. 99	U	3	−0·188	12 49 8·1	−0·9	−0·3	+1·5		8·4	12 48 27·9	− 0 40·5	+ 8·6
					R. P. L. 12	L	4	+0·277	12 53 5·3	+1·2	+0·3	+1·5		8·3	12 52 31·8	− 0 36·5	
		" 29	"	E	R. P. L. 158	L	4	+0·360	11 55 38·6	+1·5	+0·2	+1·5		41·8	11 27 30·4	−28 11·4	−10·3
					R. P. L. 89	U	5	−0·303	12 27 14·0	−1·4	−0·2	−1·5	+0·2	11·1	11 59 6·5	−28 4·6	
		" "	"	W	R. P. L. 98	U	4	−0·188	12 48 45·2	−0·9	−0·2	+1·5		45·6	12 48 20·6	− 0 25·0	− 8·2
					R. P. L. 99	U	4	−0·188	12 48 52·8	−0·9	−0·2	+1·5		53·2	12 48 27·9	− 0 25·3	− 7·5
					R. P. L. 12	L	4	+0·277	12 52 57·7	+1·2	+0·2	+1·5		60·6	12 52 31·8	− 0 28·8	
		" 30	"	E	R. P. L. 158	L	5	+0·360	11 55 33·1	+1·5	+0·6	+1·5		36·7	11 27 30·6	−28 6·1	−16·1
					R. P. L. 89	U	4	−0·303	12 27 5·2	−1·4	−0·7	−1·5	+0·2	1·8	11 59 6·4	−27 55·4	
		" "	"	W	R. P. L. 98	U	4	−0·188	12 48 32·2	−0·9	−0·5	+1·5		32·3	12 48 20·6	− 0 11·7	−13·3
					R. P. L. 99	U	4	−0·188	12 48 39·4	−0·9	−0·5	+1·5		39·5	12 48 27·9	− 0 11·6	−13·5
					R. P. L. 12	L	4	+0·277	12 52 46·6	+1·2	+0·4	+1·5		49·7	12 52 31·8	− 0 17·9	
		" 31	*I. P. E.*	W	R. P. L. 98	U	4	−0·188	12 48 19·3	−0·1	−0·1	+1·5		20·6	12 48 20·6	0 0·0	−12·3
					R. P. L. 99	U	4	−0·188	12 48 27·2	−0·1	−0·1	+1·5		28·5	12 48 27·9	− 0 0·6	−11·0
					R. P. L. 12	L	4	+0·277	12 52 35·7	+0·2	+0·1	+1·5		37·5	12 52 31·8	− 0 5·7	
		Apr. 1	"	E	R. P. L. 158	L	4	+0·360	11 55 21·6	+0·2	+0·2	+1·5		23·5	11 27 30·9	−27 52·6	−18·1
					R. P. L. 89	U	4	−0·303	12 26 48·6	−0·2	−0·2	−1·5	+0·2	46·9	11 59 6·3	−27 40·6	
		" "	"	W	R. P. L. 98	U	4	−0·188	12 48 8·5	−0·1	−0·1	+1·5		9·8	12 48 20·6	+ 0 10·8	−12·7
					R. P. L. 99	U	4	−0·188	12 48 16·3	−0·1	−0·1	+1·5		17·6	12 48 27·9	+ 0 10·3	−11·6
					R. P. L. 12	L	4	+0·277	12 52 25·2	+0·2	+0·1	+1·5		27·0	12 52 31·9	+ 0 4·9	
		" 3	"	E	R. P. L. 158	L	5	+0·360	11 54 59·7	+0·2	+0·3	+1·5		61·7	11 27 31·2	−27 30·5	+ 3·0
					R. P. L. 89	U	5	−0·303	12 26 40·4	−0·2	−0·3	−1·5	+0·2	38·6	11 59 6·1	−27 32·5	
		" "	"	W	R. P. L. 98	U	4	−0·188	12 47 51·9	−0·1	−0·2	+1·5		53·1	12 48 20·6	+ 0 27·5	+ 7·5
					R. P. L. 99	U	4	−0·188	12 47 59·2	−0·1	−0·2	+1·5		0·4	12 48 27·9	+ 0 27·5	+ 7·5
					R. P. L. 12	L	4	+0·277	12 51 59·0	+0·2	+0·2	+1·5		0·9	12 52 31·9	+ 0 31·0	

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for: Collimation	Level	Pen Equation Q	Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
AGRA (E), AND DEESA (W)	AGRA (Latitude 27° 10')	1881			R. P. L. 98	U	3	−0·182	12 46 16·3	−0·3	0·0	+1·5		17·5	12 48 20·4	+ 2 2·9	+16·3
		Apr. 10	I. P. E.	E	R. P. L. 99	U	3	−0·182	12 46 23·7	−0·3	0·0	+1·5		24·9	12 48 27·7	+ 2 2·8	+16·5
					R. P. L. 12	L	4	+0·272	12 50 19·9	+0·3	0·0	+1·5		21·7	12 52 32·0	+ 2 10·3	
		„ „	„	„	Polaris	L	1	+0·877	13 12 9·7	+1·2	0·0	−1·5		9·4	13 14 27·2	+ 2 17·8	+13·5
					R. P. L. 111	U	4	−0·194	15 1 51·0	−0·3	0·0	+1·5	−0·3	51·9	15 3 55·2	+ 2 3·3	
		„ 11	„	„	R. P. L. 98	U	2	−0·182	12 46 20·4	−0·3	0·0	+1·5		21·6	12 48 20·3	+ 1 58·7	+23·2
					R. P. L. 99	U	2	−0·182	12 46 27·6	−0·3	0·0	+1·5		28·8	12 48 27·6	+ 1 58·8	+23·0
					R. P. L. 12	L	4	+0·272	12 50 21·3	+0·3	0·0	+1·5		23·1	12 52 32·1	+ 2 9·0	
					Polaris	L	1	+0·877	13 12 3·9	+1·2	−0·1	−1·5	−0·1	3·4	13 14 27·2	+ 2 23·8	
		„ 13	„	„	R. P. L. 98	U	3	−0·182	12 46 29·2	−0·3	+0·7	+1·5		31·1	12 48 20·2	+ 1 49·1	+39·3
					R. P. L. 99	U	3	−0·182	12 46 36·6	−0·3	+0·7	+1·5		38·5	12 48 27·5	+ 1 49·0	+39·5
					R. P. L. 12	L	4	+0·272	12 50 23·5	+0·3	−0·6	+1·5		24·7	12 52 32·3	+ 2 7·6	
					Polaris	L	1	+0·877	13 11 1·2	+1·2	−2·4	−1·5	−0·1	58·4	13 14 27·5	+ 2 29·1	
		„ „	„	„	R. P. L. 111	U	3	−0·194	15 2 5·1	−0·3	+0·7	+1·5		7·0	15 3 55·4	+ 1 48·4	+38·9
					R. P. L. 34	L	3	+0·318	15 25 24·7	+0·4	−0·8	+1·5		25·8	15 27 34·1	+ 2 8·3	
		„ 14	I. P. W.	„	R. P. L. 98	U	3	−0·182	12 46 38·0	−0·2	−0·1	+1·5		39·2	12 48 20·2	+ 1 41·0	+66·0
					R. P. L. 99	U	3	−0·182	12 46 45·7	−0·2	−0·1	+1·5		46·9	12 48 27·4	+ 1 40·5	+66·8
					R. P. L. 12	L	4	+0·272	12 50 19·1	+0·3	+0·1	+1·5		21·0	12 52 32·4	+ 2 11·4	
					Polaris	L	1	+0·877	13 11 38·3	+0·9	+0·3	−1·5	−0·1	37·9	13 14 27·7	+ 2 49·8	
		„ „	„	„	R. P. L. 111	U	4	−0·194	15 2 14·9	−0·2	−0·1	+1·5		16·1	15 3 55·4	+ 1 39·3	+65·8
					R. P. L. 34	L	3	+0·318	15 25 19·2	+0·3	+0·1	+1·5	−0·1	21·0	15 27 34·0	+ 2 13·0	
		„ 15	„	„	R. P. L. 98	U	3	−0·182	12 46 42·0	−0·2	0·0	+1·5		43·3	12 48 20·1	+ 1 36·8	+69·3
					R. P. L. 99	U	3	−0·182	12 46 49·6	−0·2	0·0	+1·5		50·9	12 48 27·4	+ 1 36·5	+69·8
					R. P. L. 12	L	4	+0·272	12 50 21·6	+0·3	0·0	+1·5		23·4	12 52 32·5	+ 2 9·1	
					Polaris	L	2	+0·877	13 11 40·5	+0·9	0·0	−1·5	−0·1	39·8	13 14 28·0	+ 2 48·2	
		„ „	„	„	R. P. L. 111	U	4	−0·194	15 2 19·0	−0·2	0·0	+1·5		20·3	15 3 55·6	+ 1 35·3	+68·0
					R. P. L. 34	L	3	+0·318	15 25 22·1	+0·3	0·0	+1·5	−0·1	23·8	15 27 33·9	+ 2 10·1	
		„ 16	„	„	R. P. L. 98	U	3	−0·182	12 46 44·6	−0·2	+0·2	+1·5		46·1	12 48 20·1	+ 1 34·0	+69·9
					R. P. L. 99	U	3	−0·182	12 46 52·5	−0·2	+0·2	+1·5		54·0	12 48 27·3	+ 1 33·3	+71·0
					R. P. L. 12	L	4	+0·272	12 50 25·1	+0·3	−0·2	+1·5		26·7	12 52 32·6	+ 2 5·9	
					Polaris	L	1	+0·877	13 11 42·3	+0·9	−0·9	−1·5	−0·1	40·7	13 14 28·3	+ 2 47·6	

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (Increased by 12 hours for Lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation Correction a_1
									h m s	s	s	s	s	s	h m s	m s	d
AGRA (E), AND DEESA (W)	AGRA (Latitude 27° 10′)	1881 Apr. 16	I. P. W.	E	R. P. L. 111	U	4	−0·194	15 2 21·8	−0·2	+0·3	+1·5		23·4	15 3 55·7	+ 1 32·3	+68·4
					R. P. L 84	L	3	+0·318	15 25 25·1	+0·3	−0·3	+1·5	−0·1	26·5	15 27 33·8	+ 2 7·3	
	DEESA (Latitude 24° 16′)	1881 Apr. 10	I. P. E.	E	R. P. L. 98	U	4	−0·188	13 9 38·4	−0·4	0·0	+1·5		39·5	12 48 20·4	−21 19·1	+23·7
					R. P. L. 99	U	4	−0·188	13 9 45·8	−0·4	0·0	+1·5		46·9	12 48 27·7	−21 19·2	+23·9
					R. P. L. 12	L	4	+0·277	13 13 38·0	+0·6	0·0	+1·5		40·1	12 52 32·0	−21 8·1	
		" "	"	W	R. P. L. 111	U	4	−0·199	15 2 13·7	−0·5	0·0	−1·5		11·7	15 3 55·2	+ 1 43·5	+20·9
					R. P. L. 84	L	5	+0·323	15 25 40·9	+0·7	0·0	−1·5	−0·1	40·0	15 27 34·4	+ 1 54·4	
		" 11	"	E	R. P. L. 98	U	5	−0·188	13 9 36·5	−0·4	−0·2	+1·6		37·5	12 48 20·3	−21 17·2	− 3·2
					R. P. L. 99	U	5	−0·188	13 9 44·0	−0·4	−0·2	+1·6		45·0	12 48 27·6	−21 17·4	− 2·8
					R. P. L. 12	L	4	+0·277	13 13 48·5	+0·6	+0·1	+1·6		50·8	12 52 32·1	−21 18·7	
		" 13	"	E	R. P. L. 98	U	4	−0·188	13 9 42·4	−0·4	+0·2	+1·5		43·7	12 48 20·2	−21 23·5	− 4·7
					R. P. L. 99	U	4	−0·188	13 9 49·9	−0·4	+0·2	+1·5		51·2	12 48 27·5	−21 23·7	− 4·3
					R. P. L. 12	L	4	+0·277	13 13 56·1	+0·6	−0·2	+1·5		58·0	12 52 32·3	−21 25·7	
		" "	"	W	R. P. L. 111	U	4	−0·199	15 1 36·1	−0·5	+0·2	−1·5		34·3	15 3 55·4	+ 2 21·1	− 5·7
					R. P. L. 84	L	4	+0·323	15 25 17·1	+0·7	−0·2	−1·5	−0·1	16·0	15 27 34·1	+ 2 18·1	
		" 14	I. P. W.	E	R. P. L. 98	U	4	−0·188	13 9 45·0	+0·1	−0·9	+1·5		45·7	12 48 20·2	−21 25·5	−11·0
					R. P. L. 99	U	4	−0·188	13 9 52·9	+0·1	−0·9	+1·5		53·6	12 48 27·4	−21 26·2	− 9·5
					R. P. L. 12	L	4	+0·277	13 14 0·9	−0·2	+0·8	+1·5		3·0	12 52 32·4	−21 30·6	
		" "	"	W	R. P. L. 111	U	4	−0·199	15 1 23·9	+0·1	−0·9	−1·5		21·6	15 3 55·5	+ 2 33·9	−13·6
					R. P. L. 84	L	4	+0·323	15 25 8·0	−0·2	+1·0	−1·5	−0·1	7·2	15 27 34·0	+ 2 26·8	
		" 15	"	E	R. P. L. 98	U	4	−0·188	13 9 45·4	+0·1	+0·3	+1·5		47·3	12 48 20·1	−21 27·2	−21·5
					R. P. L. 99	U	4	−0·188	13 9 53·3	+0·1	+0·3	+1·5		55·2	12 48 27·4	−21 27·8	−20·2
					R. P. L. 12	L	4	+0·277	13 14 8·6	−0·2	−0·2	+1·5		9·7	12 52 32·5	−21 37·2	
		" "	"	W	R. P. L. 111	U	4	−0·199	15 1 9·3	+0·1	+0·3	−1·5		8·2	15 3 55·6	+ 2 47·4	−24·5
					R. P. L. 84	L	4	+0·323	15 24 61·4	−0·2	−0·3	−1·5	−0·1	59·3	15 27 33·9	+ 2 34·6	
		" 16	"	E	R. P. L. 98	U	4	−0·188	13 9 51·9	+0·1	+0·3	+1·5		53·8	12 48 20·1	−21 33·7	− 5·6
					R. P. L. 99	U	4	−0·188	13 9 59·5	+0·1	+0·3	+1·5		61·4	12 48 27·3	−21 34·1	− 4·7
					R. P. L. 12	L	4	+0·277	13 14 7·9	−0·2	−0·3	+1·5		8·9	12 52 32·6	−21 36·3	
		" "	"	W	R. P. L. 111	U	7	−0·199	15 1 1·3	+0·1	+0·4	−1·5		0·3	15 3 55·7	+ 2 55·4	− 5·0
					R. P. L. 84	L	5	+0·323	15 24 43·2	−0·2	−0·4	−1·5	−0·1	41·0	15 27 33·8	+ 2 52·8	

TABLE XXIV. DEDUCTION OF THE DEVIATION CORRECTION, a_1, AT JUBBULPORE ON 10TH AND 13TH FEBRUARY 1881.

Number of Star and its Deviation Constant, A	Astronomical Date	Clock in use	Culmination	Instrumental Position	Observed Time of Transit	Reduction of each Observation to that of the first day						Comparison of Reduced Observations of 10th and 13th with the Mean of those of 9th and 14th February		Deduced value of Deviation Correction a_1
						Instrumental Corrections			Corrections for		Reduced Observation			
						Collimation	Level	Q	Clock Rate	Change in R.A.		$A \times \delta a_1$	δa_1	
	1881				h m s	s	s	s	m s	s	h m s	s	d	d
R. P. L. 60	Feb. 9	E	U	*I. P. E.*	8 51 39·6	− 0·3	+ 0·4	− 1·3			8 51 38·4	...	...	+ 2·1*
A = − 0·211	„ 14	„	„	*I. P. W.*	8 50 10·6	− 0·8	− 0·2	− 1·2	+ 1 26·4	+ 0·1	8 51 34·9	...	...	− 16·1*
										Mean	8 51 36·7		Mean	− 7·0
	„ 10	„	„	„	8 51 22·6	− 0·8	+ 0·1	− 1·4	+ 0 17·2	0·0	8 51 37·7	− 1·0	+ 4·7	− 2·3
	„ 13	„	„	„	8 50 27·7	− 0·8	0·0	− 1·2	+ 1 9·1	+ 0·1	8 51 34·9	+ 1·8	− 8·5	− 15·5
R. P. L. 70	Feb. 9	W	U	*I. P. E.*	9 21 19·1	− 0·3	+ 0·4	+ 1·3			9 21 20·5	...	...	+ 2·1*
A = − 0·205	„ 14	„	„	*I. P. W.*	9 20 3·5	− 0·7	− 0·2	+ 1·2	+ 1 13·1	− 0·2	9 21 16·7	...	...	− 16·1*
										Mean	9 21 18·6		Mean	− 7·0
	„ 10	„	„	„	9 21 4·6	− 0·7	0.0	+ 1·4	+ 0 14·3	0·0	9 21 19·6	− 1·0	+ 4·9	− 2·1

* These quantities are the final values of deviation correction, or a, being the means of the values of a_1 deduced on each day.

Arc	Astronomical Date		Station	*a*	Station	*a*
	1880			d		d
BOMBAY (E), AND DEESA (W)	December	13	BOMBAY	− 28·7	DEESA	− 14·2
	„	14		− 27·8		− 11·7
	„	16		− 24·6		− 11·2
	„	17		− 76·4		− 0·4
	„	18		− 69·7		− 1·4
	„	19		− 66·9		− 0·4
	1881					
DEESA (E), AND KURRACHEE (W)	January	5	DEESA	− 10·1	KURRACHEE	+ 175·6
	„	6		− 13·9		+ 146·1
	„	7		− 10·3		+ 149·7
	„	8		− 5·7		− 35·4
	„	9		− 11·4		− 27·9
	„	10		− 10·2		− 22 2
BOMBAY (E), AND KURRACHEE (W)	January	17	BOMBAY	− 7·3	KURRACHEE	− 3·0
	„	18		+ 2·1		+ 7·0
	„	19		+ 10·0		+ 12·4
	„	20		+ 20·7		+ 22·3
	„	21		+ 21·4		+ 17·3
	„	23		+ 36·7		+ 30·5
JUBBULPORE (E), AND BOMBAY (W)	February	6	JUBBULPORE	+ 5·9	BOMBAY	+ 21·9
	„	7		+ 4·2		+ 38·3
	„	8		+ 4·0		+ 44·3
	„	9		+ 2·1		+ 50·3
	„	10		− 2·2		+ 83·1
	„	13		− 15·5		+ 90·7
	„	14		− 16·1		+ 92·4

Arc	Astronomical Date		Station	*a*	Station	*a*
	1881			d		d
JUBBULPORE (E), AND BOLARUM (W)	February	23	JUBBULPORE	− 40·5	BOLARUM	− 56·3
	„	24		− 3·9		− 58·9
	„	25		− 5·5		− 0·8
	„	28		− 14·1		− 18·4
	March	2		− 20·9		− 18·5
	„	3		− 11·2		− 20·4
JUBBULPORE (E), AND AGRA (W)	March	11	JUBBULPORE	− 0·2	AGRA	+ 63·4
	„	12		+ 1·6		− 2·7
	„	13		+ 3·8		+ 10·8
	„	15		+ 12·9		+ 16·0
	„	17		+ 19·4		+ 48·0
	„	20		+ 13·3		+ 3·4
	„	21		+ 13·2		+ 1·9
JUBBULPORE (E), AND DEESA (W)	March	28	JUBBULPORE	− 11·1	DEESA	+ 4·8
	„	29		− 15·3		− 9·1
	„	30		− 19·3		− 14·8
	„	31		− 23·0		− 11·7
	April	1		− 24·8		− 15·1
	„	3		− 28·0		+ 5·3
AGRA (E), AND DEESA (W)	April	10	AGRA	+ 15·0	DEESA	+ 22·4
	„	11		+ 23·1		− 3·0
	„	13		+ 39·1		− 5·1
	„	14		+ 66·1		− 12·0
	„	15		+ 68·8		− 22·7
	„	16		+ 69·4		− 5·1

Between Lieut.-Colonel Campbell and Major Heaviside.

OBSERVED WITH TELESCOPE No. 1.

At POONA

By Stars of	November 28, 1880 Star	Decl.	Equation C − H	November 29, 1880 Star	Decl.	Equation C − H
		°	s		°	s
North Aspect	831	+27	+0·12	866	+25	+0·05
	866	+25	+ ·04	877	+35	+ ·19
	877	+35	− ·11	888	+38	− ·13
	888	+38	+ ·12	957	+25	+ ·12
	957	+25	− ·10	999	+21	+ ·09
	999	+21	− ·07	1008	+39	− ·12
	1008	+39	+ ·09	1123	+37	− ·09
	1123	+37	− ·04	1138	+32	− ·03
	1138	+32	− ·04			
Mean ($C_N - H_N$)			+0·001 ±0·021			+0·010 ±0·029
South Aspect	794	+ 5	−0·04	852	+ 4	+0·03
	811	0	+ ·05	905	+ 8	+ ·01
	852	+ 4	− ·09	929	+ 8	+ ·10
	905	+ 8	+ ·02	987	+13	− ·04
	929	+ 8	− ·06	1028	+ 3	− ·04
	987	+13	− ·02	1057	+ 9	− ·15
	1028	+ 3	− ·03	1068	+ 9	+ ·10
	1057	+ 9	+ ·12	1084	+11	·00
	1084	+11	+ ·04	1096	+17	− ·12
	1096	+17	− ·04	1110	0	− ·12
	1110	+ 0	− ·14	1174	+11	− ·08
				1202	+ 6	+ ·18
Mean ($C_S - H_S$)			−0·017 ±0·015			−0·011 ±0·020

At BOMBAY

By Stars of	January 29, 1881 Star	Decl.	Equation C − H	January 30, 1881 Star	Decl.	Equation C − H
		°	s		°	s
North Aspect	921	+21	+0·05	2747	+30	+0·16
	936	+32	+ ·03	2789	+24	+ ·16
	957	+25	+ ·01	2799	+19	+ ·01
	974	+29	·00	2833	+25	+ ·08
	989	+27	·00	2840	+25	+ ·11
	999	+21	+ ·05	2999	+33	+ ·03
	1023	+27	+ ·03	3026	+28	+ ·01
	1034	+21	+ ·02	3046	+31	+ ·06
	1045	+20	+ ·04	3056	+33	+ ·08
	1095	+24	+ ·10	3068	+33	+ ·09
				3079	+25	+ ·10
Mean ($C_N - H_N$)			+0·033 ±0·006			+0·081 ±0·011
South Aspect	892	+16	+0·05	2759	+18	−0·02
	898	+17	·00	2778	+10	+ ·07
	950	+ 4	·00	2782	+ 9	+ ·10
	966	+17	+ ·03	2810	+18	− ·03
	1013	− 9	+ ·04	2816	+17	− ·02
	1057	+ 9	+ ·06	2970	+13	+ ·16
	1068	+ 9	+ ·03	2977	+13	+ ·09
	1079	+16	+ ·02	2990	+18	− ·07
	1090	− 5	+ ·02	3015	+18	+ ·18
	1119	+16	+ ·07			
Mean ($C_S - H_S$)			+0·032 ±0·005			+0·051 ±0·020

At AGRA

By Stars of	April 23, 1881 Star	Decl.	Equation C − H	April 24, 1881 Star	Decl.	Equation C − H
		°	s		°	s
North Aspect	4747	+36	+0·04	4304	+28	+0·16
	4758	+39	+ ·10	4315	+28	+ ·22
	4797	+37	+ ·04	4345	+39	+ ·18
	4809	+27	+ ·25	4346	+39	+ ·17
	4820	+33	+ ·01	4421	+28	+ ·16
	4830	+50	+ ·24	4433	+41	+ ·07
	4841	+44	+ ·10	4479	+38	+ ·15
	4863	+37	+ ·13	4536	+38	+ ·05
	4876	+28	+ ·11	4747	+36	+ ·10
	4897	+38	+ ·09	4758	+39	·00
	4917	+47	+ ·20	4797	+37	+ ·08
	4942	+40	+ ·19	4809	+27	+ ·24
	5302	+27	+ ·11	4820	+33	+ ·11
				4830	+50	+ ·26
				4841	+44	+ ·14
Mean ($C_N - H_N$)			+0·124 ±0·014			+0·139 ±0·013
South Aspect	4766	+ 9	+0·06	4329	+13	−0·03
	4785	+20	+ ·05	4351	+18	+ ·04
	4853	+12	− ·01	4364	+22	+ ·11
	4926	+15	+ ·02	4373	− 3	− ·04
	4953	+25	+ ·03	4388	+23	+ ·09
	4969	+27	·00	4403	+17	− ·01
	5252	+21	+ ·03	4440	+10	+ ·05
	5270	+ 9	+ ·06	4472	+ 6	− ·01
	5284	+16	− ·01	4499	+14	+ ·04
	5315	+18	+ ·08	4526	+25	+ ·03
	5325	+ 5	+ ·04	4559	+11	+ ·04
	5359	+10	+ ·05	4566	+23	+ ·11
	5376	+18	− ·01	4575	+23	+ ·13
				4731	+19	+ ·03
				4766	+ 9	+ ·07
Mean ($C_S - H_S$)			+0·030 ±0·006			+0·043 ±0·009

Between Lieut.-Colonel Campbell and Major Heaviside.

Observed with Telescope No. 2.

At POONA

By Stars of	November 19, 1880			November 21, 1880			November 26, 1880		
	Star	Declination	Equation C − H	Star	Declination	Equation C − H	Star	Declination	Equation C − H
		°	s		°	s		°	s
North Aspect	502	+ 40	+ 0·06	544	+ 37	0·00	999	+ 21	− 0·06
	544	+ 37	− ·02	576	+ 37	− ·02	1008	+ 39	·00
	576	+ 37	+ ·03	593	+ 23	+ ·02	1123	+ 37	− ·10
	593	+ 23	+ ·08	665	+ 19	− ·01	1311	+ 20	+ ·21
	665	+ 19	+ ·01	707	+ 19	+ ·07	1449	+ 23	+ ·10
	707	+ 19	+ ·02	752	+ 31	− ·02			
	752	+ 31	·00	766	+ 25	− ·01			
	831	+ 27	+ ·05	831	+ 27	− ·01			
	866	+ 25	+ ·01	866	+ 25	− ·04			
	877	+ 35	+ ·04	888	+ 38	− ·01			
	Mean ($C_N - H_N$)		+ 0·028			− 0·003			+ 0·030
			± 0·006			± 0·006			± 0·038
South Aspect	561	+ 10	− 0·11	488	+ 12	− 0·03	929	+ 8	− 0·02
	615	+ 3	− ·06	561	+ 10	− ·07	1028	+ 3	− ·07
	650	+ 17	− ·08	615	+ 3	− ·08	1057	+ 9	− ·16
	684	+ 8	− ·06	650	+ 17	− ·02	1068	+ 9	+ ·11
	729	0	− ·05	684	+ 8	− ·02	1084	+ 11	− ·03
	780	+ 15	− ·02	780	+ 15	− ·08	1096	+ 17	·00
	794	+ 5	+ ·03	794	+ 5	− ·06	1110	0	− ·17
	811	0	− ·06	811	0	− ·08	1298	+ 9	− ·04
	852	+ 4	− ·08	852	+ 4	− ·09	1330	+ 14	·00
				905	+ 8	− ·05	1350	+ 17	− ·07
							1370	+ 14	− ·28
							1403	0	+ ·16
							1420	+ 16	+ ·11
							1431	+ 1	− ·14
							1468	+ 19	+ ·01
	Mean ($C_S - H_S$)		− 0·054			− 0·058			− 0·039
			± 0·009			± 0·006			± 0·020

Between Lieut.-Colonel Campbell and Major Heaviside.

Observed with Telescope No. 2.												
By Stars of	At Bombay						At Agra					
	January 31, 1881			February 1, 1881			April 21, 1881			April 22, 1881		
	Star	Declination	Equation C − H	Star	Declination	Equation C − H	Star	Declination	Equation C − H	Star	Declination	Equation C − H
		°	s		°	s		°	s		°	s
North Aspect	2254	+ 26	+0·05	2239	+ 39	+0·07	4304	+ 28	+0·08	4304	+ 28	+0·15
	2301	+ 30	+ ·06	2254	+ 26	+ ·09	4315	+ 28	+ ·13	4315	+ 28	+ ·07
	2314	+ 35	+ ·08	2301	+ 30	+ ·08	4345	+ 39	+ ·12	4345	+ 39	+ ·09
	2431	+ 25	+ ·04	2314	+ 35	+ ·15	4346	+ 39	+ ·10	4346	+ 39	+ ·04
	2493	+ 27	+ ·08	2431	+ 25	+ ·05	4421	+ 28	+ ·15	4421	+ 28	+ ·12
	2499	+ 20	+ ·05	2493	+ 27	·00	4433	+ 41	+ ·11	4433	+ 41	+ ·09
	2514	+ 24	− ·02	2506	+ 25	+ ·09	4479	+ 38	+ ·09	4479	+ 38	+ ·11
	2789	+ 24	+ ·06	2514	+ 24	+ ·08	4536	+ 38	+ ·10	4536	+ 38	+ ·15
	2833	+ 25	− ·01	2747	+ 30	+ ·03	4747	+ 36	+ ·15	4747	+ 36	+ ·08
	2840	+ 25	+ ·08	2789	+ 24	+ ·07	4758	+ 39	+ ·16	4758	+ 39	+ ·09
							4797	+ 37	+ ·18	4797	+ 37	+ ·09
							4809	+ 27	+ ·07	4809	+ 27	+ ·15
							4820	+ 33	+ ·13	4820	+ 33	+ ·09
							4830	+ 50	+ ·16	4830	+ 50	+ ·15
							4841	+ 44	+ ·16	4841	+ 44	+ ·10
							4876	+ 28	+ ·09	4863	+ 37	+ ·13
							4897	+ 38	+ ·12	4876	+ 28	+ ·13
							4917	+ 47	+ ·06	4897	+ 38	+ ·10
							4942	+ 40	+ ·11	4917	+ 47	+ ·22
										4942	+ 40	+ ·09
	Mean ($C_N - H_N$)		+0·047 ±0·008			+0·071 ±0·009			+0·119 ±0·005			+0·112 ±0·006
South Aspect	2265	+ 18	+0·01	2271	+ 18	+0·01	4329	+ 13	+0·02	4329	+ 13	+0·06
	2271	+ 18	+ ·04	2280	+ 16	+ ·15	4351	+ 18	+ ·01	4351	+ 18	+ ·07
	2280	+ 16	+ ·07	2444	+ 12	+ ·04	4364	+ 22	+ ·16	4364	+ 22	·00
	2444	+ 12	+ ·03	2462	+ 9	+ ·01	4373	− 3	+ ·04	4373	− 3	+ ·09
	2462	+ 9	− ·02	2468	+ 9	+ ·03	4388	+ 23	+ ·01	4388	+ 23	+ ·06
	2468	+ 9	+ ·04	2473	+ 12	+ ·02	4403	+ 17	− ·02	4403	+ 17	+ ·05
	2473	+ 12	− ·09	2480	+ 2	+ ·04	4440	+ 10	+ ·04	4440	+ 10	·00
	2480	+ 2	+ ·02	2759	+ 18	+ ·10	4472	+ 6	+ ·02	4472	+ 6	+ ·07
	2759	+ 18	− ·03	2778	+ 10	+ ·04	4499	+ 14	+ ·03	4499	+ 14	+ ·06
	2778	+ 10	+ ·05	2782	+ 9	+ ·13	4526	+ 25	+ ·09	4559	+ 11	+ ·01
	2799	+ 19	+ ·08				4559	+ 11	+ ·12	4566	+ 23	+ ·09
	2810	+ 18	− ·04				4566	+ 23	+ ·11	4575	+ 23	+ ·02
	2816	+ 17	+ ·04				4575	+ 23	+ ·19	4731	+ 19	+ ·03
							4731	+ 19	+ ·02	4766	+ 9	·00
							4766	+ 9	+ ·11	4785	+ 20	+ ·06
							4785	+ 20	+ ·02	4853	+ 12	+ ·05
							4853	+ 12	·00	4926	+ 15	+ ·01
							4926	+ 15	+ ·09	4953	+ 25	+ ·07
							4953	+ 25	+ ·10	4969	+ 27	+ ·09
							4969	+ 27	+ ·01			
	Mean ($C_S - H_S$)		+0·015 ±0·009			+0·057 ±0·011			+0·059 ±0·009			+0·047 ±0·005

Between Lieut.-Colonel Campbell and Major Heaviside.

Season	By Stars of North Aspect					By Stars of South Aspect				
	Astronomical Date	Telescope in use	Mean Value of Equation $C_N - H_N$	Combination Weight	General Mean $C_N - H_N$	Astronomical Date	Telescope in use	Mean Value of Equation $C_S - H_S$	Combination Weight	General Mean $C_S - H_S$
1880-81	1880		″			1880		″		
	November 19	No. 2	+ 0·028	278		November 19	No. 2	− 0·054	123	
	„ 21	„ 2	− ·003	278	″	„ 21	„ 2	− ·058	278	″
	„ 26	„ 2	+ ·030	7	+ 0·012	„ 26	„ 2	− ·039	25	− 0·050
	„ 28	„ 1	+ ·001	23		„ 28	„ 1	− ·017	44	
	„ 29	„ 1	+ ·010	12		„ 29	„ 1	− ·011	25	
	1881					1881				
	January 29	No. 1	+ 0·033	278		January 29	No. 1	+ 0·032	400	
	„ 30	„ 1	+ ·081	83	+ 0·050	„ 30	„ 1	+ ·051	25	+ 0·033
	„ 31	„ 2	+ ·047	156		„ 31	„ 2	+ ·015	123	
	February 1	„ 2	+ ·071	123		February 1	„ 2	+ ·057	83	
	April 21	No. 2	+ 0·119	400		April 21	No. 2	+ 0·059	123	
	„ 22	„ 2	+ ·112	278	+ 0·118	„ 22	„ 2	+ ·047	400	+ 0·043
	„ 23	„ 1	+ ·124	51		„ 23	„ 1	+ ·030	278	
	„ 24	„ 1	+ ·139	59		„ 24	„ 1	+ ·043	123	

Final Values of the Equation adopted.

For the measurements, Bombay-Deesa, Deesa-Kurrachee, and Bombay-Kurrachee, executed between November 29, 1880 and January 29, 1881, the following values of the personal equations were adopted for the reductions, *viz.*,

$$C_N - H_N = +0''.031, \quad \text{and } C_S - H_S = -0''.009.$$

And for the measurements, Jubbulpore-Bombay, Jubbulpore-Bolarum, Jubbulpore-Agra, Jubbulpore-Deesa and Agra-Deesa, executed between February 1, 1881 and April 21, 1881, *viz.*,

$$C_N - H_N = +0''.084, \quad \text{and } C_S - H_S = +0''.038.$$

In these equations the general symbol, C — H, signifies a quantity which must be added to times observed by Major Heaviside, before they are compared with those observed by Lieut.-Colonel Campbell.

Of Lieut.-Colonel Campbell and Major Heaviside, Season 1880-81.

Arc Bombay-Deesa				Arc Deesa-Kurrachee				Arc Bombay-Kurrachee				Arc Jubbulpore-Bombay			
Campbell at Bombay		Heaviside at Deesa		Heaviside at Deesa		Campbell at Kurrachee		Heaviside at Bombay		Campbell at Kurrachee		Heaviside at Jubbulpore		Campbell at Bombay	
Star	Equation N−S	Star	Equation N−S	Star	Equation N−S	Star	Equation N−S	Star	Equation N−S	Star	Equation N−S	Star	Equation N−S	Star	Equation N−S
	s		s		s		s		s		s		s		s
1365	+0·05	1458	+0·02	1572	−0·04	1572	+0·02	2271	−0·01	2254	+0·11	2789	+0·04	2759	+0·07
	− ·04		+ ·15		+ ·09		− ·02		+ ·03		+ ·08		+ ·05		+ ·03
	+ ·02		+ ·08		+ ·03		+ ·03		− ·03		+ ·08		− ·07		+ ·09
	+ ·06		+ ·04		+ ·09		− ·06		− ·05		+ ·02		+ ·14		+ ·04
1376	+ ·06		− ·03		+ ·03		− ·01	2499	+ ·03		+ ·09		+ ·13		+ ·10
	+ ·02		+ ·07		− ·04	1778	+ ·04	2759	− ·06		+ ·08		− ·01	2799	+ ·03
	+ ·05	1572	− ·02	1837	+ ·02		+ ·06		+ ·06	2431	+ ·11	2840	+ ·03		+ ·09
	+ ·06		− ·02		− ·01		+ ·06		+ ·03		+ ·11		− ·03		+ ·09
	+ ·02		+ ·01		− ·05		+ ·07		·00		+ ·02		+ ·04		+ ·07
	+ ·05		+ ·01		+ ·09	1829	+ ·03		+ ·17		+ ·09		+ ·01		+ ·06
1563	+ ·06		+ ·03		+ ·02		+ ·10		− ·03		+ ·04		+ ·02		+ ·03
	− ·01		+ ·06	2058	− ·07		·00	2799	+ ·10	2789	·00		+ ·03		+ ·10
	+ ·08	2028	+ ·04		+ ·03		− ·02		+ ·06		+ ·08	3327	+ ·10	2816	− ·01
	+ ·04		− ·03		·00		+ ·04		+ ·08		+ ·01		+ ·10		+ ·04
	+ ·03		− ·04		+ ·04		− ·01		+ ·03		+ ·05		+ ·08		− ·03
	+ ·08		·00		− ·02	2058	+ ·14		− ·01		+ ·08		+ ·07		·00
1586	·00		+ ·03		+ ·03		− ·01		+ ·02		+ ·05		+ ·03		+ ·01
	+ ·13		+ ·03	2154	− ·02		+ ·03	2990	+ ·02	2833	+ ·06		+ ·07		− ·02
	+ ·05	2313	− ·04		+ ·06		+ ·03		+ ·02		·00	3511	− ·02		− ·05
	+ ·02		+ ·01		+ ·04		·00		+ ·01		+ ·02		+ ·01	2990	+ ·02
	+ ·02		− ·02		+ ·01	2154	+ ·02		+ ·07		+ ·05		− ·01		+ ·05
2134	+ ·03		− ·01		− ·06		+ ·06	Genl. Mean	+0·026		+ ·12		− ·01		+ ·01
	+ ·02		+ ·04	2254	− ·02		+ ·08				+ ·05		− ·01		+ ·03
	+ ·06	Genl. Mean	+0·018		+ ·02		− ·01			3079	+ ·07		·00		+ ·03
	+ ·02				+ ·02		− ·03				+ ·02	Genl. Mean	+0·033		+ ·08
	+ ·07				+ ·08	Genl. Mean	+0·026				+ ·06			3278	+ ·09
2271	+ ·04				·00						− ·02				+ ·05
	+ ·01				·00						+ ·06				+ ·07
	+ ·04			Genl. Mean	+0·013						+ ·03				+ ·02
	+ ·09									Genl. Mean	+0·056			Genl. Mean	+0·041
	+ ·04														
Genl. Mean	+0·041														

Of Lieut.-Colonel Campbell and Major Heaviside, Season 1880-81.

Arc Jubbulpore–Bolarum				Arc Jubbulpore–Agra				Arc Jubbulpore–Deesa				Arc Agra–Deesa			
Heaviside at Jubbulpore		Campbell at Bolarum		Campbell at Jubbulpore		Heaviside at Agra		Campbell at Jubbulpore		Heaviside at Deesa		Campbell at Agra		Heaviside at Deesa	
Star	Equation N−S	Star	Equation N−S	Star	Equation N−S	Star	Equation N−S	Star	Equation N−S	Star	Equation N−S	Star	Equation N−S	Star	Equation N−S
	s		s		s		s		s		s		s		s
3827	+0·14	8278	+0·04	3671	+0·06	3650	+0·12	4066	+0·08	4066	+0·01	4304	+0·02	4364	+0·08
	+ ·11		+ ·08		+ ·05		+ ·08		+ ·04		+ ·06		− ·03		+ ·10
	+ ·04		+ ·07		+ ·04		+ ·09		+ ·17		+ ·05		·00		+ ·09
	+ ·09		·00		+ ·13		+ ·04		+ ·09		+ ·10		− ·02		+ ·08
	+ ·10		+ ·02		+ ·14		+ ·09		+ ·12	4364	+ ·06		+ ·04		+ ·16
	+ ·09	8534	− ·02		+ ·09		+ ·03		+ ·08		+ ·13	4315	+ ·12		+ ·03
3809	+ ·01		+ ·06	3842	+ ·01	4100	+ ·04	4364	+ ·10		+ ·05		+ ·05	4388	+ ·07
	+ ·06		+ ·07		+ ·02		+ ·15		+ ·10		+ ·09		+ ·04		+ ·08
	− ·03		+ ·03		+ ·05		+ ·04		·00		+ ·07		+ ·19		+ ·05
	+ ·03		+ ·03		+ ·01		+ ·04		+ ·08		+ ·12		+ ·15		+ ·07
	+ ·02	8824	+ ·10		+ ·05		+ ·05		+ ·02	4388	+ ·13		+ ·08		+ ·07
	+ ·01		+ ·10		+ ·06		+ ·09		·00		+ ·05	4393	+ ·03		− ·07
3842	− ·01		+ ·14		+ ·07	4195	+ ·11	4388	+ ·13		+ ·06		+ ·10	4526	− ·02
	+ ·03		+ ·11	4066	+ ·04		+ ·08		+ ·04		+ ·13		+ ·03		+ ·05
	+ ·05		+ ·09		+ ·11		+ ·05		+ ·02		+ ·02		+ ·03		+ ·06
	+ ·01		+ ·07		+ ·06		+ ·11		+ ·07		+ ·14		+ ·03		− ·04
	+ ·02	8997	+ ·03		+ ·08		+ ·06		+ ·01	4526	+ ·05		+ ·03		− ·03
	− ·04		+ ·03		+ ·07	4207	− ·05		+ ·05		− ·01	4809	+ ·12	4566	+ ·05
3964	+ ·03		+ ·01		+ ·06		− ·01	4513	+ ·02		− ·01		+ ·17		+ ·01
	+ ·04		+ ·07		+ ·06		− ·01		+ ·10		+ ·06		+ ·27		+ ·01
	+ ·05		+ ·06	4240	+ ·03		+ ·12		− ·02		+ ·03	4969	+ ·12		+ ·02
	+ ·10		+ ·02		+ ·08		− ·04		+ ·01		+ ·07		+ ·09	4575	+ ·01
	+ ·08	Genl. Mean	+0·055		− ·03		+ ·06	4566	+ ·04	4566	− ·01		+ ·10		+ ·09
	+ ·11				+ ·07		+ ·09		+ ·01		+ ·02		+ ·09		+ ·07
Genl. Mean	+0·048				+ ·05	Genl. Mean	+0·060		+ ·04		+ ·02		+ ·06		+ ·07
					+ ·11				+ ·04		+ ·03	Genl. Mean	+0·076		+ ·08
					− ·08				+ ·06		− ·02				+ ·04
				4260	+ ·06				+ ·14		+ ·05			4953	+ ·12
					+ ·05			4575	+ ·11	4575	+ ·06				+ ·09
					+ ·05				+ ·11		+ ·07				+ ·05
					+ ·04				+ ·17		+ ·09				− ·05
					+ ·08				+ ·14		+ ·12				+ ·05
					+ ·04				+ ·14		+ ·11				+ ·13
					+ ·06				+ ·12		+ ·01			Genl. Mean	+0·051
				Genl. Mean	+0·055			Genl. Mean	+0·071	Genl. Mean	+0·059				

Note.—The symbol, N−S, signifies a quantity which must be added to the times observed for stars of South Aspect, before they can be compared with those for stars of North Aspect, by the same observer.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m 25s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s{\cdot}041$, $H_N - H_S = +0{\cdot}018$	$\delta L_N - \rho$
1880		° ′			h m s	s	s			h m s	s	s	m s				
Dec. 13	1376	+18 55	S	I. P. E.	4 18 35·23	+0·69	35·92	S	I. P. E.	4 21 5·63	+1·96	7·59	2 31·67				
	1391	+15 56	S	d c −27·1	20 40·09	+0·70	40·79	S	d c − 2·9	23 10·50	+1·94	12·44	31·65				
	1394	+15 54	S	b −22·8 a −28·7	20 53·38	+0·70	54·08	S	b + 6·3 a −14·2	23 23·78	+1·94	25·72	31·64				
	1408	+28 43	N	s Q +1·88	24 6·63	+0·73	7·36	N	s Q +1·91	26 36·98	+2·02	39·00	31·64				
	1421	+ 9 55	S		26 2·21	+0·64	2·85	S		28 32·55	+1·90	34·45	31·60	m s 2 31·650	− 0·022	− 0·013	2 31·615
	1437	+15 41	S		29 23·39	+0·69	24·08	S		31 53·74	+1·94	55·68	31·60				
	1444	+28 23	N		30 48·34	+0·73	49·07	N		33 18·73	+2·02	20·75	31·68				
	1453	+23 52	N		32 56·92	+0·70	57·62	N		35 27·30	+1·99	29·29	31·67				
	1462	+28 26	N		35 18·23	+0·73	18·96	N		37 48·64	+2·02	50·66	31·70				
Dec. 13	1542	+14 12	S	I. P. E.	4 50 47·94	−3·08	44·86	S	I. P. E.	4 53 18·39	−1·90	16·49	2 31·63				
	1551	+21 25	N	d c −27·1	52 58·25	−3·05	55·20	S	d c − 2·9	55 28·73	−1·85	26·88	31·68				
	1563	+19 38	S	b −22·8 a −28·7	55 30·50	−3·06	27·44	S	b + 6·3 a −14·2	57 61·04	−1·86	59·18	31·74				
	1572	+24 7	N	s Q −1·88	57 50·92	−3·06	47·86	N	s Q −1·91	5 0 21·41	−1·83	19·58	31·72				
	1586	+19 42	N		58 48·40	−3·06	45·34	S		1 18·99	−1·86	17·13	31·79	m s 2 31·723	− 0·022	− 0·005	2 31·696
	1601	+15 54	S		5 1 50·76	−3·06	47·70	S		4 21·32	−1·88	19·44	31·74				
	1614	+32 33	N		4 38·99	−3·02	35·97	N		7 9·41	−1·76	7·65	31·68				
	1629	+33 38	N		7 28·72	−3·01	25·71	N		9 59·22	−1·76	57·46	31·75				
	1632	+33 37	N		8 9·88	−3·01	6·87	N		10 40·38	−1·76	38·62	31·75				
	1647	+19 27	S		10 16·58	−3·06	13·52	S		12 47·13	−1·86	45·27	31·75				
Dec. 14	1408	+28 43	N	I. P. E.	4 24 19·25	+0·79	20·04	N	I. P. E.	4 26 50·09	+1·72	51·81	2 31·77				
	1421	+ 9 55	S	d c −27·1	26 14·80	+0·71	15·51	S	d c − 2·9	28 45·55	+1·65	47·20	31·69				
	1432	+15 48	S	b −20·8 a −27·8	28 28·61	+0·75	29·36	S	b − 4·8 a −11·7	30 59·39	+1·68	61·07	31·71	m s 2 31·737	− 0·022	− 0·010	2 31·705
	1437	+15 41	S	s Q +1·90	29 35·99	+0·75	36·74	S	s Q +1·90	32 6·80	+1·68	8·48	31·74				
	1444	+28 23	N		32 0·97	+0·80	1·77	N		34 31·74	+1·72	33·46	31·69				
	1453	+23 52	N		33 9·55	+0·77	10·32	N		35 40·43	+1·71	42·14	31·82				
	1462	+28 26	N		35 30·90	+0·80	31·70	N		38 1·72	+1·72	3·44	31·74				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

BOMBAY (E), *Lat. 18° 54′, Long. 4ʰ 51ᵐ 25ˢ*: AND DEESA (W), *Lat. 24° 16′, Long. 4ʰ 48ᵐ 54ˢ.*

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.041$, $H_N - H_S = +0.018$	$\delta L_N - \rho$
1880		° ′			h m s	s	s			h m s	s	s	m s				
Dec. 14	1542	+14 12	S	*I. P. E.*	4 50 60·61	−3·05	57·56	S	*I. P. E.*	4 53 31·42	−2·13	29·29	2 31·73				
	1551	+21 25	N	d c −27·1	53 10·93	−3·02	7·91	S	d c − 2·9	55 41·70	−2·10	39·60	31·69				
	1563	+19 38	S	b −20·8 a −27·8	55 43·19	−3·04	40·15	S	b − 4·8 a −11·7	58 13·99	−2·10	11·89	31·74				
	1572	+24 7	N	s Q −1·90	58 3·65	−3·03	0·62	N	s Q −1·90	5 0 34·42	−2·09	32·33	31·71				
	1586	+19 42	S		58 61·08	−3·04	58·04	S		1 31·87	−2·10	29·77	31·73				
	1601	+15 54	S		5 2 3·48	−3·04	0·44	S		4 34·26	−2·12	32·14	31·70	m s 2 31·705	−0·022	−0·011	2 31·672
	1614	+32 33	N		4 51·72	−2·99	48·73	N		7 22·50	−2·06	20·44	31·71				
	1629	+33 38	N		7 41·45	−2·98	38·47	N		10 12·24	−2·06	10·18	31·71				
	1632	+33 37	N		8 22·62	−2·98	19·64	N		10 53·37	−2·06	51·31	31·67				
	1647	+19 27	S		10 29·34	−3·04	26·30	S		12 60·05	−2·10	57·95	31·65				
	1651	+19 41	S		11 6·94	−3·04	3·90	S		13 37·71	−2·10	35·61	31·71				
Dec. 16	1376	+18 55	S	*I. P. E.*	4 19 12·21	+1·91	14·12	S	*I. P. E.*	4 21 44·00	+1·77	45·77	2 31·65				
	1891	+15 56	S	d c − 2·1	20 17·09	+1·88	18·97	S	d c − 2·9	22 48·89	+1·75	50·64	31·67				
	1394	+15 54	S	b + 2·4 a −24·6	20 30·32	+1·88	32·20	S	b − 4·4 a −11·2	23 2·14	+1·75	3·89	31·69				
	1402	+15 36	S	s Q +1·90	22 36·06	+1·88	37·94	S	s Q +1·96	25 7·92	+1·75	9·67	31·73				
	1408	+28 43	N		24 43·53	+2·02	45·55	N		27 15·41	+1·79	17·20	31·65				
	1421	+ 9 55	S		26 39·18	+1·81	40·99	S		29 10·86	+1·73	12·59	31·60	m s 2 31·684	−0·022	−0·015	2 31·647
	1432	+15 48	S		28 52·91	+1·88	54·79	S		31 24·72	+1·75	26·47	31·68				
	1437	+15 41	S		30 0·29	+1·88	2·17	S		32 32·13	+1·75	33·88	31·71				
	1444	+28 23	N		31 25·19	+2·01	27·20	N		33 57·09	+1·79	58·88	31·68				
	1453	+23 52	N		33 33·80	+1·96	35·76	N		36 5·72	+1·78	7·50	31·74				
	1462	+28 26	N		35 55·09	+2·01	57·10	N		38 27·03	+1·79	28·82	31·72				

Note. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

*ρ is the retardation of an electric signal between the stations.

BOMBAY (E), *Lat. 18° 54′, Long. 4h 51m 25s*: AND DEESA (W), *Lat. 24° 16′, Long. 4h 48m 54s*.

Astronomical Date	Star		Transits Observed at E, *By Campbell, with Telescope No. 2*					Transits Observed at W, *By Heaviside, with Telescope No. 1*					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Peral. Equations $C_N - C_S = +0^s{\cdot}041$, $H_N - H_S = +0{\cdot}018$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1880		° ′			h m s	s	s			h m s	s	s	m s				
Dec. 16	1542	+14 12	S	*I. P. E.*	4 51 24·95	−1·94	23·01	S	*I. P. E.*	4 53 56·85	−2·16	54·69	2 31·68				
	1551	+21 25	N	(d) c − 2·1	53 35·23	−1·86	33·37	S	(d) c − 2·9	56 7·20	−2·14	5·06	31·69				
	1563	+19 38	S	b + 2·4	56 7·45	−1·88	5·57	S	b − 4·4	58 39·40	−2·14	37·26	31·69				
	1572	+24 7	N	a − 24·6	58 27·94	−1·84	26·10	N	a − 11·2	5 0 59·98	−2·13	57·85	31·75				
	1586	+19 42	S	(s) Q − 1·90	59 25·26	−1·88	23·38	S	(s) Q − 1·95	1 57·37	−2·14	55·23	31·85				
	1601	+15 54	S		5 2 27·75	−1·92	25·83	S		4 59·66	−2·16	57·50	31·67	m s 2 31·717	− 0·022	− 0·011	2 31·684
	1614	+32 33	N		5 15·96	−1·75	14·21	N		7 48·04	−2·11	45·93	31·72				
	1629	+33 38	N		8 5·67	−1·73	3·94	N		10 37·80	−2·10	35·70	31·76				
	1632	+33 37	N		8 46·81	−1·73	45·08	N		11 18·86	−2·10	16·76	31·68				
	1647	+19 27	S		10 53·64	−1·89	51·75	S		13 25·55	−2·14	23·41	31·66				
	1651	+19 41	S		11 31·25	−1·88	29·37	S		14 3·25	−2·14	1·11	31·74				
Dec. 17	1408	+28 43	N	*I. P. W.*	4 24 55·97	+2·40	58·37	N	*I. P. W.*	4 27 28·09	+2·11	30·20	2 31·83				
	1421	+ 9 55	S	(d) c − 0·6	26 52·11	+1·78	53·89	S	(d) c + 4·0	29 23·40	+2·08	25·48	31·59				
	1432	+15 48	S	b + 7·6	29 5·72	+1·96	7·68	S	b + 4·2	31 37·17	+2·09	39·26	31·58				
	1437	+15 41	S	a − 76·4	30 13·14	+1·96	15·10	S	a − 0·4	32 44·60	+2·09	46·69	31·59	m s 2 31·714	− 0·023	− 0·010	2 31·681
	1444	+28 23	N	(s) Q + 1·89	31 37·70	+2·38	40·08	N	(s) Q + 1·90	34 9·83	+2·11	11·94	31·86				
	1453	+23 52	N		33 46·43	+2·22	48·65	N		36 18·33	+2·10	20·43	31·78				
	1462	+28 26	N		36 7·64	+2·38	10·02	N		38 39·68	+2·11	41·79	31·77				
Dec. 17	1542	+14 12	S	*I. P. W.*	4 51 37·78	−1·87	35·91	S	*I. P. W.*	4 54 9·29	−1·71	7·58	2 31·67				
	1551	+21 25	N	(d) c − 0·6	53 47·88	−1·64	46·24	S	(d) c + 4·0	56 19·73	−1·70	18·03	31·79				
	1563	+19 38	S	b + 7·6	56 20·19	−1·70	18·49	S	b + 4·2	58 51·99	−1·70	50·29	31·80				
	1572	+24 7	N	a − 76·4	58 40·49	−1·55	38·94	N	a − 0·4	5 1 12·52	−1·70	10·82	31·88				
	1601	+15 54	S	(s) Q − 1·89	5 2 40·54	−1·81	38·73	S	(s) Q − 1·90	5 12·11	−1·71	10·40	31·67	m s 2 31·787	− 0·023	− 0·008	2 31·756
	1614	+32 33	N		5 28·25	−1·23	27·02	N		7 60·53	−1·68	58·85	31·83				
	1629	+33 38	N		8 17·91	−1·18	16·73	N		10 50·30	−1·68	48·62	31·89				
	1632	+33 37	N		8 59·12	−1·18	57·94	N		11 31·45	−1·68	29·77	31·83				
	1647	+19 27	S		11 6·27	−1·70	4·57	S		13 37·99	−1·70	36·29	31·72				

Note. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

BOMBAY (E), *Lat. 18° 54′, Long. 4h 51m 25s*: AND DEESA (W), *Lat. 24° 16′, Long. 4h 48m 54s*.

Astronomical Date	Star		Transits Observed at E — *By Campbell, with Telescope No. 2*					Transits Observed at W — *By Heaviside, with Telescope No. 1*					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_B = + 0^s{\cdot}041$, $H_N - H_B = + 0{\cdot}018$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1880		° ′			h m s	s	s			h m s	s	s	m s				
Dec. 18	1865	+17 39	S	I. P. W.	4 16 34·09	+1·85	35·94	S	I. P. W.	4 19 6·09	+1·53	7·62	2 31·68				
	1876	+18 55	S	d c − 0·6	19 37·90	+1·88	39·78	S	d c − 1·0	22 9·96	+1·54	11·50	31·72				
	1891	+15 56	S	b + 1·4 a −69·7	21 42·83	+1·80	44·63	S	b + 5·3 a − 1·4	24 14·74	+1·53	16·27	31·64				
	1394	+15 54	S	s Q + 1·86	21 56·09	+1·80	57·89	S	s Q + 1·43	24 28·03	+1·53	29·56	31·67				
	1402	+15 36	S		23 1·86	+1·78	3·64	S		25 33·78	+1·52	35·30	31·66				
	1408	+28 43	N		25 9·02	+2·19	11·21	N		27 41·47	+1·54	43·01	31·80	m s 2 31·689	− 0·022	− 0·015	2 31·652
	1421	+ 9 55	S		27 5·05	+1·64	6·69	S		29 36·76	+1·52	38·28	31·59				
	1432	+15 48	S		29 18·71	+1·79	20·50	S		31 50·62	+1·53	52·15	31·65				
	1444	+28 23	N		31 50·73	+2·17	52·90	N		34 23·13	+1·54	24·67	31·77				
	1453	+23 52	N		33 59·47	+2·02	61·49	N		36 31·64	+1·53	33·17	31·68				
	1462	+28 26	N		36 20·68	+2·17	22·85	N		38 53·03	+1·54	54·57	31·72				
Dec. 18	1542	+14 12	S	I. P. W.	4 51 50·73	−1·97	48·76	S	I. P. W.	4 54 21·70	−1·34	20·36	2 31·60				
	1551	+21 25	N	d c − 0·6	53 60·86	−1·76	59·10	S	d c − 1·0	56 32·05	−1·32	30·73	31·63				
	1563	+19 38	S	b + 1·4 a −69·7	56 33·16	−1·82	31·34	S	b + 5·3 a − 1·4	59 4·36	−1·32	3·04	31·70				
	1572	+24 7	N	s Q − 1·86	58 53·51	−1·70	51·81	N	s Q − 1·43	5 1 24·78	−1·33	23·45	31·64				
	1586	+19 42	S		59 51·02	−1·81	49·21	S		2 22·24	−1·32	20·92	31·71				
	1601	+15 54	S		5 2 53·50	−1·92	51·58	S		5 24·55	−1·33	23·22	31·64	m s 2 31·661	− 0·022	− 0·011	2 31·628
	1614	+32 33	N		5 41·31	−1·40	39·91	N		8 12·90	−1·31	11·59	31·68				
	1629	+33 38	N		8 31·00	−1·36	29·64	N		11 2·64	−1·31	1·33	31·69				
	1632	+33 37	N		9 12·15	−1·36	10·79	N		11 43·81	−1·31	42·50	31·71				
	1647	+19 27	S		11 19·29	−1·83	17·46	S		13 50·41	−1·32	49·09	31·63				
	1651	+19 41	S		11 56·93	−1·82	55·11	S		14 28·07	−1·32	26·75	31·64				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m 25s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $U_N - U_S = +0^s.041$, $H_N - H_S = +0.018$	$\delta L_N - \rho$
1880		° ′			h m s	s	s			h m s	s	s	m s				
Dec. 19	1365	+17 39	S	*I. P. W.*	4 16 46·08	+1·90	47·98	S	*I. P. W.*	4 19 18·17	+1·54	19·71	2 31·73				
	1376	+18 55	S	d c − 0·6	19 49·91	+1·93	51·84	S	d c − 1·0	22 21·98	+1·54	23·52	31·68				
	1391	+15 56	S	b + 2·6	21 54·85	+1·85	56·70	S	b + 5·5	24 26·89	+1·54	28·43	31·73				
	1394	+15 54	S	a −66·9	22 8·14	+1·85	9·99	S	a − 0·4	24 40·15	+1·54	41·69	31·70				
	1402	+15 36	S	s Q + 1·88	23 13·90	+1·84	15·74	S	s Q + 1·43	25 45·89	+1·54	47·43	31·69				
	1408	+28 43	N		25 21·09	+2·22	23·31	N		27 53·45	+1·54	54·99	31·68	m s 2 31·683	− 0·020	− 0·015	2 31·648
	1421	+ 9 55	S		27 17·05	+1·70	18·75	S		29 48·88	+1·53	50·41	31·66				
	1432	+15 48	S		29 30·76	+1·84	32·60	S		32 2·68	+1·54	4·22	31·62				
	1437	+15 41	S		30 38·11	+1·84	39·95	S		33 10·11	+1·54	11·65	31·70				
	1444	+28 23	N		32 2·81	+2·21	5·02	N		34 35·15	+1·54	36·69	31·67				
	1453	+23 52	N		34 11·50	+2·06	13·56	N		36 43·71	+1·54	45·25	31·69				
	1462	+28 26	N		36 32·73	+2·21	34·94	N		39 5·05	+1·54	6·59	31·65				
Dec. 19	1551	+21 25	N	*I. P. W.*	4 54 12·88	−1·76	11·12	S	*I. P. W.*	4 56 44·05	−1·32	42·73	2 31·61				
	1563	+19 38	S	d c − 0·6	56 45·18	−1·81	43·37	S	d c − 1·0	59 16·40	−1·32	15·08	31·71				
	1572	+24 7	N	b + 2·6	59 5·53	−1·69	3·84	N	b + 5·5	5 1 36·84	−1·32	35·52	31·68				
	1601	+15 54	S	a −66·9	5 3 5·52	−1·91	3·61	S	a − 0·4	5 36·56	−1·32	35·24	31·63				
	1614	+32 33	N	s Q − 1·88	5 53·34	−1·41	51·93	N	s Q − 1·43	8 24·91	−1·31	23·60	31·67	m s 2 31·648	− 0·020	− 0·008	2 31·620
	1629	+33 38	N		8 43·07	−1·37	41·70	N		11 14·66	−1·31	13·35	31·65				
	1632	+33 37	N		9 24·21	−1·37	22·84	N		11 55·81	−1·31	54·50	31·66				
	1647	+19 27	S		11 31·33	−1·82	29·51	S		14 2·39	−1·32	1·07	31·56				
	1651	+19 41	S		12 8·95	−1·81	7·14	S		14 40·12	−1·32	38·80	31·66				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

BOMBAY (E), *Lat. 18° 54′, Long. 4h 51m 25s* : AND DEESA (W), *Lat. 24° 16′, Long. 4h 48m 54s.*

Astronomical Date	Star		Transits Observed at E — *By Campbell, with Telescope No. 2*					Transits Observed at W — *By Heaviside, with Telescope No. 1*					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s{\cdot}041$ $H_N - H_S = +0{\cdot}018$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1880		° ′			h m s	s	s			h m s	s	s	m s				
Dec. 13	2111	+15 59	S	*I. P. E.*	6 22 29·56	+0·70	30·26	S	*I. P. E.*	6 25 0·18	+1·94	2·12	2 31·86				
	2134	+19 31	S	d c −27·1	25 20·86	+0·70	21·56	S	d c − 2·9	27 51·46	+1·96	53·42	31·86	m s 2 31·875	− 0·071	− 0·012	2 31·792
	2155	+39 30	N	b −22·8 a −28·7	28 8·19	+0·76	8·95	N	b + 6·3 a −14·2	30 38·73	+2·12	40·85	31·90				
	2170	+28 22	N	s Q +1·88	29 46·06	+0·73	46·79	N	s Q +1·91	32 16·65	+2·02	18·67	31·88				
Dec. 13	2255	+13 20	S	*I. P. E.*	6 45 43·01	−3·09	39·92	S	*I. P. E.*	6 48 13·63	−1·90	11·73	2 31·81				
	2271	+18 3	S	d c −27·1	48 34·37	−3·08	31·29	S	d c − 2·9	51 5·00	−1·87	3·13	31·84				
	2280	+16 6	S	b −22·8 a −28·7	50 47·89	−3·06	44·83	S	b + 6·3 a −14·2	53 18·54	−1·88	16·66	31·83				
	2285	+16 15	S	s Q −1·88	51 12·81	−3·06	9·75	S	s Q −1·91	53 43·44	−1·88	41·56	31·81				
	2301	+29 32	N		53 44·20	−3·02	41·18	N		56 14·77	−1·80	12·97	31·79	m s 2 31·829	− 0·071	− 0·014	2 31·744
	2318	+22 49	N		55 56·07	−3·04	53·03	N		58 26·67	−1·84	24·83	31·80				
	2329	+15 43	S		58 59·77	−3·07	56·70	S		7 1 30·53	−1·88	28·65	31·95				
	2340	+30 26	N		7 1 21·68	−3·01	18·67	N		3 52·26	−1·79	50·47	31·80				
	2356	+ 5 51	S		3 18·12	−3·15	14·97	S		5 48·79	−1·94	46·84	31·87				
	2374	+28 6	N		6 19·12	−3·04	16·08	N		8 49·68	−1·81	47·87	31·79				
Dec. 14	2038	+21 11	N	*I. P. E.*	6 12 30·60	+0·78	31·38	S	*I. P. E.*	6 15 1·52	+1·69	3·21	2 31·83				
	2059	+ 4 39	S	d c −27·1	15 50·82	+0·67	51·49	S	d c − 2·9	18 21·65	+1·64	23·29	31·80				
	2082	+30 34	N	b −20·8 a −27·8	19 18·62	+0·82	19·44	N	b − 4·8 a −11·7	21 49·57	+1·73	51·30	31·86				
	2099	− 0 30	S	s Q +1·90	21 6·09	+0·64	6·73	S	s Q +1·90	23 36·95	+1·62	38·57	31·84	m s 2 31·826	− 0·071	− 0·010	2 31·745
	2111	+15 59	S		23 10·09	+0·76	10·85	S		25 40·98	+1·68	42·66	31·81				
	2134	+19 31	S		26 1·41	+0·76	2·17	S		28 32·31	+1·70	34·01	31·84				
	2155	+39 30	N		28 48·72	+0·82	49·54	N		31 19·58	+1·78	21·36	31·82				
	2170	+28 22	N		30 26·61	+0·80	27·41	N		32 57·50	+1·72	59·22	31·81				

NOTE $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m 25s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	E: Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	W: Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s\!\cdot\!041$, $H_N - H_S = +0\cdot018$	$\delta L_N + \rho$
1880		° ′			h m s	s	s			h m s	s	s	m s				
Dec. 14	2271	+18 3	S	*I. P. E.*	6 49 14·95	−3·05	11·90	S	*I. P. E.*	6 51 45·88	−2·11	43·77	2 31·87				
	2280	+16 6	S	d c −27·1	51 28·43	−3·04	25·39	S	d c − 2·9	53 59·37	−2·12	57·25	31·86				
	2285	+16 15	S	b −20·8 a −27·8	51 53·41	−3·04	50·37	S	b − 4·8 a −11·7	54 24·30	−2·12	22·18	31·81				
	2301	+29 32	N	s	54 24·77	−3·00	21·77	N	s	56 55·63	−2·07	53·56	31·79	m s 2 31·816	− 0·071	− 0·012	2 31·733
	2313	+22 49	N	Q −1·90	56 36·62	−3·02	33·[illegible]	N	Q −1·90	59 7·57	−2·10	5·47	31·87				
	2340	+30 26	N		7 1 62·24	−2·99	59·25	N		7 4 33·03	−2·07	30·96	31·71				
	2356	+ 5 51	S		3 58·70	−3·12	55·58	S		6 29·57	−2·15	27·42	31·84				
	2374	+28 6	N		6 59·69	−3·01	56·68	N		9 30·54	−2·08	28·46	31·78				
Dec. 16	2059	+ 4 39	S	*I. P. E.*	6 17 10·58	+1·76	12·34	S	*I. P. E.*	6 19 42·55	+1·70	44·25	2 31·91				
	2082	+30 34	N	d c − 2·1	20 38·27	+2·04	40·31	N	d c − 2·9	23 10·50	+1·79	12·29	31·98				
	2111	+15 59	S	b + 2·4 a −24·6	24 29·85	+1·88	31·73	S	b − 4·4 a −11·2	27 1·81	+1·74	3·55	31·82	m s 2 31·893	− 0·071	− 0·012	2 31·810
	2134	+19 31	S	s	27 21·13	+1·92	23·05	S	s	29 53·16	+1·76	54·92	31·87				
	2155	+39 30	N	Q +1·90	30 8·28	+2·16	10·44	N	Q +1·95	32 40·49	+1·84	42·33	31·89				
	2170	+28 22	N		31 46·28	+2·01	48·29	N		34 18·40	+1·78	20·18	31·89				
Dec. 16	2255	+13 20	S	*I. P. E.*	6 47 43·33	−1·95	41·38	S	*I. P. E.*	6 50 15·40	−2·17	13·23	2 31·85				
	2271	+18 3	S	d c − 2·1	50 34·69	−1·90	32·79	S	d c − 2·9	53 6·75	−2·15	4·60	31·81				
	2280	+16 6	S	b + 2·4 a −24·6	52 48·19	−1·92	46·27	S	b − 4·4 a −11·2	55 20·28	−2·16	18·12	31·85				
	2285	+16 15	S	s	53 13·13	−1·92	11·21	S	s	55 45·26	−2·16	43·10	31·89	m s 2 31·866	− 0·071	− 0·015	2 31·780
	2301	+29 32	N	Q −1·90	55 44·39	−1·77	42·62	N	Q −1·95	58 16·66	−2·11	14·55	31·93				
	2313	+22 49	N		57 56·34	−1·85	54·49	N		7 0 28·51	−2·14	26·37	31·88				
	2356	+ 5 51	S		7 5 18·45	−2·03	16·42	S		7 50·46	−2·19	48·27	31·85				
	2374	+28 6	N		8 19·34	−1·79	17·55	N		10 51·54	−2·12	49·42	31·87				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m 25s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star		Transits Observed at E — By Campbell, with Telescope No. 2					Transits Observed at W — By Heaviside, with Telescope No. 1					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s{\cdot}041$, $H_N - H_S = +0^s{\cdot}018$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1880		° ′			h m s	s	s			h m s	s	s	m s				
Dec. 17	2039	+21 15	N	I. P. W.	6 14 37·80	+2·14	39·94	S	I. P. W.	6 17 9·57	+2·10	11·67	2 31·73				
	2059	+ 4 39	S	d c − 0·6	17 51·01	+1·63	52·64	S	d c + 4·0	20 22·36	+2·08	24·44	31·80				
	2082	+30 34	N	b + 7·6	21 18·11	+2·46	20·57	N	b + 4·2	23 50·43	+2·11	52·54	31·97				
	2099	− 0 30	S	a − 76·4	23 6·43	+1·47	7·90	S	a − 0·4	25 37·62	+2·08	39·70	31·80	m s 2 31·848	− 0·070	− 0·010	2 31·768
	2111	+15 59	S	s Q + 1·89	25 9·96	+1·97	11·93	S	s Q + 1·90	27 41·68	+2·09	43·77	31·84				
	2134	+19 31	S		28 1·13	+2·08	3·21	S		30 32·95	+2·10	35·05	31·84				
	2155	+39 30	N		30 47·82	+2·86	50·68	N		33 20·41	+2·14	22·55	31·87				
	2170	+28 22	N		32 26·09	+2·38	28·47	N		34 58·29	+2·11	60·40	31·93				
Dec. 17	2271	+18 3	S	I. P. W.	6 51 14·73	−1·75	12·98	S	I. P. W.	6 53 46·58	−1·70	44·88	2 31·90				
	2280	+16 6	S	d c − 0·6	53 28·27	−1·81	26·46	S	d c + 4·0	55 60·06	−1·71	58·35	31·89				
	2285	+16 15	S	b + 7·6	53 53·23	−1·80	51·43	S	b + 4·2	56 25·04	−1·71	23·33	31·90				
	2301	+29 32	N	a − 76·4	56 24·19	−1·35	22·84	N	a − 0·4	58 56·45	−1·69	54·76	31·92	m s 2 31·920	− 0·070	− 0·012	2 31·838
	2313	+22 49	N	s Q − 1·89	58 36·26	−1·59	34·67	N	s Q − 1·90	7 1 8·26	−1·70	6·56	31·89				
	2340	+30 26	N		7 4 1·60	−1·32	0·28	N		6 33·98	−1·69	32·29	32·01				
	2356	+ 5 51	S		5 58·74	−2·12	56·62	S		8 30·24	−1·72	28·52	31·90				
	2374	+28 6	N		8 59·16	−1·41	57·75	N		11 31·39	−1·69	29·70	31·95				
Dec. 18	2028	+23 31	N	I. P. W.	6 13 7·54	+2·02	9·56	N	I. P. W.	6 15 39·81	+1·53	41·34	2 31·78				
	2059	+ 4 39	S	d c − 0·6	18 31·03	+1·50	32·53	S	d c − 1·0	21 2·81	+1·51	4·32	31·79				
	2082	+30 34	N	b + 1·4	21 58·19	+2·25	60·44	N	b + 5·3	24 30·72	+1·54	32·26	31·82				
	2099	− 0 30	S	a − 69·7	23 46·42	+1·36	47·78	S	a − 1·4	26 17·99	+1·51	19·50	31·72	m s 2 31·795	− 0·070	− 0·006	2 31·719
	2111	+15 59	S	s Q + 1·86	25 50·02	+1·80	51·82	S	s Q + 1·43	28 22·16	+1·53	23·69	31·87				
	2134	+19 31	S		28 41·22	+1·90	43·12	S		31 13·44	+1·54	14·98	31·86				
	2155	+39 30	N		31 27·95	+2·59	30·54	N		34 0·73	+1·56	2·29	31·75				
	2170	+28 22	N		33 6·21	+2·17	8·38	N		35 38·61	+1·54	40·15	31·77				

Note. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m 25s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star		Transits Observed at E — *By Campbell, with Telescope No. 2*					Transits Observed at W — *By Heaviside, with Telescope No. 1*					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s{\cdot}041$, $H_N - H_S = +0{\cdot}018$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1880		° ′			h m s	s	s			h m s	s	s	m s				
Dec. 18	2255	+13 20	S	*I. P. W.*	6 49 3·56	−2·00	1·56	S	*I. P. W.*	6 51 34·56	−1·34	33·22	2 31·66				
	2271	+18 3	S	d c − 0·6	51 54·75	−1·87	52·88	S	d c − 1·0	54 25·93	−1·33	24·60	31·72				
	2280	+16 6	S	b + 1·4 a −69·7	54 8·32	−1·92	6·40	S	b + 5·3 a − 1·4	56 39·45	−1·33	38·12	31·72				
	2285	+16 15	S	s	54 33·26	−1·92	31·34	S	s	57 4·39	−1·33	3·06	31·72				
	2301	+29 32	N	Q −1·86	57 4·29	−1·51	2·78	N	Q −1·43	59 35·99	−1·32	34·67	31·89	m s 2 31·749	−0·070	−0·013	2 31·666
	2318	+22 49	N		59 16·34	−1·73	14·61	N		7 1 47·73	−1·32	46·41	31·80				
	2340	+30 26	N		7 4 41·78	−1·48	40·30	N		7 13·33	−1·32	12·01	31·71				
	2356	+ 5 51	S		6 38·77	−2·20	36·57	S		9 9·62	−1·35	8·27	31·70				
	2374	+28 6	N		9 39·23	−1·56	37·67	N		12 10·82	−1·33	9·49	31·82				
Dec. 19	2028	+23 31	N	*I. P. W.*	6 13 47·56	+2·06	49·62	N	*I. P. W.*	6 16 19·80	+1·53	21·33	2 31·71				
	2059	+ 4 39	S	d c − 0·6	19 11·00	+1·56	12·56	S	d c − 1·0	21 42·69	+1·53	44·22	31·66				
	2082	+30 34	N	b + 2·6 a −66·9	22 38·25	+2·28	40·53	N	b + 5·5 a − 0·4	25 10·78	+1·54	12·32	31·79				
	2099	− 0 30	S	s	24 26·41	+1·43	27·84	S	s	26 58·08	+1·52	59·60	31·76	m s 2 31·760	−0·070	−0·012	2 31·678
	2111	+15 59	S	Q +1·88	26 30·00	+1·85	31·85	S	Q +1·43	29 2·08	+1·54	3·62	31·77				
	2155	+39 30	N		32 7·95	+2·61	10·56	N		34 40·87	+1·56	42·43	31·87				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

DEESA (E), *Lat.* 24° 16′, *Long.* 4h 48m 54s : **AND KURRACHEE (W),** *Lat.* 24° 51′, *Long.* 4h 28m 13s.

Astronomical Date	Star		Transits Observed at E, By Heaviside, with Telescope No. 1					Transits Observed at W, By Campbell, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Peral. Equations $H_N - H_S = +0^s.013$, $O_N - O_S = +0.026$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 5	1541	+40 54	N	I. P. W.	4 54 52·97	+1·67	54·64	N	I. P. W.	5 15 25·14	+9·78	34·92	20 40·28				
	1551	+21 25	S	d c − 1·8	56 41·77	+1·58	43·35	S	d c + 4·1	17 13·78	+9·91	23·69	40·34				
	1563	+19 38	S	b + 1·5 a −10·1	59 14·00	+1·57	15·57	S	b +342·3 a +175·6	19 46·06	+9·93	55·99	40·42				
	1572	+24 7	N	s Q + 1·59	5 1 34·43	+1·58	36·01	N	s Q + 1·31	22 6·46	+9·88	16·34	40·33				
			S		1 34·47	+1·58	36·05	S		22 6·44	+9·88	16·32	40·27				
	1586	+19 42	S		2 31·87	+1·57	33·44	S		23 3·89	+9·93	13·82	40·38	m s 20 40·346	+0·108	+0·007	20 40·461
	1602	+38 20	N		6 0·32	+1·65	1·97	N		26 32·56	+9·80	42·36	40·39				
	1614	+32 33	N		8 22·44	+1·62	24·06	N		28 54·53	+9·86	64·39	40·33				
	1629	+33 38	N		11 12·20	+1·62	13·82	N		31 44·29	+9·84	54·13	40·31				
	1632	+33 37	N		11 53·36	+1·62	54·98	N		32 25·50	+9·84	35·34	40·36				
	1647	+19 27	S		13 59·93	+1·57	61·50	S		34 31·91	+9·95	41·86	40·36				
	1651	+19 41	S		14 37·53	+1·57	39·10	S		35 9·53	+9·95	19·48	40·38				
Jan. 5	1754	+26 51	N	I. P. W.	5 30 29·01	−1·59	27·42	N	I. P. W.	5 51 0·50	+7·26	7·76	20 40·34				
	1767	+21 4	S	d c − 1·8	31 17·87	−1·60	16·27	S	d c + 4·1	51 49·31	+7·29	56·60	40·33				
	1778	+25 50	N	b + 1·5 a −10·1	33 7·72	−1·59	6·13	N	b +342·3 a +175·6	53 39·28	+7·28	46·56	40·43				
	1793	+22 36	S	s Q − 1·59	35 38·23	−1·60	36·63	S	s Q − 1·31	56 9·71	+7·29	17·00	40·37				
	1801	+23 9	S		36 51·88	−1·59	50·29	S		57 23·35	+7·26	30·61	40·32				
	1810	+16 2	S		38 47·62	−1·63	45·99	S		59 19·22	+7·32	26·54	40·55	m s 20 40·427	+0·108	+0·008	20 40·543
	1829	+24 38	N		41 23·51	−1·60	21·91	N		6 1 55·12	+7·26	62·38	40·47				
	1837	+24 31	N		42 28·72	−1·60	27·12	N		3 0·27	+7·28	7·55	40·43				
	1852	+14 16	S		44 28·44	−1·64	26·80	S		4 59·88	+7·38	67·26	40·46				
	1853	+14 24	S		44 47·77	−1·64	46·13	S		5 19·34	+7·36	26·70	40·57				

Note. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

DEESA (E), *Lat.* 24° 16′, *Long.* 4h 48m 54s: AND KURRACHEE (W), *Lat.* 24° 51′, *Long.* 4h 28m 13s.

Astronomical Date	Star		Transits Observed at E — By Heaviside, with Telescope No. 1					Transits Observed at W — By Campbell, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}013$, $O_N - O_S = +0{\cdot}026$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 6	1551	+21 25	S	I. P. W.	4 56 33·99	+1·54	35·53	S	I. P. W.	5 17 14·53	+1·50	16·03	20 40·50				
	1563	+19 38	S	d c − 1·8	59 6·25	+1·53	7·78	S	d c − 0·9	19 46·71	+1·61	48·32	40·54				
	1572	+24 7	N	b + 0·4 a −13·9	5 1 26·76	+1·55	28·31	N	b + 0·6 a +146·1	22 7·34	+1·34	8·68	40·37				
			S	s Q +1·59	1 26·67	+1·55	28·22	S	s Q +1·31	22 7·36	+1·34	8·70	40·48				
	1586	+19 42	S		2 24·15	+1·53	25·68	S		23 4·54	+1·61	6·15	40·47				
	1602	+38 20	N		5 52·52	+1·65	54·17	N		26 34·37	+0·32	34·69	40·52	m s 20 40·483	+ 0·115	+ 0·007	20 40·605
	1614	+32 33	N		8 14·68	+1·60	16·28	N		28 55·95	+0·78	56·73	40·45				
	1629	+33 38	N		11 4·37	+1·61	5·98	N		31 45·76	+0·71	46·47	40·49				
	1632	+33 37	N		11 45·49	+1·61	47·10	N		32 26·88	+0·71	27·59	40·49				
	1647	+19 27	S		13 52·14	+1·53	53·67	S		34 32·58	+1·62	34·20	40·53				
	1651	+19 41	S		14 29·77	+1·53	31·30	S		35 10·16	+1·61	11·77	40·47				
Jan. 6	1754	+26 51	N	I. P. W.	5 30 21·20	−1·61	19·59	N	I. P. W.	5 51 1·51	−1·43	0·08	20 40·49				
	1767	+21 4	S	d c − 1·8	31 10·07	−1·64	8·43	S	d c − 0·9	51 50·01	−1·09	48·92	40·49				
	1778	+25 50	N	b + 0·4 a −13·9	32 59·97	−1·62	58·35	N	b + 0·6 a +146·1	53 40·23	−1·37	38·86	40·51				
	1793	+22 36	S	s Q −1·59	35 30·48	−1·63	28·85	S	s Q −1·31	56 10·49	−1·17	9·32	40·47				
	1801	+23 9	S		36 44·10	−1·63	42·47	S		57 24·13	−1·22	22·91	40·44				
	1810	+16 2	S		38 39·95	−1·67	38·28	N		59 19·64	−0·79	18·85	40·57	m s 20 40·522	+ 0·115	+ 0·005	20 40·642
	1829	+24 38	N		41 15·76	−1·63	14·13	N		6 1 55·96	−1·31	54·65	40·52				
	1837	+24 31	N		42 20·94	−1·63	19·31	N		2 61·17	−1·29	59·88	40·57				
	1852	+14 16	S		44 20·71	−1·68	19·03	S		4 60·27	−0·67	59·60	40·57				
	1853	+14 24	S		44 40·02	−1·68	38·34	S		5 19·64	−0·71	18·93	40·59				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

DEESA (E), *Lat.* 24° 16′, *Long.* 4ʰ 48ᵐ 54ˢ: AND KURRACHEE (W), *Lat.* 24° 51′, *Long.* 4ʰ 28ᵐ 13ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.013$, $C_N - C_S = +0.026$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 7	1541	+40 54	N	*I. P. W.*	4 54 37·20	+1·43	38·63	N	*I. P. W.*	5 15 18·89	+0·13	19·02	20 40·39				
	1551	+21 25	S	d c − 1·8	56 26·00	+1·34	27·34	S	d c − 0·9	17 6·28	+1·58	7·86	40·52				
	1563	+19 38	S	b + 0·3 a −10·3	58 58·26	+1·33	59·59	S	b + 2·7 a +149·7	19 38·43	+1·67	40·10	40·51				
	1572	+24 7	N	s Q +1·38	5 1 18·69	+1·34	20·03	N	s Q + 1·32	21 59·12	+1·41	60·53	40·50				
			S		1 18·66	+1·34	20·00	S		21 59·09	+1·41	60·50	40·50				
	1586	+19 42	S		2 16·09	+1·33	17·42	S		22 56·31	+1·67	57·98	40·56	m s 20 40·508	+0·120	+0·007	20 40·635
	1602	+38 20	N		5 44·55	+1·41	45·96	N		26 26·08	+0·37	26·45	40·49				
	1614	+32 33	N		8 6·63	+1·38	8·01	N		28 47·73	+0·83	48·56	40·55				
	1629	+33 38	N		10 56·36	+1·39	57·75	N		31 37·48	+0·76	38·24	40·49				
	1632	+33 37	N		11 37·47	+1·39	38·86	N		32 18·61	+0·76	19·37	40·51				
	1647	+19 27	S		13 44·19	+1·33	45·52	S		34 24·33	+1·69	26·02	40·50				
	1651	+19 41	S		14 21·75	+1·33	23·08	S		35 1·98	+1·67	3·65	40·57				
Jan. 7	1754	+26 51	N	*I. P. W.*	5 30 12·81	−1·41	11·40	N	*I. P. W.*	5 50 53·24	−1·39	51·85	20 40·45				
	1767	+21 4	S	d c − 1·8	31 1·65	−1·42	0·23	S	d c − 0·9	51 41·81	−1·04	40·77	40·54				
	1778	+25 50	N	b + 0·3 a −10·3	32 51·42	−1·41	50·01	S	b + 2·7 a +149·7	53 31·93	−1·33	30·60	40·59				
	1798	+22 36	S	s Q −1·38	35 22·00	−1·42	20·58	S	s Q − 1·32	56 2·30	−1·12	1·18	40·60				
	1801	+23 9	S		36 35·55	−1·41	34·14	S		57 16·02	−1·17	14·85	40·71	m s 20 40·600	+0·120	+0·012	20 40·732
	1810	+16 2	S		38 31·44	−1·45	29·99	S		59 11·41	−0·74	10·67	40·68				
	1829	+24 38	N		41 7·31	−1·42	5·89	N		6 1 47·77	−1·26	46·51	40·62				
	1837	+24 31	S		42 12·48	−1·42	11·06	S		2 52·87	−1·24	51·63	40·57				
	1852	+14 16	S		44 12·19	−1·45	10·74	S		4 51·95	−0·64	51·31	40·57				
	1853	+14 24	S		44 31·54	−1·45	30·09	S		5 11·41	−0·65	10·76	40·67				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

DEESA (E), *Lat.* 24° 16′, *Long.* 4h 48m 54s; AND KURRACHEE (W), *Lat.* 24° 51′, *Long.* 4h 28m 18s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	In-strumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	In-strumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Perl. Equations $H_N - H_S = +0^s.013$, $C_N - C_S = +0.026$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 8	1541	+40 54	N	*I. P. E.*	4 54 29·05	+1·29	30·34	N	*I. P. E.*	5 15 8·96	+1·46	10·42	20 40·08				
	1551	+21 25	S	d c − 0·5	56 17·76	+1·25	19·01	S	d c − 1·0	16 58·08	+1·15	59·23	40·22				
	1563	+19 38	S	b − 2·9 a − 5·7	58 49·95	+1·25	51·20	S	b − 4·9 a −35·4	19 30·37	+1·13	31·50	40·30				
	1572	+24 7	N	s Q +1·34	5 1 10·47	+1·26	11·73	N	s Q +1·34	21 50·71	+1·18	51·89	40·16				
			S		1 10·38	+1·26	11·64	S		21 50·77	+1·18	51·95	40·31				
	1602	+38 20	N		5 36·38	+1·29	37·67	N		26 16·38	+1·41	17·79	40·12	m s 20 40·186	+ 0·123	+ 0·007	20 40·316
	1629	+33 38	N		10 48·17	+1·28	49·45	N		31 28·25	+1·33	29·58	40·13				
	1632	+33 37	N		11 29·30	+1·28	30·58	N		32 9·40	+1·33	10·73	40·15				
	1647	+19 27	S		13 35·86	+1·25	37·11	S		34 16·22	+1·12	17·34	40·23				
	1651	+19 41	S		14 13·53	+1·25	14·78	S		34 53·81	+1·13	54·94	40·16				
Jan. 8	1754	+26 51	N	*I. P. E.*	5 30 4·40	−1·41	2·99	N	*I. P. E.*	5 50 44·73	−1·46	43·27	20 40·28				
	1767	+21 4	S	d c − 0·5	30 53·18	−1·43	51·75	S	d c − 1·0	51 33·63	−1·54	32·09	40·34				
	1778	+25 50	N	b − 2·9 a − 5·7	32 43·11	−1·42	41·69	S	b − 4·9 a −35·4	53 23·40	−1·48	21·92	40·23				
	1793	+22 36	S	s Q −1·34	35 13·58	−1·42	12·16	S	s Q −1·34	55 53·99	−1·52	52·47	40·31	m s 20 40·294	+ 0·123	+ 0·009	20 40·426
	1829	+24 38	N		40 58·98	−1·42	57·56	N		6 1 39·36	−1·49	37·87	40·31				
	1837	+24 31	N		42 4·22	−1·42	2·80	N		2 44·57	−1·50	43·07	40·27				
	1852	+14 16	S		44 3·84	−1·44	2·40	S		4 44·32	−1·62	42·70	40·30				
	1853	+14 24	S		44 23·22	−1·44	21·78	S		5 3·71	−1·62	2·09	40·31				
Jan. 9	1541	+40 54	N	*I. P. E.*	4 54 20·21	+1·37	21·58	N	*I. P. E.*	5 15 0·31	+1·48	1·79	20 40·21				
	1551	+21 25	S	d c − 0·5	56 9·08	+1·28	10·36	S	d c − 1·0	16 49·38	+1·22	50·60	40·24				
	1572	+24 7	N	b − 1·4 a −11·4	5 1 1·79	+1·29	3·08	N	b − 1·1 a −27·9	21 41·98	+1·24	43·22	40·14				
			S	s Q +1·33	1 1·76	+1·29	3·05	S	s Q +1·31	21 41·99	+1·24	43·23	40·18				
	1586	+19 42	S		1 59·13	+1·27	60·40	S		22 39·45	+1·20	40·65	40·25				
	1602	+38 20	N		5 27·67	+1·36	29·03	N		26 7·75	+1·44	9·19	40·16	m s 20 40·212	+ 0·129	+ 0·006	20 40·347
	1614	+32 33	N		7 49·71	+1·32	51·03	N		28 29·92	+1·35	31·27	40·24				
	1629	+33 38	N		10 39·42	+1·33	40·75	N		31 19·61	+1·36	20·97	40·22				
	1632	+33 37	N		11 20·59	+1·33	21·92	N		32 0·73	+1·36	2·09	40·17				
	1647	+19 27	S		13 27·16	+1·27	28·43	S		34 7·50	+1·20	8·70	40·27				
	1651	+19 41	S		14 4·79	+1·27	6·06	S		34 45·11	+1·20	46·31	40·25				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

DEESA (E), *Lat.* 24° 16′, *Long.* 4h 48m 54s: AND KURRACHEE (W), *Lat.* 24° 51′, *Long.* 4h 28m 13s.

Astronomical Date	Star		Transits Observed at E. *By Heaviside, with Telescope No. 1*					Transits Observed at W. *By Campbell, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.013$, $C_N - C_S = +0.026$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 9	1754	+26 51	N	I. P. E.	5 29 55·78	−1·37	54·41	N	I. P. E.	5 50 35·91	−1·35	34·56	20 40·15				
	1767	+21 4	S	d c − 0·5	30 44·58	−1·39	43·19	S	d c − 1·0	51 24·78	−1·40	23·38	40·19				
	1778	+25 50	N	b − 1·4 a − 11·4	32 34·46	−1·36	33·10	N	b − 1·1 a − 27·9	53 14·64	−1·36	13·28	40·18				
	1793	+22 36	S	s Q − 1·33	35 4·99	−1·38	3·61	S	s Q − 1·31	55 45·17	−1·39	43·78	40·17				
	1810	+16 2	S		38 14·42	−1·41	13·01	S		58 54·76	−1·46	53·30	40·29	m s 20 40·220	+ 0·129	+ 0·010	20 40·359
	1829	+24 38	N		40 50·34	−1·37	48·97	N		6 1 30·50	−1·37	29·13	40·16				
	1837	+24 31	N		41 55·54	−1·37	54·17	S		2 35·68	−1·38	34·30	40·13				
	1852	+14 16	S		43 55·14	−1·42	53·72	S		4 35·55	−1·48	34·07	40·35				
	1853	+14 24	S		44 14·50	−1·42	13·08	S		4 54·92	−1·48	53·44	40·36				
Jan. 10	1551	+21 25	S	I. P. E.	4 55 59·85	+1·23	61·08	S	I. P. E.	5 16 40·13	+1·23	41·36	20 40·28				
	1568	+19 38	S	d c − 0·5	58 32·08	+1·22	33·30	S	d c − 1·0	19 12·40	+1·22	13·62	40·32				
	1586	+19 42	S	b − 3·5 a − 10·2	5 1 49·98	+1·22	51·20	S	b − 2·3 a − 22·2	22 30·28	+1·22	31·50	40·30				
	1602	+38 20	N	s Q + 1·33	5 18·41	+1·29	19·70	N	s Q + 1·34	25 58·61	+1·40	60·01	40·31				
	1614	+32 33	N		7 40·54	+1·27	41·81	N		28 20·74	+1·33	22·07	40·26	m s 20 40·297	+ 0·137	+ 0·007	20 40·441
	1629	+33 38	N		10 30·23	+1·27	31·50	N		31 10·41	+1·34	11·75	40·25				
	1632	+33 37	N		11 11·37	+1·27	12·64	N		31 51·53	+1·34	52·87	40·23				
	1647	+19 27	S		13 17·97	+1·22	19·19	S		33 58·31	+1·22	59·53	40·34				
	1651	+19 41	S		13 55·59	+1·22	56·81	S		34 35·97	+1·22	37·19	40·38				
Jan. 10	1754	+26 51	N	I. P. E.	5 29 46·53	−1·42	45·11	N	I. P. E.	5 50 26·81	−1·41	25·40	20 40·29				
	1767	+21 4	S	d c − 0·5	30 35·41	−1·43	33·98	S	d c − 1·0	51 15·62	−1·46	14·16	40·18				
	1778	+25 50	N	b − 3·5 a − 10·2	32 25·36	−1·42	23·94	N	b − 2·3 a − 22·2	53 5·53	−1·42	4·11	40·17				
	1793	+22 36	S	s Q − 1·33	34 55·88	−1·44	54·44	S	s Q − 1·34	55 36·02	−1·44	34·58	40·14				
	1801	+23 9	S		36 9·46	−1·43	8·03	S		56 49·66	−1·44	48·22	40·19	m s 20 40·221	+ 0·137	+ 0·009	20 40·367
	1810	+16 2	S		38 5·30	−1·45	3·85	S		58 45·57	−1·49	44·08	40·23				
	1829	+24 38	N		40 41·21	−1·43	39·78	N		6 1 21·38	−1·43	19·95	40·17				
	1837	+24 31	S		41 46·36	−1·43	44·93	S		2 26·55	−1·43	25·12	40·19				
	1852	+14 16	S		43 45·99	−1·46	44·53	S		4 26·37	−1·51	24·86	40·33				
	1853	+14 24	S		44 5·31	−1·46	3·85	S		4 45·67	−1·50	44·17	40·32				

Note. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

DEESA (E), *Lat.* 24° 16′, *Long.* 4ʰ 48ᵐ 54ˢ: AND KURRACHEE (W), *Lat.* 24° 51′, *Long.* 4ʰ 28ᵐ 13ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Heaviside, with Telescope No. 1: Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W, By Campbell, with Telescope No. 2: Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Peral. Equations $H_N - H_S = +0^s{\cdot}013$, $O_N - O_S = +0{\cdot}026$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 5	2058	+25 6	N	*I. P. W.*	5 54 4·06	+1·58	5·64	N	*I. P. W.*	6 14 36·45	+9·88	46·33	20 40·69				
			S	c − 1·8 (d)	54 4·13	+1·58	5·71	S	c + 4·1 (d)	14 36·31	+9·88	46·19	40·48				
	2080	+20 51	S	b + 1·5; a −10·1	57 21·11	+1·57	22·68	S	b +342·3; a +175·6	17 53·33	+9·93	63·26	40·58	m s 20 40·598	− 0·035	+ 0·007	20 40·570
	2090	+20 17	S	Q +1·59 (s)	58 33·94	+1·57	35·51	S	Q +1·31 (s)	19 6·13	+9·92	16·05	40·54				
	2110	+32 32	N		6 1 21·53	+1·62	23·15	N		21 53·96	+9·86	63·82	40·67				
	2130	+31 31	N		4 0·22	+1·61	1·83	N		24 32·61	+9·85	42·46	40·63				
Jan. 5	2239	+38 35	N	*I. P. W.*	6 21 47·47	−1·53	45·94	N	*I. P. W.*	6 42 19·34	+7·20	26·54	20 40·60				
	2241	+38 39	N	c − 1·8 (d)	22 31·24	−1·53	29·71	N	c + 4·1 (d)	43 3·22	+7·18	10·40	40·69				
	2254	+25 31	N	b + 1·5; a −10·1	24 42·93	−1·59	41·34	N	b +342·3; a +175·6	45 14·76	+7·26	22·02	40·68				
	2265	+17 53	S	Q −1·59 (s)	26 4·43	−1·62	2·81	S	Q −1·31 (s)	46 36·23	+7·32	43·55	40·74				
	2280	+16 6	S		29 43·78	−1·63	42·15	S		50 15·45	+7·32	22·77	40·62	m s 20 40·642	− 0·035	+ 0·006	20 40·613
	2285	+16 15	S		30 8·64	−1·63	7·01	S		50 40·37	+7·33	47·70	40·69				
	2301	+29 32	N		32 40·14	−1·58	38·56	N		53 11·88	+7·26	19·14	40·58				
	2305	+20 44	S		33 46·35	−1·61	44·74	S		54 18·04	+7·31	25·35	40·61				
	2314	+34 39	N		35 4·56	−1·55	3·01	N		55 36·38	+7·20	43·58	40·57				
Jan. 6	2038	+21 11	S	*I. P. W.*	5 50 49·74	+1·54	51·28	S	*I. P. W.*	6 11 30·58	+1·52	32·10	20 40·82				
	2039	+21 15	S	c − 1·8 (d)	50 57·16	+1·54	58·70	S	c − 0·9 (d)	11 38·02	+1·52	39·54	40·84				
	2058	+25 6	N	b + 0·4; a −13·9	54 6·35	+1·56	7·91	N	b + 0·6; a +146·1	14 47·39	+1·29	48·68	40·77				
			S	Q +1·59 (s)	54 6·32	+1·56	7·88	S	Q +1·31 (s)	14 47·40	+1·29	48·69	40·81				
	2080	+20 51	S		57 23·42	+1·54	24·96	S		18 4·13	+1·55	5·68	40·72				
	2090	+20 17	S		58 36·14	+1·54	37·68	S		19 16·92	+1·58	18·50	40·82	m s 20 40·801	− 0·035	+ 0·008	20 40·774
	2110	+32 32	N		6 1 23·79	+1·60	25·39	N		22 5·44	+0·78	6·22	40·83				
	2130	+31 31	N		4 2·43	+1·60	4·03	N		24 44·01	+0·86	44·87	40·84				
	2140	+16 18	S		4 44·38	+1·51	45·89	S		25 24·88	+1·81	26·69	40·80				
	2154	+24 41	N		6 51·92	+1·55	53·47	N		27 32·98	+1·31	34·29	40·82				
			S		6 51·94	+1·55	53·49	S		27 32·92	+1·31	34·23	40·74				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

 TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

DEESA (E), *Lat. 24° 16′, Long. 4h 48m 54s*: AND KURRACHEE (W), *Lat. 24° 51′, Long. 4h 28m 13s*.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No. 1*					Transits Observed at W — *By Campbell, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = + 0^s{\cdot}013$, $C_N - C_S = + 0{\cdot}026$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 6	2239	+38 35	N	I. P. W.	6 21 49·67	−1·53	48·14	N	I. P. W.	6 42 31·26	−2·33	28·93	20 40·79				
	2241	+38 39	N	d; c − 1·8	22 33·46	−1·53	31·93	N	d; c − 0·9	43 15·14	−2·33	12·81	40·88				
	2254	+25 31	N	b + 0·4; a −13·9	24 45·21	−1·62	43·59	N	b + 0·6; a +146·1	45 25·75	−1·36	24·39	40·80				
	2271	+18 3	S	s; Q −1·59	27 32·57	−1·66	30·91	S	s; Q −1·31	48 12·69	−0·91	11·78	40·87	m s; 20 40·817	− 0·035	+ 0·004	20 40·786
	2301	+29 32	N		32 42·42	−1·60	40·82	N		53 23·19	−1·62	21·57	40·75				
	2305	+20 44	S		33 48·60	−1·64	46·96	S		54 28·84	−1·09	27·75	40·79				
	2314	+34 39	N		35 6·79	−1·56	5·23	N		55 48·05	−1·98	46·07	40·84				
Jan. 7	2088	+21 11	S	I. P. W.	5 50 52·61	+1·34	53·95	S	I. P. W.	6 11 33·09	+1·58	34·67	20 40·72				
	2089	+21 15	S	d; c − 1·8	50 59·95	+1·34	61·29	S	d; c − 0·9	11 40·49	+1·59	42·08	40·79				
	2058	+25 6	N	b + 0·3; a −10·3	54 9·14	+1·34	10·48	N	b + 2·7; a +149·7	14 49·93	+1·36	51·29	40·81				
			S	s; Q +1·38	54 9·14	+1·34	10·48	S	s; Q +1·32	14 49·90	+1·36	51·26	40·78				
	2080	+20 51	S		57 26·13	+1·33	27·46	S		18 6·62	+1·59	8·21	40·75				
	2084	+20 34	S		57 37·14	+1·33	38·47	S		18 17·61	+1·63	19·24	40·77	m s; 20 40·781	− 0·035	+ 0·008	20 40·754
	2090	+20 17	S		58 38·93	+1·33	40·26	S		19 19·39	+1·64	21·03	40·77				
	2110	+32 32	N		6 1 26·62	+1·38	28·00	N		22 7·96	+0·83	8·79	40·79				
	2130	+31 31	N		4 5·21	+1·38	6·59	N		24 46·49	+0·91	47·40	40·81				
	2154	+24 41	N		6 54·75	+1·34	56·09	N		27 35·52	+1·38	36·90	40·81				
			S		6 54·69	+1·34	56·03	S		27 35·44	+1·38	36·82	40·79				
Jan. 7	2239	+38 35	N	I. P. W.	6 21 52·01	−1·35	50·66	N	I. P. W.	6 42 33·79	−2·30	31·49	20 40·83				
	2241	+38 39	N	d; c − 1·8	22 35·84	−1·35	34·49	N	d; c − 0·9	43 17·62	−2·30	15·32	40·83				
	2254	+25 31	N	b + 0·3; a −10·3	24 47·53	−1·41	46·12	N	b + 2·7; a +149·7	45 28·26	−1·31	26·95	40·83				
	2265	+17 53	S	s; Q −1·38	26 9·08	−1·44	7·64	S	s; Q −1·32	46 49·34	−0·86	48·48	40·84				
	2271	+18 3	S		27 34·87	−1·44	33·43	S		48 15·10	−0·86	14·24	40·81	m s; 20 40·857	− 0·035	+ 0·006	20 40·828
	2280	+16 6	S		29 48·37	−1·45	46·92	S		50 28·52	−0·74	27·78	40·86				
	2301	+29 32	N		32 44·58	−1·40	43·18	N		53 25·68	−1·58	24·10	40·92				
	2305	+20 44	S		33 50·89	−1·43	49·46	S		54 31·33	−1·03	30·30	40·84				
	2314	+34 39	N		35 9·01	−1·37	7·64	N		55 50·55	−1·96	48·59	40·95				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

DEESA (E), *Lat.* 24° 16′, *Long.* 4h 48m 54s: AND KURRACHEE (W), *Lat.* 24° 51′, *Long.* 4h 28m 18s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}013$, $C_N - C_S = +0{\cdot}026$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 8	2038	+ 21 11	S	I. P. E.	5 50 54·29	+ 1·25	55·54	S	I. P. E.	6 11 34·87	+ 1·15	36·02	20 40·48				
	2039	+ 21 15	S	d; c − 0·5	51 1·62	+ 1·25	2·87	S	d; c − 1·0	11 42·27	+ 1·15	43·42	40·55				
	2058	+ 25 6	S	b − 2·9; a − 5·7	54 10·76	+ 1·26	12·02	S	b − 4·9; a − 35·4	14 51·39	+ 1·19	52·58	40·56				
	2080	+ 20 51	S	s; Q + 1·34	57 27·80	+ 1·25	29·05	S	s; Q + 1·34	18 8·38	+ 1·14	9·52	40·47				
	2084	+ 20 34	S		57 38·78	+ 1·25	40·03	S		18 19·46	+ 1·14	20·60	40·57	m s 20 40·520	− 0·017	+ 0·010	20 40·513
	2090	+ 20 17	S		58 40·56	+ 1·25	41·81	S		19 21·22	+ 1·13	22·35	40·54				
	2110	+ 32 32	N		6 1 28·35	+ 1·27	29·62	N		22 8·77	+ 1·31	10·08	40·46				
	2130	+ 31 31	N		4 6·96	+ 1·27	8·23	N		24 47·39	+ 1·29	48·68	40·45				
	2140	+ 16 18	S		4 48·76	+ 1·24	50·00	S		25 29·48	+ 1·09	30·57	40·57				
	2154	+ 24 41	S		6 56·39	+ 1·26	57·65	S		27 37·00	+ 1·20	38·20	40·55				
Jan. 8	2239	+ 38 35	N	I. P. E.	6 21 53·70	− 1·39	52·31	N	I. P. E.	6 42 34·07	− 1·27	32·80	20 40·49				
	2241	+ 38 39	N	d; c − 0·5	22 37·53	− 1·39	36·14	N	d; c − 1·0	43 17·87	− 1·27	16 60	40·46				
	2254	+ 25 31	N	b − 2·9; a − 5·7	22 49·21	− 1·42	47·79	N	b − 4·9; a − 35·4	43 29·74	− 1·48	28·26	40·47				
	2265	+ 17 53	S	s; Q − 1·34	26 10·71	− 1·43	9·28	S	s; Q − 1·34	46 51·36	− 1·58	49·78	40·50				
	2271	+ 18 3	S		27 36·53	− 1·43	35·10	S		48 17·20	− 1·58	15·62	40·52	m s 20 40·506	− 0·017	+ 0·007	20 40·496
	2280	+ 16 6	S		29 49·94	− 1·44	48·50	S		50 30·66	− 1·60	29·06	40·56				
	2285	+ 16 15	S		30 14·91	− 1·44	13·47	S		50 55·58	− 1·59	53·99	40·52				
	2305	+ 20 44	S		33 52·56	− 1·43	51·13	S		54 33·22	− 1·54	31·68	40·55				
	2314	+ 34 39	N		35 10·77	− 1·40	9·37	N		55 51·19	− 1·34	49·85	40·48				
Jan. 9	2038	+ 21 11	S	I. P. E.	5 50 55·63	+ 1·28	56·91	S	I. P. E.	6 11 36·15	+ 1·22	37·37	20 40·46				
	2039	+ 21 15	S	d; c − 0·5	51 3·03	+ 1·28	4·31	S	d; c − 1·0	11 43·56	+ 1·22	44·78	40·47				
	2058	+ 25 6	N	b − 1·4; a − 11·4	54 12·18	+ 1·29	13·47	N	b − 1·1; a − 27·9	14 52·71	+ 1·25	53·96	40·49				
			S	s; Q + 1·33	54 12·20	+ 1·29	13·49	S	s; Q + 1·31	14 52·68	+ 1·25	53·93	40·44				
	2080	+ 20 51	S		57 29·23	+ 1·27	30·50	S		18 9·73	+ 1·21	10·94	40·44				
	2084	+ 20 34	S		57 40·14	+ 1·27	41·41	S		18 20·76	+ 1·21	21·97	40·56	m s 20 40·481	− 0·017	+ 0·009	20 40·473
	2090	+ 20 17	S		58 41·96	+ 1·27	43·23	S		19 22·50	+ 1·21	23·71	40·48				
	2110	+ 32 32	N		6 1 29·68	+ 1·32	31·00	N		22 10·13	+ 1·35	11·48	40·48				
	2130	+ 31 31	N		4 8·31	+ 1·32	9·63	N		24 48·79	+ 1·34	50·13	40·50				
	2140	+ 16 18	S		4 50·15	+ 1·25	51·40	S		25 30·79	+ 1·16	31·95	40·55				
	2154	+ 24 41	N		6 57·79	+ 1·29	59·08	N		27 38·27	+ 1·25	39·52	40·44				
			S		6 57·78	+ 1·29	59·07	S		27 38·28	+ 1·25	39·53	40·46				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

DEESA (E), *Lat.* 24° 16′, *Long.* 4h 48m 54s: AND KURRACHEE (W), *Lat.* 24° 51′, *Long.* 4h 28m 13s.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No.* 1					Transits Observed at W — *By Campbell, with Telescope No.* 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.013$, $O_N - O_S = +0^s.026$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 9	2239	+38 35	N	I. P. E.	6 21 54·90	−1·30	53·60	N	I. P. E.	6 42 35·28	−1·18	34·10	20 40·50				
	2241	+38 39	N	d; c − 0·5	22 38·79	−1·30	37·49	N	d; c − 1·0	43 19·17	−1·18	17·99	40·50				
	2254	+25 31	N	b − 1·4; a −11·4	24 50·47	−1·36	49·11	N	b − 1·1; a −27·9	45 30·91	−1·36	29·55	40·44				
	2265	+17 53	S	s; Q −1·33	26 11·98	−1·40	10·58	S	s; Q −1·31	46 52·55	−1·44	51·11	40·53				
	2271	+18 3	S		27 37·73	−1·40	36·33	S		48 18·37	−1·44	16·93	40·60				
	2280	+16 6	S		29 51·26	−1·41	49·85	S		50 31·84	−1·46	30·38	40·53	m s 20 40·523	−0·017	+0·007	20 40·513
	2285	+16 15	S		30 16·16	−1·41	14·75	S		50 56·78	−1·46	55·32	40·57				
	2301	+29 32	N		32 47·57	−1·35	46·22	N		53 28·04	−1·31	26·73	40·51				
	2305	+20 44	S		33 53·81	−1·39	52·42	S		54 34·35	−1·41	32·94	40·52				
	2314	+34 39	N		35 12·00	−1·32	10·68	N		55 52·45	−1·24	51·21	40·53				
Jan. 10	2058	+25 6	N	I. P. E.	5 54 12·92	+1·23	14·15	N	I. P. E.	6 14 53·42	+1·25	54·67	20 40·52				
			S	d; c − 0·5	54 12·89	+1·23	14·12	S	d; c − 1·0	14 53·42	+1·25	54·67	40·55				
	2080	+20 51	S	b − 3·5; a −10·2	57 29·87	+1·22	31·09	S	b − 2·3; a −22·2	18 10·40	+1·22	11·62	40·53				
	2084	+20 34	S	s; Q +1·33	57 40·84	+1·22	42·06	S	s; Q +1·34	18 21·38	+1·22	22·60	40·54				
	2090	+20 17	S		58 42·62	+1·22	43·84	S		19 23·23	+1·23	24·46	40·62				
	2110	+32 32	N		6 1 30·48	+1·27	31·75	N		22 10·83	+1·33	12·16	40·41	m s 20 40·517	−0·017	+0·008	20 40·508
	2130	+31 31	N		4 9·11	+1·26	10·37	N		24 49·50	+1·32	50·82	40·45				
	2140	+16 18	S		4 50·84	+1·21	52·05	S		25 31·40	+1·19	32·59	40·54				
	2154	+24 41	N		6 58·47	+1·23	59·70	N		27 38·97	+1·25	40·22	40·52				
			S		6 58·53	+1·23	59·76	S		27 39·00	+1·25	40·25	40·49				
Jan. 10	2239	+38 35	N	I. P. E.	6 21 55·65	−1·37	54·28	N	I. P. E.	6 42 36·19	−1·28	34·91	20 40·63				
	2241	+38 39	N	d; c −·0·5	22 39·49	−1·37	38·12	N	d; c − 1·0	43 20·04	−1·28	18·76	40·64				
	2254	+25 31	N	b − 3·5; a −10·2	24 51·17	−1·42	49·75	N	b − 2·3; a −22·2	45 31·72	−1·42	30·30	40·55				
	2265	+17 53	S	s; Q −1·33	26 12·64	−1·45	11·19	S	s; Q −1·34	46 53·28	−1·47	51·81	40·62				
	2271	+18 3	S		27 38·48	−1·45	37·03	S		48 19·15	−1·47	17·68	40·65	m s 20 40·616	−0·017	+0·006	20 40·605
	2285	+16 15	S		30 16·86	−1·45	15·41	S		50 57·53	−1·49	56·04	40·63				
	2301	+29 32	N		32 48·29	−1·41	46·88	N		53 28·84	−1·38	27·46	40·58				
	2305	+20 44	S		33 54·50	−1·44	53·06	S		54 35·13	−1.45	33·68	40·62				
	2314	+34 39	N		35 12·69	−1·38	11·31	N		55 53·26	−1·33	51·93	40·62				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m 25s: AND KURRACHEE (W), *Lat.* 24° 51′, *Long.* 4h 28m 18s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.026$, $O_N - O_S = +0^s.056$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 17	2239	+38 35	N	I. P. E.	6 46 54·98	+1·50	56·48	N	I. P. E.	7 10 6·75	+1·39	8·14	23 11·66				
	2241	+38 39	N	d c − 5·2	47 38·83	+1·50	40·33	N	d c − 0·8	10 50·61	+1·39	52·00	11·67				
	2254	+25 31	N	b − 5·2 a − 7·3	49 50·38	+1·48	51·86	N	b − 0·3 a − 3·0	13 2·22	+1·37	3·59	11·73				
	2265	+17 53	S	s Q + 1·72	51 11·86	+1·48	13·34	S	s Q + 1·40	14 23·68	+1·36	25·04	11·70				
	2280	+16 6	S		54 51·14	+1·47	52·61	S		18 2·94	+1·36	4·30	11·69	m s 23 11·728	+ 0·327	+ 0·013	23 12·068
	2285	+16 15	S		55 15·96	+1·47	17·43	S		18 27·87	+1·36	29·23	11·80				
	2301	+29 33	N		57 47·39	+1·49	48·88	N		20 59·29	+1·38	60·67	11·79				
	2304	+ 9 19	S		58 37·86	+1·45	39·31	S		21 49·68	+1·35	51·03	11·72				
	2314	+34 39	N		7 0 11·78	+1·50	13·28	N		23 23·68	+1·39	25·07	11·79				
Jan. 17	2444	+11 54	S	I. P. E.	7 20 15·16	−1·98	13·18	S	I. P. E.	7 43 26·33	−1·45	24·88	23 11·70				
	2480	+ 2 10	S	d c − 5·2	27 48·45	−1·99	46·46	S	d c − 0·8	50 59·67	−1·46	58·21	11·75				
	2493	+27 10	N	b − 5·2 a − 7·3	30 29·12	−1·95	27·17	N	b − 0·3 a − 3·0	53 40·29	−1·43	38·86	11·69	m s 23 11·697	+ 0·327	+ 0·034	23 12·058
	2499	+20 25	S	s Q − 1·72	31 59·31	−1·95	57·36	S	s Q − 1·40	55 10·49	−1·44	9·05	11·69				
	2506	+24 38	N		32 55·97	−1·96	54·01	S		56 7·16	−1·43	5·73	11·72				
	2514	+24 29	N		33 54·31	−1·96	52·35	S		57 5·41	−1·43	3·98	11·63				
Jan. 18	2254	+25 31	N	I. P. E.	6 49 30·09	+1·53	31·62	N	I. P. E.	7 12 41·97	+1·39	43·36	23 11·74				
	2265	+17 53	S	d c − 5·2	50 51·58	+1·55	53·13	S	d c − 0·8	14 3·43	+1·41	4·84	11·71				
	2271	+18 3	S	b − 2·2 a + 2·1	52 17·44	+1·55	18·99	S	b + 1·2 a + 7·0	15 29·27	+1·41	30·68	11·69				
	2280	+16 6	S	s Q + 1·72	54 30·80	+1·55	32·35	S	s Q + 1·38	17 42·67	+1·42	44·09	11·74	m s 23 11·724	+ 0·326	+ 0·019	23 12·069
	2285	+16 15	S		54 55·76	+1·55	57·31	S		18 7·58	+1·41	8·99	11·68				
	2301	+29 33	N		57 27·16	+1·51	28·67	N		20 39·01	+1·38	40·39	11·72				
	2304	+ 9 19	S		58 17·48	+1·56	19·04	S		21 29·35	+1·43	30·78	11·74				
	2314	+34 39	N		59 51·54	+1·50	53·04	N		23 3·45	+1·36	4·81	11·77				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m 25s: AND KURRACHEE (W), *Lat.* 24° 51′, *Long.* 4h 28m 18s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference of Corrected Times (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}026$, $C_N - C_S = +0^s{\cdot}056$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 18	2431	+25 17	N	I. P. E.	7 17 46·87	−1·91	44·96	N	I. P. E.	7 40 58·01	−1·37	56·64	23 11·68				
	2444	+11 54	S	d c − 5·2	19 54·82	−1·88	52·94	S	d c − 0·8	43 5·99	−1·33	4·66	11·72				
	2462	+ 8 32	S	b − 2·2	22 15·05	−1·88	13·17	S	b + 1·2	45 26·16	−1·33	24·83	11·66				
	2468	+ 9 10	S	a + 2·1	23 14·19	−1·88	12·31	S	a + 7·0	46 25·36	−1·33	24·03	11·72				
	2478	+12 15	S	s Q − 1·72	24 43·56	−1·88	41·68	S	s Q − 1·38	47 54·67	−1·33	53·34	11·66				
	2480	+ 2 10	S		27 28·14	−1·88	26·26	S		50 39·23	−1·32	37·91	11·65	m s 23 11·659	+ 0·326	+ 0·032	23 12·017
	2493	+27 10	N		30 8·84	−1·91	6·93	N		53 19·95	−1·38	18·57	11·64				
	2499	+20 25	N		31 38·99	−1·89	37·10	S		54 50·10	−1·36	48·74	11·64				
	2506	+24 38	N		32 35·70	−1·91	33·79	S		55 46·78	−1·37	45·41	11·62				
	2514	+24 29	N		33 33·97	−1·91	32·06	S		56 45·03	−1·37	43·66	11·60				
Jan. 19	2239	+38 35	N	I. P. E.	6 46 14·55	+1·52	16·07	N	I. P. E.	7 9 26·50	+1·32	27·82	23 11·75				
	2241	+38 39	N	d c − 5·2	46 58·35	+1·52	59·87	N	d c − 0·8	10 10·34	+1·32	11·66	11·79				
	2254	+25 31	N	b + 1·8	49 9·83	+1·60	11·43	N	b + 1·4	12 21·82	+1·40	23·22	11·79				
	2265	+17 53	S	a +10·0	50 31·34	+1·64	32·98	S	a +12·4	13 43·26	+1·43	44·69	11·71				
	2271	+18 3	S	s Q + 1·72	51 57·11	+1·64	58·75	S	s Q + 1·39	15 9·08	+1·43	10·51	11·76	m s 23 11·791	+ 0·322	+ 0·013	23 12·126
	2280	+16 6	S		54 10·43	+1·65	12·08	S		17 22·52	+1·44	23·96	11·88				
	2301	+29 33	N		57 6·83	+1·58	8·41	N		20 18·92	+1·38	20·30	11·89				
	2304	+ 9 19	S		57 57·14	+1·68	58·82	S		21 9·22	+1·47	10·69	11·87				
	2314	+34 39	N		59 31·39	+1·55	32·94	N		22 43·27	+1·35	44·62	11·68				
Jan. 19	2431	+25 17	N	I. P. E.	7 17 26·51	−1·84	24·67	N	I. P. E.	7 40 37·84	−1·38	36·46	23 11·79				
	2444	+11 54	S	d c − 5·2	19 34·52	−1·77	32·75	S	d c − 0·8	42 45·82	−1·32	44·50	11·75				
	2462	+ 8 32	S	b + 1·8	21 54·70	−1·76	52·94	S	b + 1·4	45 6·00	−1·30	4·70	11·76				
	2468	+ 9 10	S	a +10·0	22 53·83	−1·76	52·07	S	a +12·4	46 5·19	−1·30	3·89	11·82	m s 23 11·756	+ 0·322	+ 0·021	23 12·099
	2478	+12 15	S	s Q − 1·72	24 23·24	−1·77	21·47	S	s Q − 1·39	47 34·54	−1·32	33·22	11·75				
	2480	+ 2 10	S		27 7·83	−1·74	6·09	S		50 19·05	−1·27	17·78	11·69				
	2514	+24 29	N		33 13·65	−1·83	11·82	N		56 24·93	−1·38	23·55	11·73				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

BOMBAY (E), *Lat. 18° 54′, Long. 4ʰ 51ᵐ 25ˢ*: AND KURRACHEE (W), *Lat. 24° 51′, Long. 4ʰ 28ᵐ 13ˢ*.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No. 1*					Transits Observed at W — *By Campbell, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}026$, $C_N - C_S = +0{\cdot}056$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 20	2241	+38 39	N	*I. P. W.*	6 46 38·28	+1·71	39·99	N	*I. P. W.*	7 9 50·41	+1·34	51·75	23 11·76				
	2254	+25 31	N	d	48 49·74	+1·84	51·58	N	d	12 1·84	+1·47	3·31	11·73				
	2265	+17 53	S	c + 2·1 b + 4·8 a + 20·7	50 11·13	+1·89	13·02	S	c − 2·3 b + 6·4 a + 22·3	13 23·31	+1·53	24·84	11·82				
	2271	+18 3	S	s	51 37·01	+1·89	38·90	S	s	14 49·16	+1·53	50·69	11·79				
	2280	+16 6	S	Q + 1·72	53 50·46	+1·90	52·36	S	Q + 1·38	17 2·54	+1·56	4·10	11·74	m s 23 11·796	+ 0·319	+ 0·017	23 12·132
	2285	+16 15	S		54 15·33	+1·90	17·23	S		17 27·49	+1·56	29·05	11·82				
	2301	+29 33	N		56 46·80	+1·79	48·59	N		19 58·97	+1·44	60·41	11·82				
	2304	+ 9 19	S		57 37·08	+1·96	39·04	S		20 49·29	+1·61	50·90	11·86				
	2314	+34 39	N		59 11·24	+1·76	13·00	N		22 23·43	+1·39	24·82	11·82				
Jan. 20	2431	+25 17	N	*I. P. W.*	7 17 6·45	−1·61	4·84	N	*I. P. W.*	7 40 17·88	−1·28	16·60	23 11·76				
	2444	+11 54	S	d	19 14·38	−1·50	12·88	S	d	42 25·82	−1·18	24·64	11·76				
	2462	+ 8 32	S	c + 2·1 b + 4·8 a + 20·7	21 34·62	−1·48	33·14	S	c − 2·3 b + 6·4 a + 22·3	44 46 06	−1·15	44·91	11·77				
	2468	+ 9 10	S	s	22 33·83	−1·48	32·35	S	s	45 45·25	−1·15	44·10	11·75				
	2473	+12 15	S	Q − 1·72	24 3·20	−1·50	1·70	S	Q − 1·38	47 14·58	−1·18	13·40	11·70	m s 23 11·746	+ 0·319	+ 0·021	23 12·086
	2480	+ 2 10	S		26 47·68	−1·44	46·24	S		49 59·12	−1·11	58·01	11·77				
	2493	+27 10	N		29 28·50	−1·63	26·87	N		52 39·96	−1·30	38·66	11·79				
	2499	+20 25	N		30 58·67	−1·56	57·10	S		54 10·02	−1·25	8·77	11·67				
	2506	+24 38	N		31 55·33	−1·60	53·73	N		55 6·77	−1·28	5·49	11·76				
	2514	+24 29	N		32 53·62	−1·60	52·02	N		56 5·03	−1·28	3·75	11·73				
Jan. 21	2239	+38 35	N	*I. P. W.*	6 45 34·81	+1·66	36·47	N	*I. P. W.*	7 8 47·11	+1·16	48·27	23 11·80				
	2241	+38 39	N	d	46 18·67	+1·66	20·33	N	d	9 30·93	+1·16	32·09	11·76				
	2254	+25 31	N	c + 2·1 b + 3·8 a + 21·4	48 30·07	+1·79	31·86	N	c − 2·3 b − 0·1 a + 17·3	11 42·39	+1·28	43·67	11·81				
	2265	+17 53	S	s	49 51·49	+1·86	53·35	S	s	13 3·85	+1·34	5·19	11·84				
	2271	+18 3	S	Q + 1·71	51 17·34	+1·86	19·20	S	Q + 1·35	14 29·67	+1·34	31·01	11·81	m s 23 11·824	+ 0·316	+ 0·013	23 12·153
	2280	+16 6	S		53 30·70	+1·88	32·58	S		16 43·08	+1·36	44·44	11·86				
	2285	+16 15	S		53 55·64	+1·87	57·51	S		17 7·96	+1·36	9·32	11·81				
	2301	+29 33	N		56 27·11	+1·76	28·87	N		19 39·47	+1·25	40·72	11·85				
	2314	+34 39	N		58 51·58	+1·71	53·29	N		22 3·96	+1·21	5·17	11·88				

Note. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

BOMBAY (E), *Lat. 18° 54′, Long. 4h 51m 25s*: AND KURRACHEE (W), *Lat. 24° 51′, Long. 4h 28m 13s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	E: Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	W: Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference of Corrected Times (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}026$, $C_N - C_S = +0{\cdot}056$	$\delta L_N - \rho$
				Transits Observed at E, By Heaviside, with Telescope No. 1					Transits Observed at W, By Campbell, with Telescope No. 2								
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 21	2431	+25 17	N	I.P.W.	7 16 46·87	−1·63	45·24	N	I.P.W.	7 39 58·41	−1·41	57·00	23 11·76				
	2444	+11 54	S	d: c + 2·1	18 54·74	−1·51	53·23	S	d: c − 2·3	42 6·34	−1·31	5·03	11·80				
	2468	+ 9 10	S	b + 3·8; a + 21·4	22 14·13	−1·49	12·64	S	b − 0·1; a + 17·3	45 25·71	−1·29	24·42	11·78				
	2473	+12 15	S	s: Q − 1·71	23 43·49	−1·51	41·98	S	s: Q − 1·35	46 55·06	−1·31	53·75	11·77				
	2480	+ 2 10	S		26 27·97	−1·44	26·53	S		49 39·59	−1·25	38·34	11·81	m s 23 11·762	+ 0·316	+ 0·019	23 12·097
	2493	+27 10	N		29 8·93	−1·64	7·29	N		52 20·39	−1·43	18·96	11·67				
	2499	+20 25	N		30 38·99	−1·58	37·41	S		53 50·50	−1·38	49·12	11·71				
	2506	+24 38	N		31 35·66	−1·62	34·04	N		54 47·24	−1·41	45·83	11·79				
	2514	+24 29	N		32 33·94	−1·62	32·32	N		55 45·50	−1·41	44·09	11·77				
Jan. 22	2239	+38 35	N	I.P.W.	6 44 55·91	+1·40	57·31	N	I.P.W.	7 8 8·03	+1·12	9·15	23 11·84				
	2241	+38 39	N	d: c + 2·1	45 39·75	+1·39	41·14	N	d: c − 2·3	8 51·86	+1·12	52·98	11·84				
	2254	+25 31	N	b − 1·4; a + 36·7	47 51·12	+1·64	52·76	N	b + 2·7; a + 30·5	11 3·23	+1·32	4·55	11·79				
	2265	+17 53	S	s: Q + 1·73	49 12·52	+1·76	14·28	S	s: Q + 1·32	12 24·63	+1·41	26·04	11·76				
	2271	+18 3	S		50 38·33	+1·76	40·09	S		13 50·49	+1·41	51·90	11·81	m s 23 11·830	+ 0·314	+ 0·015	23 12·159
	2280	+16 6	S		52 51·69	+1·79	53·48	S		16 3·82	+1·44	5·26	11·78				
	2285	+16 15	S		53 16·63	+1·79	18·42	S		16 28·79	+1·44	30·23	11·81				
	2301	+29 33	N		55 48·18	+1·56	49·74	N		19 0·35	+1·27	1·62	11·88				
	2304	+ 9 19	S		56 38·26	+1·89	40·15	S		19 50·57	+1·52	52·09	11·94				
	2314	+34 39	N		58 12·70	+1·48	14·18	N		21 24·84	+1·19	26·03	11·85				
Jan. 23	2431	+25 17	N	I.P.W.	7 16 7·75	−1·81	5·94	N	I.P.W.	7 39 19·20	−1·32	17·88	23 11·94				
	2444	+11 54	S	d: c + 2·1	18 15·64	−1·61	14·03	S	d: c − 2·3	41 27·09	−1·15	25·94	11·91				
	2462	+ 8 32	S	b − 1·4; a + 36·7	20 35·81	−1·56	34·25	S	b + 2·7; a + 30·5	43 47·25	−1·11	46·14	11·89				
	2468	+ 9 10	S	s: Q − 1·73	21 34·99	−1·57	33·42	S	s: Q − 1·32	44 46·42	−1·12	45·30	11·88				
	2473	+12 15	S		23 4·41	−1·61	2·80	S		46 15·80	−1·16	14·64	11·84	m s 23 11·898	+ 0·314	+ 0·021	23 12·233
	2480	+ 2 10	S		25 48·85	−1·48	47·37	S		48 60·28	−1·05	59·23	11·86				
	2493	+27 10	N		28 29·84	−1·86	27·98	N		51 41·24	−1·34	39·90	11·92				
	2499	+20 25	N		29 59·88	−1·74	58·14	S		53 11·30	−1·27	10·03	11·89				
	2506	+24 38	N		30 56·63	−1·80	54·83	N		54 8·07	−1·31	6·76	11·93				
	2514	+24 29	N		31 54·92	−1·80	53·12	N		55 6·34	−1·30	5·04	11·92				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

BOMBAY (E), *Lat. 18° 54′, Long. 4ʰ 51ᵐ 25ˢ*: AND KURRACHEE (W), *Lat. 24° 51′, Long. 4ʰ 28ᵐ 13ˢ*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = + 0^s.026$, $C_N - C_S = + 0.056$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 17	2747	+30 1	N	*I. P. E.*	7 40 1·95	+1·49	3·44	N	*I. P. E.*	8 3 14·20	+1·38	15·58	23 12·14				
	2759	+18 2	N	d c − 5·2	41 37·72	+1·48	39·20	S	d c − 0·8	4 50·07	+1·36	51·43	12·23				
	2778	+ 9 33	S	b − 5·2	44 18·99	+1·46	20·45	S	b − 0·3	7 31·25	+1·35	32·60	12·15				
	2782	+ 9 14	S	*a* − 7·3	45 20·18	+1·45	21·63	S	*a* − 3·0	8 32·53	+1·35	33·88	12·25				
	2789	+24 24	N	s *Q* +1·72	47 43·05	+1·48	44·53	N	s *Q* +1·40	10 55·37	+1·37	56·74	12·21				
	2799	+18 43	S		50 48·30	+1·48	49·78	S		14 0·60	+1·36	1·96	12·18	m s 23 12·177	− 0·001	+ 0·021	23 12·197
	2810	+17 34	S		52 14·47	+1·48	15·95	S		15 26·70	+1·36	28·06	12·11				
	2816	+17 28	S		53 21·09	+1·48	22·57	S		16 33·36	+1·36	34·72	12·15				
	2833	+24 32	N		55 48·92	+1·48	50·40	N		19 1·22	+1·37	2·59	12·19				
	2840	+24 44	N		56 51·78	+1·48	53·26	N		20 4·05	+1·37	5·42	12·16				
Jan. 17	2970	+12 33	S	*I. P. E.*	8 14 43·31	−1·98	41·33	S	*I. P. E.*	8 37 54·92	−1·44	53·48	23 12·15				
	2977	+12 59	S	d c − 5·2	16 25·68	−1·98	23·70	S	d c − 0·8	39 37·34	−1·44	35·90	12·20				
	2990	+18 27	S	b − 5·2	18 14·69	−1·96	12·73	S	b − 0·3	41 26·27	−1·44	24·83	12·10				
	2999	+32 55	N	*a* − 7·3	19 32·56	−1·94	30·62	N	*a* − 3·0	42 44·21	−1·42	42·79	12·17				
	3015	+17 49	S	s *Q* −1·72	20 48·36	−1·96	46·40	S	s *Q* −1·40	43 59·97	−1·44	58·53	12·13				
	3026	+28 23	N		22 50·93	−1·96	48·97	N		46 2·53	−1·42	1·11	12·14	m s 23 12·147	− 0·001	+ 0·012	23 12·158
	3046	+30 41	N		25 3·91	−1·95	1·96	N		48 15·50	−1·42	14·08	12·12				
	3056	+32 53	N		26 33·16	−1·94	31·22	N		49 44·79	−1·42	43·37	12·15				
	3068	+32 43	N		28 25·30	−1·94	23·36	N		51 36·88	−1·42	35·46	12·10				
	3079	+24 55	N		30 5·66	−1·96	3·70	N		53 17·34	−1·43	15·91	12·21				
Jan. 18	2759	+18 2	S	*I. P. E.*	7 41 37·59	+1·55	39·14	S	*I. P. E.*	8 4 50·04	+1·41	51·45	23 12·31				
	2778	+ 9 33	S	d c − 5·2	44 18·81	+1·56	20·37	S	d c − 0·8	7 31·17	+1·43	32·60	12·23				
	2782	+ 9 14	S	b − 2·2	45 20·13	+1·56	21·69	S	b + 1·2	8 32·50	+1·43	33·93	12·24				
	2789	+24 24	N	*a* + 2·1	47 42·96	+1·53	44·49	N	*a* + 7·0	10 55·41	+1·39	56·80	12·31				
	2799	+18 43	S	s *Q* +1·72	50 48·25	+1·55	49·80	S	s *Q* +1·38	14 0·62	+1·41	2·03	12·23	m s 23 12·277	+ 0·002	+ 0·020	23 12·299
	2810	+17 34	S		52 14·29	+1·55	15·84	S		15 26·73	+1·41	28·14	12·30				
	2816	+17 28	S		53 20·95	+1·55	22·50	S		16 33·35	+1·41	34·76	12·26				
	2833	+24 32	N		55 48·80	+1·53	50·33	N		19 1·23	+1·39	2·62	12·29				
	2840	+24 44	N		56 51·65	+1·53	53·18	N		20 4·11	+1·39	5·50	12·32				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m 25s : AND KURRACHEE (W), *Lat.* 24° 51′, *Long.* 4h 28m 13s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = + 0^s.026$, $C_N - C_S = + 0.056$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 18	2970	+ 12 33	S	I. P. E.	8 14 43·21	− 1·89	41·32	S	I. P. E.	8 37 54·88	− 1·34	53·54	23 12·22				
	2977	+ 12 59	S	d c − 5·2	16 25·54	− 1·89	23·65	S	d c − 0·8	39 37·22	− 1·34	35·88	12·23				
	2990	+ 18 27	S	b − 2·2 a + 2·1	18 14·51	− 1·89	12·62	S	b + 1·2 a + 7·0	41 26·24	− 1·35	24·89	12·27				
	2999	+ 32 55	N	s Q − 1·72	19 32·44	− 1·93	30·51	N	s Q − 1·38	42 44·18	− 1·40	42·78	12·27				
	3015	+ 17 49	S		20 48·21	− 1·89	46·32	S		43 59·90	− 1·35	58·55	12·23	m s 23 12·254	+ 0·002	+ 0·012	23 12·268
	3026	+ 28 23	N		22 50·80	− 1·93	48·87	N		46 2·51	− 1·38	1·13	12·26				
	3046	+ 30 41	N		25 3·76	− 1·93	1·83	N		48 15·48	− 1·39	14·09	12·26				
	3056	+ 32 53	N		26 33·07	− 1·93	31·14	N		49 44·78	− 1·40	43·38	12·24				
	3068	+ 32 43	N		28 25·19	− 1·93	23·26	N		51 36·93	− 1·40	35·53	12·27				
	3079	+ 24 55	N		30 5·52	− 1·91	3·61	N		53 17·27	− 1·37	15·90	12·29				
Jan. 19	2747	+ 30 1	N	I. P. E.	7 40 1·60	+ 1·58	3·18	N	I. P. E.	8 3 14·04	+ 1·38	15·42	23 12·24				
	2759	+ 18 2	N	d c − 5·2	41 37·36	+ 1·64	39·00	S	d c − 0·8	4 49·80	+ 1·43	51·23	12·23				
	2778	+ 9 33	S	b + 1·8 a + 10·0	44 18·45	+ 1·68	20·13	S	b + 1·4 a + 12·4	7 30·99	+ 1·47	32·46	12·33				
	2782	+ 9 14	S	s Q + 1·72	45 19·86	+ 1·68	21·54	S	s Q + 1·39	8 32·29	+ 1·48	33·77	12·23				
	2789	+ 24 24	N		47 42·71	+ 1·61	44·32	N		10 55·13	+ 1·40	56·53	12·21	m s 23 12·266	+ 0·002	+ 0·021	23 12·289
	2799	+ 18 43	S		50 47·92	+ 1·64	49·56	S		14 0·39	+ 1·43	1·82	12·26				
	2810	+ 17 34	S		52 14·02	+ 1·65	15·67	S		15 26·50	+ 1·44	27·94	12·27				
	2816	+ 17 28	S		53 20·65	+ 1·65	22·30	S		16 33·13	+ 1·44	34·57	12·27				
	2833	+ 24 32	N		55 48·50	+ 1·61	50·11	N		19 1·00	+ 1·40	2·40	12·29				
	2840	+ 24 44	N		56 51·34	+ 1·61	52·95	N		20 3·88	+ 1·40	5·28	12·33				
Jan. 19	2970	+ 12 33	S	I. P. E.	8 14 42·88	− 1·77	41·11	S	I. P. E.	8 37 54·65	− 1·32	53·33	23 12·22				
	2977	+ 12 59	S	d c − 5·2	16 25·20	− 1·78	23·42	S	d c − 0·8	39 37·05	− 1·33	35·72	12·30				
	2990	+ 18 27	S	b + 1·8 a + 10·0	18 14·19	− 1·80	12·39	S	b + 1·4 a + 12·4	41 26·01	− 1·35	24·66	12·27				
	2999	+ 32 55	N	s Q − 1·72	19 32·09	− 1·88	30·21	N	s Q − 1·39	42 43·92	− 1·42	42·50	12·29				
	3015	+ 17 49	S		20 47·88	− 1·80	46·08	S		43 59·72	− 1·34	58·38	12·30	m s 23 12·272	+ 0·002	+ 0·012	23 12·286
	3026	+ 28 23	N		22 50·49	− 1·85	48·64	N		46 2·32	− 1·39	0·93	12·29				
	3046	+ 30 41	N		25 3·46	− 1·86	1·60	N		48 15·26	− 1·40	13·86	12·26				
	3056	+ 32 53	N		26 32·78	− 1·88	30·90	N		49 44·58	− 1·42	43·16	12·26				
	3068	+ 32 43	N		28 24·88	− 1·87	23·01	N		51 36·69	− 1·42	35·27	12·26				
	3079	+ 24 55	N		30 5·25	− 1·84	3·41	N		53 17·06	− 1·38	15·68	12·27				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m 25s: AND KURRACHEE (W), *Lat.* 24° 51′, *Long.* 4h 28m 13s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.026$, $C_N - C_S = +0.056$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 20	2747	+30 1	N	I. P. W.	7 40 1·34	+1·79	3·13	N	I. P. W.	8 3 13·96	+1·44	15·40	23 12·27				
	2759	+18 2	S	d c + 2·1	41 37·09	+1·89	38·98	S	d c − 2·3	4 49·68	+1·53	51·21	12·23				
	2778	+ 9 33	S	b + 4·8 a + 20·7	44 18·21	+1·96	20·17	S	b + 6·4 a + 22·3	7 30·81	+1·60	32·41	12·24				
	2782	+ 9 14	S	s	45 19·58	+1·96	21·54	S	s	8 32·06	+1·61	33·67	12·13				
	2789	+24 24	N	Q + 1·72	47 42·41	+1·84	44·25	N	Q + 1·38	10 55·02	+1·48	56·50	12·25	m s 23 12·241	0·000	+ 0·017	23 12·258
	2799	+18 43	S		50 47·66	+1·88	49·54	S		14 0·26	+1·53	1·79	12·25				
	2816	+17 28	S		53 20·40	+1·89	22·29	S		16 32·96	+1·54	34·50	12·21				
	2833	+24 32	N		55 48·21	+1·84	50·05	N		19 0·88	+1·48	2·36	12·31				
	2840	+24 44	N		56 51·13	+1·84	52·97	N		20 3·77	+1·48	5·25	12·28				
Jan. 20	2970	+12 33	S	I. P. W.	8 14 42·47	−1·51	40·96	S	I. P. W.	8 37 54·54	−1·18	53·36	23 12·40				
	2977	+12 59	S	d c + 2·1	16 24·80	−1·51	23·29	S	d c − 2·3	39 36·89	−1·19	35·70	12·41				
	2999	+32 55	N	b + 4·8 a + 20·7	19 31·90	−1·67	30·23	N	b + 6·4 a + 22·3	42 43·89	−1·35	42·54	12·31				
	3015	+17 49	S	s	20 47·58	−1·55	46·03	S	s	43 59·57	−1·23	58·34	12·31				
	3026	+28 23	N	Q − 1·72	22 50·24	−1·64	48·60	N	Q − 1·38	46 2·22	−1·32	0·90	12·30	m s 23 12·318	0·000	+ 0·010	23 12·328
	3046	+30 41	N		25 3·28	−1·66	1·62	N		48 15·23	−1·33	13·90	12·28				
	3056	+32 53	N		26 32·58	−1·67	30·91	N		49 44·55	−1·35	43·20	12·29				
	3068	+32 43	N		28 24·59	−1·67	22·92	N		51 36·65	−1·35	35·30	12·38				
	3079	+24 55	N		30 5·07	−1·60	3·47	N		53 16·93	−1·28	15·65	12·18				
Jan. 21	2747	+30 1	N	I. P. W.	7 40 1·50	+1·75	3·25	N	I. P. W.	8 3 14·18	+1·25	15·43	23 12·18				
	2759	+18 2	S	d c + 2·1	41 37·04	+1·86	38·90	S	d c − 2·3	4 49·91	+1·34	51·25	12·35				
	2778	+ 9 33	S	b + 3·8 a + 21·4	44 18·15	+1·93	20·08	S	b − 0·1 a + 17·3	7 31·05	+1·40	32·45	12·37				
	2782	+ 9 14	S	s	45 19·52	+1·93	21·45	S	s	8 32·33	+1·41	33·74	12·29				
	2789	+24 24	N	Q + 1·71	47 42·49	+1·80	44·29	N	Q + 1·35	10 55·29	+1·29	56·58	12·29	m s 23 12·309	− 0·002	+ 0·019	23 12·326
	2799	+18 43	S		50 47·69	+1·85	49·54	S		14 0·56	+1·33	1·89	12·35				
	2816	+17 28	S		53 20·36	+1·86	22·22	S		16 33·15	+1·34	34·49	12·27				
	2833	+24 32	N		55 48·32	+1·80	50·12	N		19 1·20	+1·29	2·49	12·37				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

BOMBAY (E), *Lat. 18° 54′, Long. 4h 51m 25s*: AND KURRACHEE (W), *Lat. 24° 51′, Long. 4h 28m 13s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.026$, $C_N - C_S = +0.056$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Jan. 21	2970	+12 33	S	*I. P. W.*	8 14 42·48	−1·51	40·97	S	*I. P. W.*	8 37 54·73	−1·32	53·41	23 12·44				
	2977	+12 59	S	d c + 2·1	16 24·86	−1·52	23·34	S	d c − 2·3	39 37·11	−1·32	35·79	12·45				
	2990	+18 27	S	b + 3·8 *a* +21·4	18 13·91	−1·57	12·34	S	b − 0·1 *a* +17·3	41 26·09	−1·37	24·72	12·38				
	2999	+32 55	N	s Q −1·71	19 31·95	−1·69	30·26	N	s Q −1·35	42 44·10	−1·48	42·62	12·36				
	3015	+17 49	S		20 47·62	−1·56	46·06	S		43 59·77	−1·36	58·41	12·35				
	3026	+28 23	N		22 50·32	−1·65	48·67	N		46 2·43	−1·44	0·99	12·32	m s 23 12·358	− 0·002	+ 0·012	23 12·368
	3046	+30 41	N		25 3·33	−1·67	1·66	N		48 15·47	−1·45	14·02	12·36				
	3056	+32 53	N		26 32·64	−1·69	30·95	N		49 44·78	−1·48	43·30	12·35				
	3068	+32 43	N		28 24·74	−1·69	23·05	N		51 36·81	−1·47	35·34	12·29				
	3079	+24 55	N		30 5·11	−1·63	3·48	N		53 17·17	−1·41	15·76	12·28				
Jan. 23	2747	+30 1	N	*I. P. W.*	7 40 1·92	+1·56	3·48	N	*I. P. W.*	8 3 14·64	+1·26	15·90	23 12·42				
	2759	+18 2	S	d c + 2·1	41 37·63	+1·76	39·39	S	d c − 2·3	4 50·32	+1·41	51·73	12·34				
	2778	+ 9 33	S	b − 1·4 *a* +36·7	44 18·63	+1·89	20·52	S	b + 2·7 *a* +30·5	7 31·41	+1·51	32·92	12·40				
	2782	+ 9 14	S	s Q +1·73	45 19·90	+1·89	21·79	S	s Q +1·32	8 32·73	+1·52	34·25	12·46				
	2789	+24 24	N		47 42·88	+1·66	44·54	N		10 55·72	+1·34	57·06	12·52	m s 23 12·438	− 0·005	+ 0·018	23 12·451
	2799	+18 43	S		50 48·16	+1·75	49·91	S		14 0·93	+1·40	2·33	12·42				
	2810	+17 34	S		52 14·21	+1·77	15·98	S		15 27·01	+1·41	28·42	12·44				
	2816	+17 28	S		53 20·82	+1·77	22·59	S		16 33·62	+1·41	35·03	12·44				
	2833	+24 32	N		55 48·80	+1·66	50·46	N		19 1·60	+1·34	2·94	12·48				
	2840	+24 44	N		58 51·68	+1·66	53·34	N		22 4·47	+1·33	5·80	12·46				
Jan. 23	2970	+12 33	S	*I. P. W.*	8 14 43·01	−1·61	41·40	S	*I. P. W.*	8 37 55·09	−1·16	53·93	23 12·53				
	2977	+12 59	S	d c + 2·1	16 25·34	−1·62	23·72	S	d c − 2·3	39 37·44	−1·17	36·27	12·55				
	2990	+18 27	S	b − 1·4 *a* +36·7	18 14·40	−1·70	12·70	S	b + 2·7 *a* +30·5	41 26·48	−1·24	25·24	12·54				
	3015	+17 49	S	s Q −1·73	20 48·19	−1·69	46·41	S	s Q −1·32	43 60·20	−1·23	58·97	12·56				
	3026	+28 23	N		22 50·84	−1·87	48·97	N		46 2·87	−1·36	1·51	12·54	m s 23 12·543	− 0·005	+ 0·013	23 12·551
	3046	+30 41	N		25 3·83	−1·91	1·92	N		48 15·86	−1·39	14·47	12·55				
	3056	+32 53	N		26 33·19	−1·95	31·24	N		49 45·20	−1·42	43·78	12·54				
	3068	+32 43	N		28 25·26	−1·94	23·32	N		51 37·26	−1·42	35·84	12·52				
	3079	+24 55	N		30 5·53	−1·81	3·72	N		53 17·59	−1·31	16·28	12·56				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 25s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference of Corrected Times (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.033$, $C_N - C_S = +0^s.041$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 6	2789	+24 24	N	I. P. E.	8 15 22·61	+1·59	24·20	N	I. P. E.	8 43 54·08	+1·48	55·56	28 31·36				
	2799	+18 43	S	d: c + 3·8	18 27·82	+1·58	29·40	S	d: c + 2·3	46 59·30	+1·53	60·83	31·43				
	2810	+17 34	S	b + 5·2	19 53·87	+1·58	55·45	S	b + 4·5	48 25·38	+1·54	26·92	31·47	m s 28 31·427	+ 0·341	+ 0·004	28 31·772
	2816	+17 28	S	a + 5·9	21 0·45	+1·58	2·03	S	a + 21·9	49 31·96	+1·54	33·50	31·47				
	2833	+24 32	N	s: Q + 1·36	23 28·34	+1·59	29·93	N	s: Q + 1·36	51 59·83	+1·48	61·31	31·38				
	2840	+24 24	N		24 31·17	+1·59	32·76	N		53 2·73	+1·48	4·21	31·45				
Feb. 7	2778	+ 9 33	S	I. P. E.	8 11 36·80	+6·14	42·94	S	I. P. E.	8 40 12·61	+1·60	14·21	28 31·27				
	2782	+ 9 14	S	d: c + 203·8	12 38·09	+6·14	44·23	S	d: c + 2·3	41 13·91	+1·61	15·52	31·29				
	2789	+24 24	N	b + 2·7	15 0·52	+6·54	7·06	N	b + 2·2	43 36·93	+1·38	38·31	31·25				
	2799	+18 43	S	a + 4·2	18 5·98	+6·33	12·31	S	a + 38·3	46 42·07	+1·47	43·54	31·23	m s 28 31·264	+ 0·341	+ 0·005	28 31·610
	2810	+17 34	S	s: Q + 1·37	19 32·05	+6·33	38·38	S	s: Q + 1·36	48 8·14	+1·49	9·63	31·25				
	2833	+24 32	N		23 6·25	+6·54	12·79	N		51 42·68	+1·38	44·06	31·27				
	2840	+24 44	N		24 9·10	+6·54	15·64	N		52 45·56	+1·37	46·93	31·29				
Feb. 7	2952	+31 8	N	I. P. E.	8 39 38·49	+3·98	42·47	N	I. P. E.	9 8 15·42	−1·45	13·97	28 31·50				
	2970	+12 33	S	d: c + 203·8	42 0·14	+3·40	3·54	S	d: c + 2·3	10 36·06	−1·16	34·90	31·36				
	2977	+12 59	S	b + 2·7	43 42·43	+3·40	45·83	S	b + 2·[illegible]	12 18·44	−1·17	17·27	31·44				
	2990	+18 27	S	a + 4·2	45 31·25	+3·59	34·84	S	a + 38·3	14 7·43	−1·24	6·19	31·35	m s 28 31·406	+ 0·341	+ 0·004	28 31·751
	2999	+32 55	N	s: Q − 1·37	46 48·47	+4·18	52·65	N	s: Q − 1·36	15 25·54	−1·49	24·05	31·40				
	3015	+17 49	S		48 4·86	+3·59	8·45	S		16 41·05	−1·23	39·82	31·37				
	3026	+28 23	N		50 7·05	+3·99	11·04	N		18 43·80	−1·40	42·40	31·36				
	3046	+30 41	N		52 19·89	+3·99	23·88	N		20 56·79	−1·44	55·35	31·47				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 25s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.033$, $C_N - C_S = +0^s.041$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 8	2747	+30 1	N	I. P. E.	8 7 7·23	+1·53	8·76	N	I. P. E.	8 35 38·84	+1·29	40·13	28 31·37				
	2759	+18 2	S	d c + 3·8	8 42·97	+1·54	44·51	S	d c + 2·3	37 14·39	+1·53	15·92	31·41				
	2778	+ 9 33	S	b + 2·4	11 24·17	+1·54	25·71	S	b + 3·6	39 55·44	+1·65	57·09	31·38				
	2782	+ 9 14	S	a + 4·0	12 25·48	+1·54	27·02	S	a +44·3	40 56·71	+1·66	58·37	31·35				
	2789	+24 24	N	s Q + 1·38	14 48·23	+1·54	49·77	N	s Q + 1·36	43 19·78	+1·40	21·18	31·41	m s 28 31·384	+ 0·341	+ 0·005	28 31·730
	2799	+18 43	S		17 53·52	+1·54	55·06	S		46 24·89	+1·51	26·40	31·34				
	2810	+17 34	S		19 19·56	+1·54	21·10	S		47 50·96	+1·53	52·49	31·39				
	2816	+17 28	S		20 26·19	+1·54	27·73	S		48 57·57	+1·53	59·10	31·37				
	2833	+24 32	N		22 54·01	+1·54	55·55	N		51 25·53	+1·40	26·93	31·38				
	2840	+24 44	N		23 56·81	+1·54	58·35	N		52 28·39	+1·40	29·79	31·44				
Feb. 8	2931	+20 18	S	I. P. E.	8 36 23·06	−1·23	21·83	N	I. P. E.	9 4 54·47	−1·24	53·23	28 31·40				
	2937	+21 54	S	d c + 3·8	37 47·03	−1·23	45·80	N	d c + 2·3	6 18·47	−1·27	17·20	31·40				
	2952	+31 8	N	b + 2·4	39 26·54	−1·23	25·31	N	b + 3·6	7 58·21	−1·46	56·75	31·44				
	2970	+12 33	S	a + 4·0	41 47·57	−1·22	46·35	S	a +44·3	10 18·81	−1·11	17·70	31·35				
	2977	+12 59	S	s Q − 1·38	43 29·96	−1·22	28·74	S	s Q − 1·36	12 1·19	−1·12	0·07	31·33	m s 28 31·422	+ 0·341	− 0·003	28 31·760
	2990	+18 27	S		45 18·84	−1·22	17·62	S		13 50·19	−1·20	48·99	31·37				
	2999	+32 55	N		46 36·61	−1·24	35·37	N		15 8·35	−1·50	6·85	31·48				
	3015	+17 49	S		47 52·44	−1·22	51·22	S		16 23·86	−1·19	22·67	31·45				
	3026	+28 23	N		49 54·99	−1·23	53·76	N		18 26·67	−1·40	25·27	31·51				
	3046	+30 41	N		52 7·94	−1·23	6·71	N		20 39·64	−1·44	38·20	31·49				
Feb. 9	2747	+30 1	N	I. P. E.	8 6 50·21	+1·37	51·58	N	I. P. E.	8 35 21·65	+1·25	22·90	28 31·32				
	2759	+18 2	S	d c − 1·2	8 26·03	+1·38	27·41	S	d c + 2·3	36 57·18	+1·51	58·69	31·28				
	2778	+ 9 33	S	b + 2·9	11 7·20	+1·38	8·58	S	b + 3·0	39 38·17	+1·67	39·84	31·26				
	2782	+ 9 14	S	a + 2·1	12 8·47	+1·38	9·85	S	a +50·3	40 39·48	+1·67	41·15	31·30				
	2789	+24 24	N	s Q + 1·34	14 31·33	+1·38	32·71	N	s Q + 1·36	43 2·53	+1·37	3·90	31·19	m s 28 31·324	+ 0·341	+ 0·005	28 31·670
	2799	+18 43	S		17 36·42	+1·38	37·80	S		46 7·64	+1·49	9·13	31·33				
	2810	+17 34	S		19 2·48	+1·38	3·86	S		47 33·73	+1·52	35·25	31·39				
	2816	+17 28	S		20 9·09	+1·38	10·47	S		48 40·35	+1·52	41·87	31·40				
	2833	+24 32	N		22 36·96	+1·38	38·34	N		51 8·33	+1·37	9·70	31·36				
	2840	+24 44	N		23 39·77	+1·38	41·15	N		52 11·20	+1·36	12·56	31·41				

Note. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat. 23° 10′, Long. 5h 19m 58s*: AND BOMBAY (W), *Lat. 18° 54′, Long. 4h 51m 13s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}033$, $C_N - C_S = +0{\cdot}041$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s	m s			
Feb. 9	2931	+20 18	S	*I. P. E.*	8 36 5·91	−1·30	4·61	N	*I. P. E.*	9 4 37·20	−1·26	35·94	28 31·33				
	2937	+21 54	S	d c − 1·2	37 29·95	−1·30	28·65	N	d c + 2·3	5 61·27	−1·30	59·97	31·32				
	2952	+31 8	N	b + 2·9 a + 2·1	39 9·52	−1·30	8·22	N	b + 3·0 a +50·3	7 41·03	−1·50	39·53	31·31				
	2970	+12 33	S	s Q − 1·34	41 30·48	−1·29	29·19	S	s Q − 1·36	10 1·57	−1·11	0·46	31·27				
	2977	+12 59	S		43 12·79	−1·29	11·50	S		11 43·92	−1·12	42·80	31·30	28 31·353	+ 0·341	+ 0·003	28 31·691
	2990	+18 27	S		45 1·67	−1·30	0·37	S		13 32·99	−1·22	31·77	31·40				
	2999	+32 55	N		46 19·57	−1·30	18·27	N		14 51·18	−1·55	49·63	31·36				
	3015	+17 49	S		47 35·31	−1·30	34·01	S		16 6·67	−1·20	5·47	31·46				
	3026	+28 23	N		49 37·88	−1·30	36·58	N		18 9·46	−1·43	8·03	31·45				
	3046	+30 41	N		51 50·92	−1·30	49·62	N		20 22·44	−1·49	20·95	31·33				
Feb. 10	2759	+18 2	S	*I. P. W.*	8 8 8·78	+1·34	10·12	S	*I. P. W.*	8 36 40·52	+1·08	41·60	28 31·48				
	2778	+ 9 33	S	d c − 3·1	10 49·90	+1·33	51·23	S	d c − 8·2	39 21·35	+1·37	22·72	31·49				
	2782	+ 9 14	S	b + 0·4 a − 2·2	11 51·18	+1·33	52·51	S	b − 5·2 a +83·1	40 22·59	+1·38	23·97	31·46				
	2789	+24 24	N	s Q + 1·40	14 13·99	+1·33	15·32	N	s Q + 1·37	42 45·92	+0·83	46·75	31·43				
	2799	+18 43	S		17 19·28	+1·34	20·62	S		45 50·95	+1·05	52·00	31·38	28 31·454	+ 0·343	+ 0·005	28 31·802
	2810	+17 34	S		18 45·35	+1·33	46·68	S		47 17·00	+1·10	18·10	31·42				
	2816	+17 28	S		19 51·91	+1·33	53·24	S		48 23·61	+1·10	24·71	31·47				
	2833	+24 32	N		22 19·71	+1·33	21·04	N		50 51·71	+0·83	52·54	31·50				
	2840	+24 44	N		23 22·59	+1·33	23·92	N		51 54·56	+0·82	55·38	31·46				
Feb. 10	2931	+20 18	S	*I. P. W.*	8 35 48·95	−1·46	47·49	N	*I. P. W.*	9 4 20·65	−1·74	18·91	28 31·42				
	2937	+21 54	S	d c − 3·1	37 12·93	−1·46	11·47	N	d c − 8·2	5 44·67	−1·81	42·86	31·39				
	2952	+31 8	N	b + 0·4 a − 2·2	38 52·51	−1·46	51·05	N	b − 5·2 a +83·1	7 24·58	−2·18	22·40	31·35				
	2970	+12 33	S	s Q − 1·40	41 13·41	−1·47	11·94	S	s Q − 1·37	9 44·76	−1·46	43·30	31·36				
	2977	+12 59	S		42 55·73	−1·47	54·26	S		11 27·17	−1·48	25·69	31·43	28 31·412	+ 0·343	− 0·003	28 31·752
	2990	+18 27	S		44 44·69	−1·46	43·23	S		13 16·35	−1·67	14·68	31·45				
	2999	+32 55	N		46 2·54	−1·46	1·08	N		14 34·79	−2·27	32·52	31·44				
	3015	+17 49	S		47 18·36	−1·46	16·90	S		15 49·97	−1·65	48·32	31·42				
	3026	+28 23	N		49 20·94	−1·46	19·48	N		17 52·97	−2·06	50·91	31·43				
	3046	+30 41	N		51 33·85	−1·46	32·39	N		20 5·97	−2·15	3·82	31·43				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 25s.

Astronomical Date	Star		Transits Observed at E — By Heaviside, with Telescope No. 1					Transits Observed at W — By Campbell, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = + 0^s.033$, $C_N - C_S = + 0.041$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Feb.13	2789	+24 24	N	I. P. W.	8 13 22·23	+1·09	23·32	N	I. P. W.	8 41 53·83	+1·05	54·88	28 31·56	m s 28 31·522	+0·342	+0·004	28 31·868
	2799	+18 43	S	d c − 3·1	16 27·53	+1·06	28·59	S	d c − 8·2	44 58·82	+1·28	60·10	31·51				
	2810	+17 34	S	b − 0·5	17 53·53	+1·05	54·58	S	b + 4·5	46 24·79	+1·33	26·12	31·54				
	2816	+17 28	S	a −15·5	19 0·13	+1·05	1·18	S	a +90·7	47 31·42	+1·33	32·75	31·57				
	2833	+24 32	N	s Q +1·17	21 27·93	+1·09	29·02	N	s Q +1·37	49 59·48	+1·05	60·53	31·51				
	2840	+24 44	N		22 30·84	+1·09	31·93	N		51 2·33	+1·04	3·37	31·44				
Feb.13	2937	+21 54	S	I. P. W.	8 36 20·66	−1·26	19·40	N	I. P. W.	9 4 52·43	−1·58	50·85	28 31·45	m s 28 31·423	+0·342	−0·008	28 31·757
	2999	+32 55	N	d c − 3·1	45 10·30	−1·19	9·11	N	d c − 8·2	13 42·55	−2·06	40·49	31·38				
	3026	+28 23	N	b − 0·5 a −15·5	48 28·59	−1·22	27·37	N	b + 4·5 a +90·7	16 60·68	−1·85	58·83	31·46				
	3046	+30 41	N	s Q −1·17	50 41·57	−1·21	40·36	N	s Q −1·37	19 13·70	−1·94	11·76	31·40				
Feb.14	2759	+18 2	S	I. P. W.	8 6 59·89	+1·04	60·93	S	I. P. W.	8 35 31·11	+1·29	32·40	28 31·47	m s 28 31·438	+0·338	+0·005	28 31·781
	2778	+ 9 33	S	d c − 3·1	9 41·10	+0·98	42·08	S	d c − 8·2	38 11·92	+1·60	13·52	31·44				
	2782	+ 9 14	S	b − 1·7 a −16·1	10 42·38	+0·98	43·36	S	b + 3·5 a +92·4	39 13·23	+1.61	14·84	31·48				
	2789	+24 24	N	s Q +1·18	13 5·09	+1·07	6·16	N	s Q +1·37	41 36·57	+1.03	37·60	31·44				
	2799	+18 43	S		16 10·39	+1·04	11·43	S		44 41·55	+1·25	42·80	31·37				
	2816	+17 28	S		18 43·07	+1·03	44·10	S		47 14·26	+1·31	15·57	31·47				
	2833	+24 32	N		21 10·93	+1·07	12·00	N		49 42·38	+1·03	43·41	31·41				
	2840	+24 44	N		22 13·77	+1·07	14·84	N		50 45·24	+1·02	46·26	31·42				
Feb.14	2931	+20 18	S	I. P. W.	8 34 39·56	−1·31	38·25	N	I. P. W.	9 3 11·32	−1·55	9·77	28 31·52	m s 28 31·480	+0·338	−0·003	28 31·815
	2937	+21 54	S	d c − 3·1	36 3·52	−1·30	2·22	N	d c − 8·2	4 35·36	−1·61	33·75	31·53				
	2952	+31 8	N	b − 1·7 a −16·1	37 43·04	−1·24	41·80	N	b + 3·5 a +92·4	6 15·31	−2·01	13·30	31·50				
	2970	+12 33	S	s Q −1·18	40 4·09	−1·36	2·73	S	s Q −1·37	8 35·41	−1·24	34·17	31·44				
	2977	+12 59	S		41 46·38	−1·36	45·02	S		10 17·80	−1·26	16·54	31·52				
	2990	+18 27	S		43 35·31	−1·32	33·99	S		12 6·89	−1·47	5·42	31·43				
	2999	+32 55	N		44 53·10	−1·23	51·87	N		13 25·46	−2·10	23·36	31·49				
	3015	+17 49	S		46 8·98	−1·33	7·65	S		14 40·53	−1·44	39·09	31·44				
	3026	+28 23	N		48 11·50	−1·26	10·24	N		16 43·58	−1·88	41·70	31·46				
	3046	+30 41	N		50 24·41	−1·25	23·16	N		18 56·61	−1·98	54·63	31·47				

Note. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5ʰ 19ᵐ 58ˢ: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4ʰ 51ᵐ 25ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.033$, $C_N - C_S = +0^s.041$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 6	3278	+16 58	S	I. P. E.	9 2 57·20	+1·58	58·78	S	I. P. E.	9 31 28·83	+1·54	30·37	28 31·59				
	3290	+35 47	N	d c + 3·8	4 45·20	+1·57	46·77	N	d c + 2·3	33 17·04	+1·36	18·40	31·63				
	3299	+13 51	S	b + 5·2 a + 5·9	5 18·09	+1·59	19·68	S	b + 4·5 a + 21·9	33 49·69	+1·56	51·25	31·57				
	3309	+26 27	N	s Q + 1·36	7 16·35	+1·58	17·93	N	s Q + 1·36	35 48·13	+1·46	49·59	31·66				
	3317	+30 31	N		9 3·31	+1·57	4·88	N		37 35·14	+1·42	36·56	31·68	m s 28 31·636	+ 0·285	0·000	28 31·921
	3327	+24 1	N		11 58·31	+1·59	59·90	N		40 29·97	+1·48	31·45	31·55				
	3337	+12 22	S		12 27·08	+1·60	28·68	S		40 58 79	+1·57	60·36	31·68				
	3344	+12 7	S		13 30·48	+1·60	32·08	S		42 2·17	+1·57	3·74	31·66				
	3355	+21 44	S		15 38·90	+1·58	40·48	N		44 10·68	+1·50	12·18	31·70				
Feb. 6	3459	+12 33	S	I. P. E.	9 34 32·86	−1·12	31·74	S	I. P. E.	10 3 4·57	−1·15	3·42	28 31·68				
	3468	+37 59	N	d c + 3·8	36 40·79	−1·15	39·64	N	d c + 2·3	5 12·69	−1·37	11·32	31·68				
	3475	+13 56	S	b + 5·2 a + 5·9	37 45·05	−1·13	43·92	S	b + 4·5 a + 21·9	6 16·77	−1·17	15·60	31·68				
	3483	+ 5 12	S	s Q − 1·36	39 7·57	−1·12	6·45	S	s Q − 1·36	7 39·19	−1·09	38·10	31·65				
	3490	+32 4	N		40 47·29	−1·14	46·15	N		9 19·12	−1·31	17·81	31·66	m s 28 31·666	+ 0·285	+ 0·004	28 31·955
	3508	+24 1	N		42 35·18	−1·13	34·05	N		11 6·97	−1·24	5·73	31·68				
	3511	+23 42	N		44 12·63	−1·13	11·50	N		12 44·40	−1·24	43·16	31·66				
	3529	+ 7 2	S		46 49·32	−1·12	48·20	S		15 20·96	−1·11	19·85	31·65				
	3534	+15 35	S		47 57·09	−1·13	55·96	S		16 28·79	−1·18	27·61	31·65				
Feb. 7	3278	+16 58	S	I. P. E.	9 2 37·99	+6·13	44·12	S	I. P. E.	9 31 14·41	+1·49	15·90	28 31·78				
	3290	+35 47	N	d c + 203·8	4 25·18	+7·12	32·30	N	d c + 2·3	33 2·79	+1·17	3·96	31·66				
	3299	+13 51	S	b + 2·7 a + 4·2	4 58·94	+6·14	65·08	S	b + 2·2 a + 38·3	33 35·26	+1·54	36·80	31·72				
	3309	+26 27	N	s Q + 1·37	6 56·83	+6·53	63·36	N	s Q + 1·36	35 33·74	+1·34	35·08	31·72				
	3317	+30 31	N		8 43·63	+6·73	50·36	N		37 20·82	+1·28	22·10	31·74	m s 28 31·697	+ 0·291	0·000	28 31·988
	3327	+24 1	N		10 38·77	+6·54	45·31	N		39 15·61	+1·39	17·00	31·69				
	3337	+12 22	S		12 8·01	+6·14	14·15	S		40 44·23	+1·56	45·79	31·64				
	3344	+12 7	S		13 11·43	+6·14	17·57	S		41 47·60	+1·57	49·17	31·60				
	3355	+21 44	S		15 19·64	+6·33	25·97	N		43 56·27	+1·42	57·69	31·72				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4h 51m 25s.

Astronomical Date	Star		Transits Observed at E — By Heaviside, with Telescope No. 1					Transits Observed at W — By Campbell, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Peral. Equations $H_N - H_S = +0^s{\cdot}033$, $C_N - C_S = +0{\cdot}041$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 7	3446	+35 50	N	*I. P. E.*	9 32 35·80	+4·38	40·18	N	*I. P. E.*	10 1 13·31	−1·55	11·76	28 31·58				
	3459	+12 33	S	d c +203·8	34 13·86	+3·40	17·26	S	d c + 2·3	2 50·08	−1·16	48·92	31·66				
	3468	+37 59	N	b + 2·7, *a* + 4·2	36 20·69	+4·58	25·27	N	b + 2·2, *a* +38·3	4 58·37	−1·59	56·78	31·51				
	3475	+13 56	S	s	37 25·97	+3·40	29·37	S	s	6 2·24	−1·18	1·06	31·69				
	3483	+ 5 12	S	*Q* − 1·37	38 48·62	+3·41	52·03	S	*Q* − 1·36	7 24·63	−1·06	23·57	31·54	m s 28 31·590	+ 0·291	+ 0·004	28 31·885
	3490	+32 4	N		40 27·57	+4·18	31·75	N		9 4·79	−1·47	3·32	31·57				
	3508	+24 1	N		42 15·83	+3·80	19·63	N		10 52·54	−1·33	51·21	31·58				
	3511	+23 42	N		42 53·33	+3·80	57·13	N		11 30·00	−1·33	28·67	31·54				
	3529	+ 7 2	S		46 30·40	+3·41	33·81	S		15 6·42	−1·08	5·34	31·53				
	3534	+15 35	S		47 38·01	+3·39	41·40	S		16 14·31	−1·21	13·10	31·70				
Feb. 8	3290	+35 47	N	*I. P. E.*	9 4 16·15	+1·54	17·69	N	*I. P. E.*	9 32 47·94	+1·16	49·10	28 31·41				
	3299	+13 51	S	d c + 3·8	4 48·83	+1·54	50·37	S	d c + 2·3	33 20·31	+1·58	21·89	31·52				
	3309	+26 27	N	b + 2·4, *a* + 4·0	6 47·05	+1·53	48·58	N	b + 3·6, *a* +44·3	35 18·91	+1·36	20·27	31·69				
	3317	+30 31	N	s	8 34·14	+1·53	35·67	N	s	37 5·99	+1·28	7·27	31·60				
	3327	+24 1	N	*Q* + 1·38	10 28·98	+1·54	30·52	N	*Q* + 1·36	39 0·78	+1·41	2·19	31·67	m s 28 31·569	+ 0·293	0·000	28 31·862
	3337	+12 22	S		11 57·90	+1·54	59·44	S		40 29·38	+1·61	30·99	31·55				
	3344	+12 7	S		13 1·26	+1·54	2·80	S		41 32·78	+1·61	34·39	31·59				
	3355	+21 44	S		15 9·74	+1·53	11·27	N		43 41·39	+1·46	42·85	31·58				
	3359	+ 4 54	S		16 17·66	+1·55	19·21	S		44 48·99	+1·73	50·72	31·51				
Feb. 8	3446	+35 50	N	*I. P. E.*	9 32 26·54	−1·22	25·32	N	*I. P. E.*	10 0 58·56	−1·56	57·00	28 31·68				
	3459	+12 33	S	d c + 3·8	34 3·70	−1·22	2·48	S	d c + 2·3	2 35·23	−1·11	34·12	31·64				
	3468	+37 59	N	b + 2·4, *a* + 4·0	36 11·53	−1·23	10·30	N	b + 3·6, *a* +44·3	4 43·59	−1·60	41·99	31·69				
	3475	+13 56	S	s	37 15·90	−1·23	14·67	S	s	5 47·38	−1·14	46·24	31·57				
	3483	+ 5 12	S	*Q* − 1·38	38 38·35	−1·21	37·14	S	*Q* − 1·36	7 9·74	−1·00	8·74	31·60	m s 28 31·642	+ 0·293	+ 0·004	28 31·939
	3490	+32 4	N		40 18·08	−1·24	16·84	N		8 49·95	−1·48	48·47	31·63				
	3508	+24 1	N		42 5·92	−1·22	4·70	N		10 37·71	−1·31	36·40	31·70				
	3529	+ 7 2	S		46 20·08	−1·21	18·87	S		14 51·54	−1·02	50·52	31·65				
	3534	+15 35	S		47 27·85	−1·22	26·63	S		15 59·41	−1·16	58·25	31·62				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5ʰ 19ᵐ 58ˢ: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4ʰ 51ᵐ 25ˢ.

Astronomical Date	Star		Transits Observed at E — By Heaviside, with Telescope No. 1					Transits Observed at W — By Campbell, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.033$, $C_N - C_S = +0.041$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 9	3278	+16 58	S	*I. P. E.*	9 2 13·38	+1·39	14·77	S	*I. P. E.*	9 30 44·78	+1·52	46·30	28 31·53				
	3290	+35 47	N	(d) c − 1·2	4 1·41	+1·38	2·79	N	(d) c + 2·3	32 33·35	+1·09	34·44	31·65				
	3299	+13 51	S	b + 2·9	4 34·22	+1·39	35·61	S	b + 3·0	33 5·64	+1·59	7·23	31·62				
	3309	+26 27	N	a + 2·1	6 32·45	+1·38	33·83	N	a + 50·3	35 4·16	+1·32	5·48	31·65				
	3317	+30 31	N	(s) Q + 1·34	8 19·50	+1·38	20·88	N	(s) Q + 1·36	36 51·24	+1·23	52·47	31·59	m s 28 31·581	+ 0·288	+ 0·001	28 31·870
	3327	+24 1	N		10 14·43	+1·38	15·81	N		38 46·00	+1·38	47·38	31·57				
	3337	+12 22	S		11 43·25	+1·39	44·64	S		40 14·60	+1·62	16·22	31·58				
	3344	+12 7	S		12 46·70	+1·39	48·09	S		41 18·02	+1·62	19·64	31·55				
	3355	+21 44	S		14 55·14	+1·38	56·52	N		43 26·64	+1·43	28·07	31·55				
	3359	+ 4 54	S		16 3·09	+1·38	4·47	S		44 34·24	+1·75	35·99	31·52				
Feb. 9	3446	+35 50	N	*I. P. E.*	9 32 11·88	−1·30	10·58	N	*I. P. E.*	10 0 43·84	−1·63	42·21	28 31·63				
	3459	+12 33	S	(d) c − 1·2	33 49·00	−1·29	47·71	S	(d) c + 2·3	2 20·47	−1·11	19·36	31·65				
	3468	+37 59	N	b + 2·9	35 56·85	−1·31	55·54	N	b + 3·0	4 28·86	−1·68	27·18	31·64				
	3475	+13 56	S	a + 2·1	36 61·15	−1·29	59·86	S	a + 50·3	5 32·58	−1·14	31·44	31·58				
	3483	+ 5 12	S	(s) Q − 1·34	38 23·66	−1·30	22·36	S	(s) Q − 1·36	6 54·94	−0·97	53·97	31·61	m s 28 31·646	+ 0·288	+ 0·004	28 31·938
	3490	+32 4	N		40 3·40	−1·30	2·10	N		8 35·26	−1·52	33·74	31·64				
	3508	+24 1	N		41 51·25	−1·30	49·95	N		10 23·00	−1·34	21·66	31·71				
	3529	+ 7 2	S		46 5·40	−1·30	4·10	S		14 36·79	−0·99	35·80	31·70				
	3534	+15 35	S		47 13·19	−1·29	11·90	S		15 44·72	−1·17	43·55	31·65				
Feb. 10	3278	+16 58	S	*I. P. W.*	9 1 59·13	+1·33	60·46	S	*I. P. W.*	9 30 30·86	+1·13	31·99	28 31·53				
	3290	+35 47	N	(d) c − 3·1	3 47·17	+1·33	48·50	N	(d) c − 8·2	32 19·71	+0·33	20·04	31·54				
	3309	+26 27	N	b + 0·4	6 18·26	+1·33	19·59	N	b − 5·2	34 50·42	+0·76	51·18	31·59				
	3317	+30 31	N	a − 2·2	8 5·28	+1·34	6·62	N	a + 83·1	36 37·54	+0·59	38·13	31·51				
	3327	+24 1	N	(s) Q + 1·40	10 0·18	+1·33	1·51	N	(s) Q + 1·37	38 32·19	+0·85	33·04	31·53	m s 28 31·536	+ 0·288	0·000	28 31·824
	3337	+12 22	S		11 29·02	+1·33	30·35	S		40 0·61	+1·28	1·89	31·54				
	3344	+12 7	S		12 32·43	+1·33	33·76	S		41 3·99	+1·29	5·28	31·52				
	3355	+21 44	S		14 40·86	+1·34	42·20	N		43 12·83	+0·94	13·77	31·57				
	3359	+ 4 54	S		15 48·86	+1·32	50·18	S		44 20·15	+1·52	21·67	31·49				

Note. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat. 23° 10′, Long. 5h 19m 58s*: AND BOMBAY (W), *Lat. 18° 54′, Long. 4h 51m 25s*.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No. 1*					Transits Observed at W — *By Campbell, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Peral. Equations $H_N - H_S = + 0^s{\cdot}033$, $C_N - C_S = + 0{\cdot}041$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s	m s	s	s	m s
Feb. 10	3446	+35 50	N	*I. P. W.*	9 31 57·52	−1·25	56·27	N	*I. P. W.*	10 0 30·45	−2·41	28·04	28 31·77	28 31·706	+0·288	+0·005	28 31·999
	3459	+12 33	S	d: c − 3·1	33 34·65	−1·25	33·40	S	d: c − 8·2	2 6·50	−1·46	5·04	31·64				
	3468	+37 59	N	b + 0·4	35 42·47	−1·24	41·23	N	b − 5·2	4 15·45	−2·52	12·93	31·70				
	3475	+13 56	S	a − 2·2	36 46·76	−1·25	45·51	S	a +83·1	5 18·71	−1·51	17·20	31·69				
	3483	+ 5 12	S	s: Q −1·18	38 9·25	−1·26	7·99	S	s: Q −1·37	6 40·92	−1·23	39·69	31·70				
	3490	+32 4	N		39 48·98	−1·24	47·74	N		8 21·65	−2·22	19·43	31·69				
	3529	+ 7 2	S		45 50·97	−1·25	49·72	S		14 22·73	−1·29	21·44	31·72				
	3534	+15 35	S		46 58·78	−1·25	57·53	S		15 30·83	−1·56	29·27	31·74				
Feb. 13	3278	+16 58	S	*I. P. W.*	9 1 15·01	+1·05	16·06	S	*I. P. W.*	9 29 46·40	+1·36	47·76	28 31·70	28 31·685	+0·291	+0·004	28 31·980
	3290	+35 47	N	d: c − 3·1	3 2·93	+1·16	4·09	N	d: c − 8·2	31 35·25	+0·53	35·78	31·69				
	3299	+13 51	S	b − 0·5, a −15·5	3 35·87	+1·03	36·90	S	b + 4·5, a +90·7	32 7·14	+1·47	8·61	31·71				
	3317	+30 31	N	s: Q +1·17	7 21·14	+1·13	22·27	N	s: Q +1·37	35 53·11	+0·80	53·91	31·64				
Feb. 13	3459	+12 33	S	*I. P. W.*	9 32 50·40	−1·32	49·08	S	*I. P. W.*	10 1 22·06	−1·22	20·84	28 31·76	28 31·681	+0·291	+0·006	28 31·978
	3468	+37 59	N	d: c − 3·1	34 58·17	−1·16	57·01	N	d: c − 8·2	3 31·04	−2·33	28·71	31·70				
	3475	+13 56	S	b − 0·5	36 2·57	−1·31	1·26	S	b + 4·5	4 34·16	−1·28	32·88	31·62				
	3483	+ 5 12	S	a −15·5	37 25·07	−1·36	23·71	S	a +90·7	5 56·36	−0·98	55·38	31·67				
	3490	+32 4	N	s: Q −1·17	39 4·67	−1·20	3·47	N	s: Q −1·37	7 37·18	−2·01	35·17	31·70				
	3529	+ 7 2	S		45 6·83	−1·35	5·48	S		13 38·17	−1·03	37·14	31·66				
	3534	+15 35	S		46 14·58	−1·30	13·28	S		14 46·27	−1·33	44·94	31·66				
Feb. 14	3278	+16 58	S	*I. P. W.*	9 1 0·49	+1·03	1·52	S	*I. P. W.*	9 29 31·92	+1·33	33·25	28 31·73	28 31·646	+0·287	0·000	28 31·933
	3317	+30 31	N	d: c − 3·1	7 6·60	+1·11	7·71	N	d: c − 8·2	35 38·65	+0·76	39·41	31·70				
	3327	+24 1	N	b − 1·7	9 1·56	+1·07	2·63	N	b + 3·5	37 33·28	+1·05	34·33	31·70				
	3337	+12 22	S	a −16·1	10 30·43	+1·00	31·43	S	a +92·4	39 1·55	+1·51	3·06	31·63				
	3344	+12 7	S	s: Q +1·18	11 33·86	+1·00	34·86	S	s: Q +1·37	40 4·91	+1·52	6·43	31·57				
	3355	+21 44	S		13 42·23	+1·06	43·29	N		42 13·78	+1·14	14·92	31·63				
	3359	+ 4 54	S		14 50·31	+0·96	51·27	S		43 21·07	+1·76	22·83	31·56				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5ʰ 19ᵐ 58ˢ: AND BOMBAY (W), *Lat.* 18° 54′, *Long.* 4ʰ 51ᵐ 25ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Peral. Equations $H_N - H_S = +0^s.033$, $C_N - C_S = +0^s.041$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s	m s			
Feb. 14	3446	+35 50	N	*I. P. W.*	9 30 58·63	−1·22	57·41	N	*I. P. W.*	9 59 31·48	−2·26	29·22	28 31·81	28 31·738	+ 0·287	+ 0·004	28 32·029
	3459	+12 33	S	d c − 3·1	32 35·90	−1·36	34·54	S	d c − 8·2	10 1 7·50	−1·24	6·26	31·72				
	3468	+37 59	N	b − 1·7 *a* −16·1	34 43·63	−1·20	42·43	N	b + 3·5 *a* +92·4	3 16·60	−2·38	14·22	31·79				
	3483	+ 5 12	S	s *Q* −1·18	37 10·56	−1·40	9·16	S	s *Q* −1·37	5 41·84	−0·99	40·85	31·69				
	3511	+23 42	N		41 15·56	−1·30	14·26	N		9 47·69	−1·68	46·01	31·75				
	3534	+15 35	S		45 60·03	−1·34	58·69	S		14 31·71	−1·35	30·36	31·67				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat. 23° 10′, Long. 5h 19m 58s*: AND **BOLARUM (W),** *Lat. 17° 30′, Long. 5h 14m 15s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s·048$, $C_N - C_S = +0·055$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 23	3317	+30 31	N	I. P. W.	9 33 40·11	+1·19	41·30	N	I. P. W.	9 39 22·27	+1·74	24·01	5 42·71				
	3327	+24 1	N	d c − 0·7	35 35·11	+1·07	36·18	N	d c + 1·0	41 17·34	+1·56	18·90	42·72				
	3337	+12 22	S	b − 2·3 a −40·5	37 3·96	+0·89	4·85	S	b + 2·1 a −56·3	42 46·42	+1·27	47·69	42·84	m s 5 42·805	+0·069	−0·005	5 42·869
	3344	+12 7	S	s Q +1·15	38 7·34	+0·89	8·23	S	s Q +1·34	43 49·84	+1·27	51·11	42·88				
	3355	+21 44	S		40 15·69	+1·03	16·72	N		45 58·13	+1·49	59·62	42·90				
	3359	+ 4 54	S		41 23·93	+0·78	24·71	S		47 6·37	+1·12	7·49	42·78				
Feb. 23	3446	+35 50	N	I. P. W.	9 57 31·87	−0·94	30·93	N	I. P. W.	10 3 14·58	−0·78	13·80	5 42·87				
	3459	+12 33	S	d c − 0·7	59 9·34	−1·35	7·99	S	d c + 1·0	4 52·24	−1·40	50·84	42·85				
	3468	+37 59	N	b − 2·3 a −40·5	10 1 16·89	−0·89	16·00	N	b + 2·1 a −56·3	6 59·53	−0·70	58·83	42·83				
	3475	+13 56	S	s Q −1·09	2 21·45	−1·32	20·13	S	s Q −1·34	8 4·35	−1·37	2·98	42·85				
	3483	+ 5 12	S		3 44·12	−1·46	42·66	S		9 27·05	−1·56	25·49	42·83				
	3490	+32 4	N		5 23·49	−1·02	22·47	N		11 6·21	−0·91	5·30	42·83	m s 5 42·866	+0·069	−0·001	5 42·934
	3507	+24 6	N		7 4·02	−1·17	2·85	N		12 46·90	−1·12	45·78	42·93				
	3508	+24 1	N		7 11·44	−1·17	10·27	N		12 54·26	−1·12	53·14	42·87				
	3523	+20 4	S		10 22·63	−1·23	21·40	N		16 5·55	−1·22	4·33	42·93				
	3529	+ 7 2	S		11 25·79	−1·43	24·36	S		17 8·76	−1·52	7·24	42·88				
	3534	+15 35	S		12 33·47	−1·30	32·17	S		18 16·36	−1·33	15·03	42·86				
Feb. 24	3278	+16 58	S	I. P. W.	9 27 16·40	+0·96	17·36	S	I. P. W.	9 32 58·79	+1·40	60·19	5 42·83				
	3290	+35 47	N	d c − 0·7	29 4·59	+0·98	5·57	N	d c + 1·0	34 46·38	+1·94	48·32	42·75				
	3299	+13 51	S	b − 2·9 a − 3·9	29 37·28	+0·95	38·23	S	b + 3·3 a −58·9	35 19·71	+1·32	21·03	42·80				
	3309	+26 27	N	s Q +1·06	31 35·60	+0·97	36·57	N	s Q +1·33	37 17·74	+1·65	19·39	42·82				
	3317	+30 31	N		33 22·57	+0·97	23·54	N		39 4·63	+1·77	6·40	42·86	m s 5 42·811	+0·070	−0·001	5 42·880
	3327	+24 1	N		35 17·54	+0·97	18·51	N		40 59·70	+1·58	61·28	42·77				
	3337	+12 22	S		36 46·32	+0·95	47·27	S		42 28·77	+1·29	30·06	42·79				
	3344	+12 7	S		37 49·67	+0·96	50·63	S		43 32·19	+1·28	33·47	42·84				
	3355	+21 44	S		39 58·16	+0·97	59·13	N		45 40·47	+1·52	41·99	42·86				
	3359	+ 4 54	S		41 6·10	+0·95	7·05	S		46 48·73	+1·11	49·84	42·79				

NOTE. $1^d = 0^s·0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND BOLARUM (W), *Lat.* 17° 30′, *Long.* 5h 14m 15s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	In-strumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	In-strumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}048$ $C_N - C_S = +0{\cdot}055$	$\delta L_N - \rho$
1881		° ′	′		h m s	s	s			h m s	s	s	m s				
Feb.24	8446	+35 50	N	*I. P. W.*	9 57 14·42	−1·14	13·28	N	*I. P. W.*	10 2 56·85	−0·72	56·13	5 42·85				
	8459	+12 33	S	d c − 0·7	58 51·50	−1·17	50·33	S	d c + 1·0	4 34·53	−1·37	33·16	42·83				
	8468	+37 59	N	b − 2·9 a − 3·9	10 0 59·46	−1·13	58·33	N	b + 3·3 a −58·9	6 41·82	−0·64	41·18	42·85				
	8475	+13 56	S	s Q −1·06	2 3·73	−1·17	2·56	S	s Q −1·33	7 46·67	−1·33	45·34	42·78				
	8490	+32 4	N		5 5·96	−1·15	4·81	N		10 48·49	−0·85	47·64	42·83	m s 5 42·818	+ 0·070	− 0·002	5 42·886
	8508	+24 1	N		6 53·84	−1·15	52·69	N		12 36·56	−1·08	35·48	42·79				
	8522	+20 4	S		10 4·95	−1·16	3·79	N		15 47·82	−1·18	46·64	42·85				
	8529	+ 7 2	S		11 7·87	−1·17	6·70	S		16 51·03	−1·50	49·53	42·83				
	8534	+15 35	S		12 15·72	−1·16	14·56	S		17 58·60	−1·29	57·31	42·75				
Feb.25	3278	+16 58	S	*I. P. W.*	9 26 58·46	+1·10	59·56	S	*I. P. W.*	9 32 40·68	+1·52	42·20	5 42·64				
	3290	+35 47	N	d c − 0·7	28 46·49	+1·16	47·65	N	d c + 1·0	34 28·84	+1·55	30·39	42·74				
	3299	+13 51	S	b + 2·7 a − 5·5	29 19·21	+1·10	20·31	S	b + 4·2 a − 0·8	35 1·58	+1·52	3·10	42·79				
	3309	+26 27	N	s Q +1·08	31 17·61	+1·14	18·75	N	s Q +1·40	36 59·93	+1·53	61·46	42·71				
	3317	+30 31	N		33 4·59	+1·15	5·74	N		38 46·90	+1·54	48·44	42·70	m s 5 42·705	+ 0·070	− 0·001	5 42·774
	3327	+24 1	N		34 59·52	+1·13	60·65	N		40 41·76	+1·53	43·29	42·64				
	3337	+12 22	S		36 28·23	+1·09	29·32	S		42 10·51	+1·52	12·03	42·71				
	3344	+12 7	S		37 31·66	+1·09	32·75	S		43 13·97	+1·52	15·49	42·74				
	3355	+21 44	S		39 40·23	+1·13	41·36	N		45 22·50	+1·52	24·02	42·66				
	3359	+ 4 54	S		40 48·10	+1·08	49·18	S		46 30·39	+1·51	31·90	42·72				
Feb.25	8446	+35 50	N	*I. P. W.*	9 56 56·45	−1·00	55·45	N	*I. P. W.*	10 2 39·47	−1·25	38·22	5 42·77				
	8459	+12 33	S	d c − 0·7	58 33·53	−1·07	32·46	S	d c + 1·0	4 16·49	−1·28	15·21	42·75				
	8468	+37 59	N	b + 2·7 a − 5·5	10 0 41·47	−0·99	40·48	N	b + 4·2 a − 0·8	6 24·46	−1·25	23·21	42·73				
	8475	+13 56	S	s Q −1·08	1 45·68	−1·06	44·62	S	s Q −1·40	7 28·61	−1·28	27·33	42·71				
	8483	+ 5 12	S		3 8·19	−1·08	7·11	S		8 51·09	−1·29	49·80	42·69				
	8490	+32 4	N		4 47·99	−1·01	46·98	N		10 30·94	−1·25	29·69	42·71	m s 5 42·740	+ 0·070	− 0·001	5 42·809
	8507	+24 6	N		6 28·46	−1·03	27·43	N		12 11·43	−1·27	10·16	42·73				
	8508	+24 1	N		6 35·81	−1·03	34·78	N		12 18·79	−1·27	17·52	42·74				
	8522	+20 4	S		9 46·93	−1·05	45·88	N		15 29·96	−1·28	28·68	42·80				
	8529	+ 7 2	S		10 49·91	−1·08	48·83	S		16 32·88	−1·29	31·59	42·76				
	8534	+15 35	S		11 57·69	−1·06	56·63	S		17 40·66	−1·28	39·38	42·75				

Note. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s; AND BOLARUM (W), *Lat.* 17° 30′, *Long.* 5h 14m 15s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.048$, $C_N - C_S = +0.055$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 28	3278	+16 58	S	I. P. E.	9 26 6·64	+0·72	7·36	S	I. P. E.	9 31 49·03	+1·16	50·19	5 42·83				
	3299	+13 51	S	d c − 4·3	28 27·54	+0·70	28·24	S	d c − 7·1	34 9·92	+1·14	11·06	42·82				
	3309	+26 27	N	b − 4·2 a −14·1	30 25·86	+0·75	26·61	N	b − 3·4 a −18·4	36 8·21	+1·21	9·42	42·81				
	3317	+30 31	N	s Q +0·96	32 12·85	+0·78	13·63	N	s Q +1·41	37 55·19	+1·24	56·43	42·80				
	3327	+24 1	N		34 7·76	+0·75	8·51	N		39 50·14	+1·19	51·33	42·82	m s 5 42·800	+0·069	−0·001	5 42·868
	3337	+12 22	S		35 36·62	+0·70	37·32	S		41 18·93	+1·13	20·06	42·74				
	3344	+12 7	S		36 39·99	+0·70	40·69	S		42 22·32	+1·12	23·44	42·75				
	3355	+21 44	S		38 48·46	+0·75	49·21	N		44 30·85	+1·19	32·04	42·83				
	3359	+ 4 54	S		39 56·41	+0·67	57·08	S		45 38·80	+1·08	39·88	42·80				
Feb. 28	3446	+35 50	N	I. P. E.	9 56 4·50	−1·11	3·39	N	I. P. E.	10 1 47·78	−1·55	46·23	5 42·84				
	3459	+12 33	S	d c − 4·3	57 41·64	−1·21	40·43	S	d c − 7·1	3 24·93	−1·69	23·24	42·81				
	3468	+37 59	N	b − 4·2 a −14·1	59 49·52	−1·10	48·42	N	b − 3·4 a −18·4	5 32·81	−1·53	31·28	42·86				
	3475	+13 56	S	s Q −0·96	10 0 53·80	−1·22	52·58	S	s Q −1·41	6 37·04	−1·68	35·36	42·78				
	3483	+ 5 12	S		2 16·29	−1·25	15·04	S		7 59·59	−1·73	57·86	42·82				
	3490	+32 4	N		3 56·01	−1·13	54·88	N		9 39·28	−1·56	37·72	42·84	m s 5 42·808	+0·069	−0·001	5 42·876
	3507	+24 6	N		5 36·54	−1·17	35·37	N		11 19·80	−1·63	18·17	42·80				
	3508	+24 1	N		5 43·92	−1·17	42·75	N		11 27·17	−1·63	25·54	42·79				
	3522	+20 4	S		8 55·06	−1·18	53·88	N		14 38·32	−1·65	36·67	42·79				
	3529	+ 7 2	S		9 58·01	−1·24	56·77	S		15 41·28	−1·73	39·55	42·78				
	3534	+15 35	S		11 5·79	−1·21	4·58	S		16 49·03	−1·67	47·36	42·78				
Mar. 2	3278	+16 58	S	I. P. E.	9 25 31·21	+0·74	31·95	S	I. P. E.	9 31 13·60	+1·21	14·81	5 42·86				
	3290	+35 47	N	d c − 4·3	27 19·18	+0·88	20·06	N	d c − 7·1	33 1·51	+1·34	2·85	42·79				
	3299	+13 51	S	b − 3·2 a −20·9	27 52·12	+0·71	52·83	S	b − 0·8 a −18·5	33 34·42	+1·19	35·61	42·78				
	3309	+26 27	N	s Q +0·97	29 50·30	+0·80	51·10	N	s Q +1·40	35 32·69	+1·26	33·95	42·85				
	3317	+30 31	N		31 37·30	+0·84	38·14	N		37 19·67	+1·30	20·97	42·83				
	3327	+24 1	N		33 32·28	+0·78	33·06	N		39 14·61	+1·24	15·85	42·79	m s 5 42·813	+0·071	−0·001	5 42·883
	3337	+12 22	S		35 1·05	+0·70	1·75	S		40 43·40	+1·18	44·58	42·83				
	3344	+12 7	S		36 4·52	+0·70	5·21	S		41 46·84	+1·17	48·01	42·80				
	3355	+21 44	S		38 12·98	+0·77	13·75	N		43 55·33	+1·24	56·57	42·82				
	3359	+ 4 54	S		39 20·95	+0·65	21·60	S		45 3·26	+1·12	4·38	42·78				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND BOLARUM (W), *Lat.* 17° 30′, *Long.* 5h 14m 15s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}048$, $C_N - C_S = +0^s{\cdot}055$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 2	3446	+35 50	N	I. P. E.	9 55 29·01	−1·06	27·95	N	I. P. E.	10 1 12·07	−1·46	10·61	5 42·66				
	3459	+12 33	S	d c − 4·3	57 6·17	−1·24	4·93	S	d c − 7·1	2 49·32	−1·62	47·70	42·77				
	3468	+37 59	N	b − 3·2 a −20·9	59 14·06	−1·04	13·02	N	b − 0·8 a −18·5	4 57·13	−1·45	55·68	42·66				
	3475	+13 56	S	s Q −0·97	10 0 18·32	−1·22	17·10	S	s Q −1·40	5 61·44	−1·61	59·83	42·73				
	3483	+ 5 12	S		1 40·89	−1·29	39·60	S		7 24·00	−1·67	22·33	42·73	m s 5 42·754	+ 0·071	− 0·003	5 42·822
	3490	+32 4	N		3 20·51	−1·08	19·43	N		9 3·68	−1·48	2·20	42·77				
	3507	+24 6	N		4 61·04	−1·16	59·88	N		10 44·20	−1·56	42·64	42·76				
	3508	+24 1	N		5 8·35	−1·16	7·19	N		10 51·55	−1·56	49·99	42·80				
	3522	+20 4	S		8 19·51	−1·19	18·32	N		14 2·81	−1·58	1·23	42·91				
Mar. 3	3309	+26 27	N	I. P. E.	9 29 32·34	+0·68	33·02	N	I. P. E.	9 35 14·58	+1·31	15·89	5 42·87				
	3317	+30 31	N	d c − 4·3	31 19·39	+0·70	20·09	N	d c − 7·1	37 1·57	+1·35	2·92	42·83				
	3327	+24 1	N	b − 2·8 a −11·2	33 14·29	+0·67	14·96	N	b + 0·7 a −20·4	38 56·51	+1·29	57·80	42·84				
	3337	+12 22	S	s Q +0·85	34 43·14	+0·64	43·78	S	s Q +1·40	40 25·33	+1·21	26·54	42·76	m s 5 42·814	+ 0·072	− 0·004	5 42·882
	3344	+12 7	S		35 46·54	+0·64	47·18	S		41 28·75	+1·21	29·96	42·78				
	3355	+21 44	S		35 54·96	+0·67	55·63	N		41 37·21	+1·28	38·49	42·86				
	3359	+ 4 54	S		39 2·97	+0·61	3·58	S		44 45·19	+1·15	46·34	42·76				
Mar. 3	3446	+35 50	N	I. P. E.	9 55 10·76	−0·99	9·77	N	I. P. E.	10 0 54·07	−1·41	52·66	5 42·89				
	3459	+12 33	S	d c − 4·3	56 47·99	−1·06	46·93	S	d c − 7·1	2 31·31	−1·59	29·72	42·79				
	3468	+37 59	N	b − 2·8 a −11·2	58 55·79	−0·97	54·82	N	b + 0·7 a −20·4	4 39·10	−1·39	37·71	42·89				
	3483	+ 5 12	S	s Q −0·85	10 1 22·64	−1·09	21·55	S	s Q −1·40	7 5·94	−1·64	4·30	42·75	m s 5 42·825	+ 0·072	− 0·004	5 42·893
	3490	+32 4	N		3 2·34	−0·99	1·35	N		8 45·61	−1·44	44·17	42·82				
	3507	+24 6	N		4 42·85	−1·03	41·82	N		10 26·14	−1·51	24·63	42·81				
	3508	+24 1	N		4 50·19	−1·03	49·16	N		10 33·48	−1·51	31·97	42·81				
	3522	+20 4	S		8 1·33	−1·04	0·29	N		13 44·66	−1·53	43·13	42·84				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND BOLARUM (W), *Lat.* 17° 30′, *Long.* 5h 14m 15s.

Astronomical Date	Star		Transits Observed at E, By Heaviside, with Telescope No. 1					Transits Observed at W, By Campbell, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s{\cdot}048$, $C_N - C_S = +0{\cdot}055$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 23	3782	+ 0 38	S	*I. P. W.*	10 48 15·67	+0·66	16·33	S	*I. P. W.*	10 53 58·27	+1·03	59·30	5 42·97				
	3788	+ 7 59	S	d: c − 0·7	51 37·05	+0·77	37·82	S	d: c + 1·0	57 19·64	+1·18	20·82	43·00				
	3795	+ 2 31	S	b − 2·3, a − 40·5	53 12·74	+0·69	13·43	S	b + 2·1, a − 56·3	58 55·36	+1·07	56·43	43·00				
	3798	+ 2 36	S	s: Q + 1·09	53 34·42	+0·69	35·11	S	s: Q + 1·34	59 17·03	+1·07	18·10	42·99				
	3809	+25 18	N		55 10·16	+1·03	11·19	N		11 0 52·57	+1·59	54·16	42·97	m s 5 42·944	+ 0·108	− 0·001	5 43·051
	3824	+15 3	S		58 13·47	+0·87	14·34	S		3 55·92	+1·34	57·26	42·92				
	3834	+21 11	S		11 0 30·86	+0·97	31·83	N		6 13·30	+1·48	14·78	42·95				
	3842	+23 45	N		1 36·57	+1·01	37·58	N		7 18·95	+1·55	20·50	42·92				
	3851	+32 12	N		4 34·09	+1·16	35·25	N		10 16·32	+1·78	18·10	42·85				
	3852	+33 45	N		4 46·99	+1·20	48·19	N		10 29·23	+1·83	31·06	42·87				
Feb. 23	3932	+17 27	S	*I. P. W.*	11 21 16·69	−1·27	15·42	S	*I. P. W.*	11 26 59·59	−1·29	58·30	5 42·88				
	3937	+28 26	N	d: c − 0·7	22 47·96	−1·09	46·87	N	d: c + 1·0	28 30·81	−1·01	29·80	42·93				
	3952	+44 17	N	b − 2·3, a − 40·5	24 45·68	−0·74	44·94	N	b + 2·1, a − 56·3	30 28·36	−0·47	27·89	42·95				
	3964	+22 1	N	s: Q − 1·09	27 21·51	−1·20	20·31	N	s: Q − 1·34	33 4·44	−1·18	3·26	42·95				
	3970	+12 57	S		28 40·64	−1·34	39·30	S		34 23·67	−1·39	22·28	42·98	m s 5 42·965	+ 0·108	+ 0·004	5 43·077
	3973	+42 23	N		30 4·66	−0·79	3·87	N		35 47·38	−0·55	46·83	42·96				
	3979	+ 8 55	S		31 54·70	−1·40	53·30	S		37 37·77	−1·47	36·30	43·00				
	3982	+ 7 12	S		32 30·20	−1·42	28·78	S		38 13·33	−1·51	11·82	43·04				
	3997	+16 54	S		35 51·46	−1·28	50·18	S		41 34·47	−1·30	33·17	42·99				
	4010	+38 34	N		38 52·47	−0·88	51·59	N		44 35·25	−0·69	34·56	42·97				
Feb. 24	3782	+ 0 38	S	*I. P. W.*	10 49 48·26	+0·95	49·21	S	*I. P. W.*	10 55 31·17	+1·02	32·19	5 42·98				
	3788	+ 7 59	S	d: c − 0·7	51 9·79	+0·96	10·75	S	d: c + 1·0	56 52·54	+1·18	53·72	42·97				
	3795	+ 2 31	S	b − 2·9, a − 3·9	52 45·41	+0·95	46·36	S	b + 3·3, a − 58·9	58 28·29	+1·07	29·36	43·00				
	3798	+ 2 36	S	s: Q + 1·06	53 7·03	+0·95	7·98	S	s: Q + 1·33	58 49·91	+1·07	50·98	43·00				
	3809	+25 18	N		54 43·08	+0·97	44·05	N		11 0 25·47	+1·62	27·09	43·04	m s 5 42·994	+ 0·106	− 0·001	5 43·099
	3824	+15 3	S		57 46·28	+0·96	47·24	S		3 28·81	+1·35	30·16	42·92				
	3834	+21 11	S		11 0 3·70	+0·97	4·67	N		5 46·20	+1·51	47·71	43·04				
	3842	+23 45	N		1 9·46	+0·97	10·43	N		6 51·86	+1·58	53·44	43·01				
	3851	+32 12	N		4 7·11	+0·97	8·08	N		9 49·23	+1·82	51·05	42·97				
	3852	+33 45	N		4 20·07	+0·98	21·05	N		10 2·16	+1·90	4·06	43·01				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND BOLARUM (W), *Lat.* 17° 30′, *Long.* 5h 14m 15s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = + 0^s{\cdot}048$, $C_N - C_S = + 0^s{\cdot}055$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 24	3930	+ 3 43	S	I. P. W.	11 20 35·11	−1·17	33·94	S	I. P. W.	11 26 18·58	−1·57	17·01	5 43·07				
	3937	+28 26	N	d; c − 0·7	22 20·85	−1·14	19·71	N	d; c + 1·0	28 3·75	−0·95	2·80	43·09				
	3952	+44 17	N	b − 2·9; a − 3·9	24 18·95	−1·13	17·82	N	b + 3·3; a −58·9	30 1·24	−0·37	0·87	43·05				
	3964	+22 1	N	s; Q − 1·06	26 54·35	−1·15	53·20	N	s; Q − 1·33	32 37·35	−1·14	36·21	43·01				
	3970	+12 57	S		28 13·39	−1·17	12·22	S		33 56·62	−1·35	55·27	43·05	m s 5 43·053	+ 0·106	+ 0·004	5 43·163
	3973	+42 23	N		29 37·85	−1·12	36·73	N		35 20·28	−0·47	19·81	43·08				
	3979	+ 8 55	S		31 27·37	−1·16	26·21	S		37 10·73	−1·45	9·28	43·07				
	3982	+ 7 12	S		32 2·91	−1·17	1·74	S		37 46·27	−1·49	44·78	43·04				
	3997	+16 54	S		35 24·30	−1·16	23·14	S		41 7·41	−1·26	6·15	43·01				
	4010	+38 34	N		38 25·63	−1·13	24·50	N		44 8·18	−0·62	7·56	43·06				
Feb. 25	3782	+ 0 38	S	I. P. W.	10 50 21·52	+1·07	22·59	S	I. P. W.	10 56 4·06	+1·50	5·56	5 42·97				
	3788	+ 7 59	S	d; c − 0·7	50 43·01	+1·09	44·10	S	d; c + 1·0	56 25·58	+1·51	27·09	42·99				
	3795	+ 2 31	S	b + 2·7; a − 5·5	53 18·69	+1·07	19·76	S	b + 4·2; a − 0·8	59 1·20	+1·51	2·71	42·95				
	3798	+ 2 36	S	s; Q + 1·08	53 40·33	+1·07	41·40	S	s; Q + 1·40	59 22·82	+1·51	24·33	42·93				
	3809	+25 18	N		55 16·41	+1·13	17·54	N		11 0 58·93	+1·53	60·46	42·92	m s 5 42·964	+ 0·105	− 0·001	5 43·068
	3824	+15 3	S		57 19·52	+1·10	20·62	S		3 2·00	+1·52	3·52	42·90				
	3834	+21 11	S		59 36·97	+1·11	38·08	N		5 19·57	+1·52	21·09	43·01				
	3842	+23 45	N		11 0 42·73	+1·13	43·86	N		6 25·31	+1·53	26·84	42·98				
	3851	+32 12	N		3 40·31	+1·15	41·46	N		9 22·92	+1·55	24·47	43·01				
	3852	+33 45	N		3 53·29	+1·16	54·45	N		9 35·88	+1·55	37·43	42·98				
Feb. 25	3930	+ 3 43	S	I. P. W.	11 20 8·38	−1·08	7·30	S	I. P. W.	11 25 51·68	−1·29	50·39	5 43·09				
	3937	+28 26	N	d; c − 0·7	21 54·17	−1·02	53·15	N	d; c + 1·0	27 37·45	−1·26	36·19	43·04				
	3952	+44 17	N	b + 2·7; a − 5·5	23 52·25	−0·96	51·29	N	b + 4·2; a − 0·8	29 35·51	−1·24	34·27	42·98				
	3964	+22 1	N	s; Q − 1·08	26 27·57	−1·03	26·54	N	s; Q − 1·40	32 10·87	−1·28	9·59	43·05				
	3970	+12 57	S		27 46·62	−1·06	45·56	S		33 29·89	−1·28	28·61	43·05	m s 5 43·047	+ 0·105	+ 0·004	5 43·156
	3973	+42 23	N		29 11·14	−0·97	10·17	N		34 54·43	−1·24	53·19	43·02				
	3979	+ 8 55	S		30 60·63	−1·07	59·56	S		36 43·95	−1·29	42·66	43·10				
	3982	+ 7 12	S		31 36·21	−1·08	35·13	S		37 19·44	−1·29	18·15	43·02				
	3997	+16 54	S		34 57·57	−1·06	56·51	S		40 40·82	−1·28	39·54	43·03				
	4010	+38 34	N		37 58·84	−0·98	57·86	N		43 42·20	−1·25	40·95	43·09				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND BOLARUM (W), *Lat.* 17° 30′, *Long.* 5h 14m 15s.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No.* 1					Transits Observed at W — *By Campbell, with Telescope No.* 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.048$ $C_N - C_S = +0.055$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Feb. 28	3782	+ 0 38	S	*I. P. E.*	10 48 2·20	+0·64	2·84	S	*I. P. E.*	10 53 44·71	+1·06	45·77	5 42·93				
	3788	+ 7 59	S	d c − 4·3	49 23·74	+0·68	24·42	S	d c − 7·1	55 6·22	+1·10	7·32	42·90				
	3795	+ 2 31	S	b − 4·2 a −14·1	50 59·28	+0·65	59·93	S	b − 3·4 a −18·4	56 41·89	+1·07	42·96	43·03				
	3798	+ 2 36	S	s Q +0·96	51 20·97	+0·65	21·62	S	s Q +1·41	57 3·53	+1·07	4·60	42·98				
	3809	+25 18	N		52 57·06	+0·76	57·82	N		58 39·53	+1·21	40·74	42·92	m s 5 42·959	+ 0·106	− 0·001	5 43·064
	3824	+15 3	S		56 0·22	+0·71	0·93	S		11 1 42·63	+1·15	43·78	42·85				
	3834	+21 11	S		58 17·60	+0·74	18·34	N		4 0·18	+1·18	1·36	43·02				
	3842	+23 45	N		59 23·29	+0·75	24·04	N		5 5·86	+1·19	7·05	43·01				
	3851	+32 12	N		11 0 20·96	+0·79	21·75	N		6 3·44	+1·26	4·70	42·95				
	3852	+33 45	N		2 33·88	+0·79	34·67	N		8 16·41	+1·26	17·67	43·00				
Feb. 28	3937	+28 26	N	*I. P. E.*	11 20 34·59	−1·15	33·44	N	*I. P. E.*	11 26 17·94	−1·60	16·34	5 42·90				
	3952	+44 17	N	d c − 4·3	22 32·62	−1·06	31·56	N	d c − 7·1	28 15·94	−1·48	14·46	42·90				
	3964	+22 1	N	b − 4·2 a −14·1	25 8·09	−1·17	6·92	N	b − 3·4 a −18·4	30 51·45	−1·63	49·82	42·90				
	3970	+12 57	S	s Q −0·96	26 27·11	−1·21	25·90	S	s Q −1·41	32 10·51	−1·69	8·82	42·92				
	3978	+42 23	N		27 51·52	−1·07	50·45	N		33 34·89	−1·48	33·41	42·96	m s 5 42·931	+ 0·106	+ 0·003	5 43·040
	3979	+ 8 55	S		29 41·09	−1·23	39·86	S		35 24·51	−1·72	22·79	42·93				
	3982	+ 7 12	S		30 16·66	−1·24	15·42	S		35 60·05	−1·73	58·32	42·90				
	3997	+16 54	S		33 37·93	−1·20	36·73	S		39 21·39	−1·66	19·73	43·00				
	4010	+38 34	N		36 39·27	−1·10	38·17	N		42 22·67	−1·53	21·14	42·97				
Mar. 2	3788	+ 7 59	S	*I. P. E.*	10 48 30·32	+0·67	30·99	S	*I. P. E.*	10 54 12·77	+1·15	13·92	5 42·93				
	3795	+ 2 31	S	d c − 4·3	50 5·93	+0·63	6·56	S	d c − 7·1	55 48·42	+1·11	49·53	42·97				
	3798	+ 2 36	S	b − 3·2 a −20·9	50 27·60	+0·63	28·23	S	b − 0·8 a −18·5	56 10·04	+1·11	11·15	42·92				
	3809	+25 18	N	s Q +0·97	52 3·52	+0·79	4·31	N	s Q +1·40	57 46·06	+1·26	47·32	43·01				
	3824	+15 3	S		55 6·71	+0·72	7·43	S		11 0 49·21	+1·20	50·41	42·98	m s 5 42·984	+ 0·106	− 0·002	5 43·088
	3834	+21 11	S		57 24·13	+0·77	24·90	N		3 6·71	+1·23	7·94	43·04				
	3842	+23 45	N		58 29·87	+0·78	30·65	N		4 12·43	+1·24	13·67	43·02				
	3851	+32 12	N		11 1 27·46	+0·86	28·32	N		7 10·04	+1·31	11·35	43·03				
	3852	+33 45	N		1 40·48	+0·86	41·34	N		7 22·98	+1·32	24·30	42·96				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXV. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND BOLARUM (W), *Lat.* 17° 30′, *Long.* 5h 14m 15s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $H_N - H_S = +0^s.048$, $C_N - C_S = +0^s.055$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 2	3930	+ 3 43	S	I. P. E.	11 17 55·45	−1·30	54·15	S	I. P. E.	11 23 38·80	−1·68	37·12	5 42·97				
	3937	+28 26	N	d c − 4·3	19 41·10	−1·12	39·98	N	d c − 7·1	25 24·51	−1·52	22·99	43·01				
	3952	+44 17	N	b − 3·2 a −20·9	21 38·97	−0·96	38·01	N	b − 0·8 a −18·5	27 22·47	−1·38	21·09	43·08				
	3964	+22 1	N	s Q −0·97	24 14·61	−1·17	13·44	N	s Q −1·40	29 58·01	−1·56	56·45	43·01				
	3970	+12 57	S		25 33·65	−1·23	32·42	S		31 17·09	−1·62	15·47	43·05	m s 5 43·004	+ 0·106	+ 0·004	5 43·114
	3973	+42 23	N		26 58·06	−0·99	57·07	N		32 41·47	−1·40	40·07	43·00				
	3979	+ 8 55	S		28 47·73	−1·26	46·47	S		34 31·04	−1·65	29·39	42·92				
	3982	+ 7 12	S		29 23·26	−1·28	21·98	S		35 6·62	−1·66	4·96	42·98				
	3997	+16 54	S		32 44·48	−1·20	43·28	S		38 27·93	−1·59	26·34	43·06				
	4010	+38 34	N		35 45·84	−1·03	44·81	N		41 29·21	−1·44	27·77	42·96				
Mar. 3	3782	+ 0 38	S	I. P. E.	10 46 42·19	+0·59	42·78	S	I. P. E.	10 52 24·66	+1·12	25·78	5 43·00				
	3788	+ 7 59	S	d c − 4·3	48 3·75	+0·62	4·37	S	d c − 7·1	53 46·15	+1·18	47·33	42·96				
	3798	+ 2 36	S	b − 2·8 a −11·2	50 1·00	+0·60	1·60	S	b + 0·7 a −20·4	55 43·39	+1·14	44·53	42·93				
	3809	+25 18	N	s Q +0·85	51 36·93	+0·68	37·61	N	s Q +1·40	57 19·39	+1·30	20·69	43·08	m s 5 42·976	+ 0·105	− 0·003	5 43·078
	3824	+15 3	S		54 40·17	+0·65	40·82	S		11 0 22·56	+1·23	23·79	42·97				
	3834	+21 11	S		56 57·64	+0·67	58·31	N		2 40·03	+1·28	41·31	43·00				
	3842	+23 45	N		58 3·36	+0·67	4·03	N		3 45·63	+1·29	46·92	42·89				
Mar. 3	3930	+ 3 43	S	I. P. E.	11 15 28·61	−1·10	27·51	S	I. P. E.	11 21 12·20	−1·65	10·55	5 43·04				
	3937	+28 26	N	d c − 4·3	19 14·27	−1·01	13·26	N	d c − 7·1	24 57·82	−1·47	56·35	43·09				
	3952	+44 17	N	b − 2·8 a −11·2	21 12·32	−0·94	11·38	N	b + 0·7 a −20·4	26 55·80	−1·32	54·48	43·10				
	3964	+22 1	N	s Q −0·85	23 47·80	−1·03	46·77	N	s Q −1·40	29 31·32	−1·52	29·80	43·03	m s 5 43·086	+ 0·105	+ 0·004	5 43·195
	3970	+12 57	S		25 6·75	−1·06	5·69	S		30 50·41	−1·58	48·83	43·14				
	3979	+ 8 55	S		28 20·83	−1·08	19·75	S		34 4·41	−1·61	2·80	43·05				
	3997	+16 54	S		32 17·70	−1·05	16·65	S		37 61·32	−1·55	59·77	43·12				
	4010	+38 34	N		35 18·98	−0·97	18·01	N		41 2·52	−1·39	1·13	43·12				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND AGRA (W), *Lat.* 27° 10′, *Long.* 5h 12m 14s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $O_N - C_S = + 0^s.055$, $H_N - H_S = + 0.060$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 11	3610	+35 36	N	*I. P. E.*	10 26 15·26	+1·47	16·73	N	*I. P. E.*	10 33 58·06	+1·48	59·54	7 42·81				
	3625	+36 56	N	d: c − 1·6	29 4·29	+1·47	5·76	N	d: c − 1·4	36 47·14	+1·43	48·57	42·81				
	3633	+34 42	N	b + 1·1, a − 0·2	30 39·78	+1·47	41·25	N	b − 0·9, a +63·4	38 22·60	+1·50	24·10	42·85				
	3640	+32 36	N	s: Q + 1·48	31 33·87	+1·47	35·34	N	s: Q + 1·79	39 16·61	+1·57	18·18	42·84				
	3650	+28 9	N		33 18·25	+1·47	19·72	N		41 0·88	+1·69	2·57	42·85	m s 7 42·866	+ 0·048	+ 0·001	7 42·915
	3661	+32 19	N		35 3·71	+1·47	5·18	N		42 46·48	+1·58	48·06	42·88				
	3671	+23 49	S		36 29·00	+1·47	30·47	S		44 11·59	+1·82	13·41	42·94				
	3685	+31 19	N		38 47·28	+1·47	48·75	N		46 30·04	+1·61	31·65	42·90				
	3696	+ 6 58	S		40 40·01	+1·46	41·47	S		48 22·15	+2·23	24·38	42·91				
Mar. 11	3782	+ 0 38	S	*I. P. E.*	10 57 6·12	−1·50	4·62	S	*I. P. E.*	11 4 48·81	−1·21	47·60	7 42·98				
	3788	+ 7 59	S	d: c − 1·6	58 27·73	−1·50	26·23	S	d: c − 1·4	6 10·55	−1·38	9·17	42·94				
	3795	+ 2 36	S	b + 1·1, a − 0·2	11 0 3·30	−1·50	1·80	S	b − 0·9, a +63·4	7 46·03	−1·25	44·78	42·98				
	3798	+ 2 31	S	s: Q − 1·48	0 24·96	−1·50	23·46	S	s: Q − 1·79	8 7·71	−1·25	6·46	43·00				
	3824	+15 3	S		5 4·24	−1·49	2·75	S		12 47·29	−1·53	45·76	43·01	m s 7 42·951	+ 0·048	+ 0·004	7 43·003
	3834	+21 11	S		7 21·78	−1·49	20·29	S		15 4·89	−1·69	3·20	42·91				
	3842	+23 45	S		8 27·56	−1·49	26·07	S		16 10·77	−1·76	9·01	42·94				
	3851	+32 12	N		11 25·25	−1·49	23·76	N		19 8·68	−2·00	6·68	42·92				
	3852	+33 45	N		11 38·23	−1·49	36·74	N		19 21·67	−2·05	19·62	42·88				
Mar. 12	3610	+35 36	N	*I. P. E.*	10 26 6·30	+1·44	7·74	N	*I. P. E.*	10 33 48·94	+1·72	50·66	7 42·92				
	3621	+ 7 34	S	d: c − 1·6	27 58·86	+1·45	60·31	S	d: c − 1·4	35 41·49	+1·71	43·20	42·89				
	3625	+36 56	N	b + 0·2, a + 1·6	28 55·35	+1·44	56·79	N	b − 1·4, a − 2·7	36 37·91	+1·72	39·63	42·84				
	3633	+34 42	N	s: Q + 1·48	30 30·83	+1·44	32·27	N	s: Q + 1·79	38 13·42	+1·72	15·14	42·87				
	3640	+32 36	N		31 24·92	+1·44	26·36	N		39 7·58	+1·72	9·30	42·94				
	3650	+28 9	N		33 9·27	+1·45	10·72	N		40 51·93	+1·71	53·64	42·92	m s 7 42·892	+ 0·048	+ 0·001	7 42·941
	3661	+32 19	N		34 54·80	+1·44	56·24	N		42 37·42	+1·72	39·14	42·90				
	3671	+23 49	S		36 20·11	+1·44	21·55	S		44 2·76	+1·72	4·48	42·93				
	3685	+31 19	N		38 38·37	+1·44	39·81	N		46 20·94	+1·72	22·66	42·85				
	3685½†	+31 19	N		38 40·27	+1·44	41·71	N		46 22·88	+1·72	24·60	42·89				
	3696	+ 6 58	S		40 31·10	+1·45	32·55	S		48 13·70	+1·71	15·41	42·86				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND AGRA (W), *Lat.* 27° 10′, *Long.* 5h 12m 14s.

Astronomical Date	Star		Transits Observed at E — *By Campbell, with Telescope No. 2*					Transits Observed at W — *By Heaviside, with Telescope No. 1*					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $O_N - O_S = +0^s{\cdot}055$, $H_N - H_S = +0{\cdot}060$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 12	3782	+ 0 38	S	*I. P. E.*	10 56 57·27	−1·51	55·76	S	*I. P. E.*	11 4 40·57	−1·88	38·69	7 42·93				
	3788	+ 7 59	S	d c − 1·6	58 18·76	−1·51	17·25	S	d c − 1·4	6 2·15	−1·87	0·28	43·03				
	3798	+ 2 36	S	b + 0·2 a + 1·6	11 0 16·01	−1·51	14·50	S	b − 1·4 a − 2·7	7 59·39	−1·88	57·51	43·01				
	3811	+36 57	N	s Q − 1·48	2 12·76	−1·52	11·24	N	s Q − 1·79	9 56·03	−1·86	54·17	42·93				
	3824	+15 3	S		4 55·35	−1·51	53·84	S		12 38·69	−1·86	36·83	42·99	m s 7 42·977	+ 0·048	+ 0·003	7 43·028
	3834	+21 11	S		7 12·87	−1·52	11·35	S		14 56·15	−1·86	54·29	42·94				
	3842	+23 45	S		8 18·61	−1·52	17·09	S		16 1·96	−1·86	0·10	43·01				
	3851	+32 12	N		11 16·30	−1·52	14·78	N		18 59·61	−1·86	57·75	42·97				
	3852	+33 45	N		11 29·31	−1·52	27·79	N		19 12·63	−1·86	10·77	42·98				
Mar. 18	3610	+35 36	N	*I. P. E.*	10 25 57·26	+1·40	58·66	N	*I. P. E.*	10 33 39·94	+1·67	41·61	7 42·95				
	3621	+ 7 34	S	d c − 1·6	27 49·78	+1·44	51·22	S	d c − 1·4	35 32·39	+1·80	34·19	42·97				
	3625	+36 56	N	b − 0·8 a + 3·8	28 46·32	+1·40	47·72	N	b − 1·2 a +10·8	36 29·05	+1·66	30·71	42·99				
	3633	+34 42	N	s Q + 1·48	30 21·80	+1·40	23·20	N	s Q + 1·78	38 4·56	+1·67	6·23	43·03				
	3640	+32 36	N		31 15·89	+1·40	17·29	N		38 58·62	+1·68	60·30	43·01	m s 7 43·006	+ 0·048	+ 0·002	7 43·056
	3650	+28 9	N		33 0·26	+1·41	1·67	N		40 42·95	+1·70	44·65	42·98				
	3661	+32 19	N		34 45·73	+1·41	47·14	N		42 28·50	+1·68	30·18	43·04				
	3671	+23 49	S		36 10·99	+1·42	12·41	S		43 53·75	+1·73	55·48	43·07				
	3685	+31 19	N		38 29·29	+1·41	30·70	N		46 12·05	+1·69	13·74	43·04				
	3696	+ 6 58	S		40 22·00	+1·45	23·45	S		48 4·63	+1·80	6·43	42·98				
Mar. 18	3782	+ 0 38	S	*I. P. E.*	10 56 48·08	−1·51	46·57	S	*I. P. E.*	11 4 31·38	−1·72	29·66	7 43·09				
	3788	+ 7 59	S	d c − 1·6	58 9·70	−1·52	8·18	S	d c − 1·4	5 53·03	−1·76	51·27	43·09				
	3795	+ 2 31	S	b − 0·8 a + 3·8	59 45·34	−1·51	43·83	S	b − 1·2 a +10·8	7 28·60	−1·73	26·87	43·04				
	3798	+ 2 36	S	s Q − 1·48	11 0 6·98	−1·51	5·47	S	s Q − 1·78	7 50·27	−1·73	48·54	43·07				
	3811	+36 57	N		2 3·80	−1·56	2·24	N		9 47·13	−1·90	45·23	42·99	m s 7 43·054	+ 0·048	+ 0·004	7 43·106
	3824	+15 3	S		4 46·32	−1·53	44·79	S		12 29·64	−1·79	27·85	43·06				
	3834	+21 11	S		7 3·83	−1·54	2·29	S		14 47·14	−1·81	45·33	43·04				
	3842	+23 45	S		8 9·59	−1·54	8·05	S		15 52·91	−1·83	51·08	43·03				
	3851	+32 12	N		11 7·26	−1·55	5·71	N		18 50·66	−1·87	48·79	43·08				

Note. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat. 23° 10′, Long. 5h 19m 58s*: AND AGRA (W), *Lat. 27° 10′, Long. 5h 12m 14s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = + 0^s.055$ $H_N - H_S = + 0.060$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 15	3633	+34 42	N	*I. P. W.*	10 30 4·30	+1·44	5·74	N	*I. P. W.*	10 37 46·67	+1·68	48·35	7 42·61				
	3640	+32 36	N	d c + 0·1	30 58·38	+1·46	59·84	N	d c − 1·3	38 40·79	+1·70	42·49	42·65				
	3650	+28 9	N	b + 1·5 a + 12·9	32 42·70	+1·49	44·19	N	b − 0·5 a + 16·0	40 25·04	+1·74	26·78	42·59				
	3661	+32 19	N	s Q + 1·47	34 28·23	+1·46	29·69	N	s Q + 1·79	42 10·60	+1·70	12·30	42·61	m s 7 42·606	+ 0·047	+ 0·001	7 42·654
	3671	+23 49	S		35 53·44	+1·51	54·95	S		43 35·81	+1·77	37·58	42·63				
	3685	+31 19	N		38 11·77	+1·47	13·24	N		45 54·16	+1·72	55·88	42·64				
	3696	+ 6 58	S		40 4·43	+1·59	6·02	S		47 46·66	+1·87	48·53	42·51				
Mar. 15	3782	+ 0 38	S	*I. P. W.*	10 56 30·54	−1·33	29·21	S	*I. P. W.*	11 4 13·45	−1·67	11·78	7 42·57				
	3788	+ 7 59	S	d c + 0·1	57 52·11	−1·36	50·75	S	d c − 1·3	5 35·04	−1·71	33·33	42·58				
	3811	+36 57	N	b + 1·5 a + 12·9	11 1 46·17	−1·51	44·66	N	b − 0·5 a + 16·0	9 29·28	−1·92	27·36	42·70				
	3824	+15 3	S	s Q − 1·47	4 28·73	−1·39	27·34	S	s Q − 1·79	12 11·68	−1·75	9·93	42·59	m s 7 42·630	+ 0·047	+ 0·003	7 42·680
	3834	+21 11	S		6 46·18	−1·42	44·76	S		14 29·22	−1·79	27·43	42·67				
	3851	+32 12	N		10 49·72	−1·48	48·24	N		18 32·79	−1·88	30·91	42·67				
Mar. 17	3782	+ 0 38	S	*I. P. W.*	10 56 12·87	−1·29	11·58	S	*I. P. W.*	11 3 55·18	−0·98	54·20	7 42·62				
	3788	+ 7 59	S	d c + 0·1	57 34·50	−1·34	33·16	S	d c − 1·3	5 16·83	−1·11	15·72	42·56				
	3795	+ 2 31	S	b + 1·7 a + 19·4	59 10·07	−1·30	8·77	S	b − 0·2 a + 48·0	6 52·36	−1·01	51·35	42·58				
	3798	+ 2 36	S	s Q − 1·50	59 31·71	−1·30	30·41	S	s Q − 1·43	7 14·02	−1·01	13·01	42·60				
	3811	+36 57	N		11 1 28·60	−1·57	27·03	N		9 11·46	−1·71	9·75	42·72	m s 7 42·650	+ 0·045	+ 0·004	7 42·699
	3824	+15 3	S		4 11·10	−1·39	9·71	S		11 53·68	−1·22	52·46	42·75				
	3834	+21 11	S		6 28·62	−1·44	27·18	S		14 11·17	−1·34	9·83	42·65				
	3842	+23 45	S		7 34·38	−1·46	32·92	S		15 16·98	−1·39	15·59	42·67				
	3851	+32 12	N		10 32·12	−1·53	30·59	N		18 14·89	−1·59	13·30	42·71				
	3852	+33 45	N		10 45·11	−1·54	43·57	N		18 27·84	−1·63	26·21	42·64				

NOTE. $1^d = 0^s·0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

JUBBULPORE (E), *Lat. 23° 10′, Long. 5h 19m 58s*: AND AGRA (W), *Lat. 27° 10′, Long. 5h 12m 14s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.055$, $H_N - H_S = +0^s.060$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 20	3621	+ 7 34	S	*I. P. W.*	10 26 50·54	+1·60	52·14	S	*I. P. W.*	10 34 33·30	+1·40	34·70	7 42·56				
	3625	+36 56	N	d c + 0·1	27 47·23	+1·41	48·64	N	d c − 1·3	35 29·87	+1·33	31·20	42·56				
	3633	+34 42	N	b − 3·2 a + 13·3	29 22·66	+1·42	24·08	N	b − 1·7 a + 3·4	37 5·39	+1·34	6·73	42·65				
	3650	+28 9	N	s Q + 1·58	32 1·10	+1·48	2·58	N	s Q + 1·44	39 43·86	+1·37	45·23	42·65	m s 7 42·603	+ 0·042	+ 0·002	7 42·647
	3661	+32 19	N		33 46·60	+1·45	48·05	N		41 29·28	+1·34	30·62	42·57				
	3671	+23 49	S		35 11·82	+1·50	13·32	S		42 54·61	+1·37	55·98	42·66				
	3685	+31 19	N		37 30·18	+1·45	31·63	N		45 12·90	+1·36	14·26	42·63				
	3696	+ 6 58	S		39 22·82	+1·60	24·42	S		47 5·56	+1·40	6·96	42·54				
Mar. 20	3782	+ 0 38	S	*I. P. W.*	10 55 49·14	−1·53	47·61	S	*I. P. W.*	11 3 31·76	−1·47	30·29	7 42·68				
	3788	+ 7 59	S	d c + 0·1	57 10·74	−1·57	9·17	S	d c − 1·3	4 53·29	−1·49	51·80	42·63				
	3795	+ 2 31	S	b − 3·2 a + 13·3	58 46·38	−1·54	44·84	S	b − 1·7 a + 3·4	6 28·93	−1·47	27·46	42·62				
	3798	+ 2 36	S	s Q − 1·58	59 8·00	−1·54	6·46	S	s Q − 1·44	6 50·58	−1·47	49·11	42·65				
	3811	+36 57	N		11 0 4·91	−1·75	3·16	N		7 47·49	−1·55	45·94	42·78	m s 7 42·701	+ 0·042	+ 0·003	7 42·746
	3824	+15 3	S		3 47·38	−1·60	45·78	S		11 30·04	−1·49	28·55	42·77				
	3834	+21 11	S		6 4·89	−1·65	3·24	S		13 47·48	−1·50	45·98	42·74				
	3851	+32 12	N		10 8·40	−1·71	6·69	N		17 50·97	−1·53	49·44	42·75				
	3852	+33 45	N		10 21·45	−1·73	19·72	N		18 3·95	−1·54	2·41	42·69				
Mar. 21	3621	+ 7 34	S	*I. P. W.*	10 26 43·00	+1·50	44·50	S	*I. P. W.*	10 34 25·81	+1·41	27·22	7 42·72				
	3625	+36 56	N	d c + 0·1	27 39·63	+1·32	40·95	N	d c − 1·3	35 22·31	+1·38	23·69	42·74				
	3633	+34 42	N	b − 3·9 a + 13·2	29 15·10	+1·33	16·43	N	b − 0·3 a + 1·9	36 57·86	+1·38	59·24	42·81				
	3640	+32 36	N	s Q + 1·51	30 9·21	+1·36	10·57	N	s Q + 1·44	37 51·98	+1·39	53·37	42·80				
	3650	+28 9	N		31 53·52	+1·39	54·91	N		39 36·23	+1·40	37·63	42·72	m s 7 42·770	+ 0·040	+ 0·002	7 42·812
	3661	+32 19	N		33 39·09	+1·36	40·45	N		41 21·80	+1·39	23·19	42·74				
	3671	+23 49	S		35 4·26	+1·41	5·67	S		42 47·09	+1·40	48·49	42·82				
	3685	+31 19	N		36 22·61	+1·37	23·98	N		44 5·39	+1·40	6·79	42·81				
	3696	+ 6 58	S		39 15·22	+1·52	16·74	S		46 58·10	+1·41	59·51	42·77				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

*ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND AGRA (W), *Lat.* 27° 10′, *Long.* 5h 12m 14s.

Astronomical Date	Star		Transits Observed at E — By Campbell, with Telescope No. 2					Transits Observed at W — By Heaviside, with Telescope No. 1					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.055$, $H_N - H_S = +0.060$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 21	3782	+ 0 38	S	I. P. W.	10 55 41·50	−1·47	40·03	S	I. P. W.	11 3 24·22	−1·46	22·76	7 42·73				
	3788	+ 7 59	S	d c + 0·1	57 3·10	−1·52	1·58	S	d c − 1·3	4 45·78	−1·47	44·31	42·73				
	3795	+ 2 31	S	b − 3·9 a + 13·2	58 38·70	−1·48	37·22	S	b − 0·3 a + 1·9	6 21·39	−1·46	19·93	42·71				
	3798	+ 2 36	S	s	58 60·35	−1·48	58·87	S	s	6 43·04	−1·46	41·58	42·71				
	3811	+36 57	N	Q − 1·51	11 0 57·23	−1·70	55·53	N	Q − 1·44	8 39·75	−1·50	38·25	42·72	m s 7 42·742	+ 0·040	+ 0·004	7 42·786
	3824	+15 3	S		3 39·70	−1·55	38·15	S		11 22·43	−1·47	20·96	42·81				
	3834	+21 11	S		5 57·23	−1·59	55·64	S		13 39·89	−1·48	38·41	42·77				
	3842	+23 45	S		7 2·98	−1·61	1·37	S		14 45·64	−1·48	44·16	42·79				
	3851	+32 12	N		9 60·77	−1·66	59·11	N		17 43·42	−1·49	41·93	42·82				
	3852	+33 45	N		10 13·76	−1·67	12·09	N		17 56·22	−1·50	54·72	42·63				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

JUBBULPORE (E), Lat. 23° 10′, Long. 5h 19m 58s: AND AGRA (W), Lat. 27° 10′, Long. 5h 12m 14s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Peral. Equations $O_N - O_S = +0^s.055$, $H_N - H_S = +0.060$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 11	4031	+ 16 19	S	I. P. E.	11 39 52·75	+ 1·47	54·22	S	I. P. E.	11 47 35·24	+ 2·02	37·26	7 43·04				
	4039	+ 4 9	S	d c − 1·6	42 27·34	+ 1·46	28·80	S	d c − 1·4	50 9·56	+ 2·30	11·86	43·06				
	4049	+ 4 19	S	b + 1·1	44 10·52	+ 1·46	11·98	S	b − 0·9	51 52·85	+ 2·29	55·14	43·16				
	4055	+ 4 18	S	a − 0·2	45 24·10	+ 1·46	25·56	S	a + 63·4	53 6·38	+ 2·29	8·67	43·11	m s 7 43·090	+ 0·015	+ 0·004	7 43·109
	4066	+ 22 7	S	s Q + 1·48	48 30·36	+ 1·47	31·83	S	s Q + 1·79	56 13·10	+ 1·87	14·97	43·14				
	4100	+ 27 57	N		55 2·86	+ 1·47	4·33	N		12 2 45·65	+ 1·70	47·35	43·02				
	4110	+ 21 12	S		56 25·52	+ 1·47	26·99	S		4 8·20	+ 1·89	10·09	43·10				
Mar. 11	4188	+ 39 41	N	I. P. E.	12 10 21·64	− 1·50	20·14	N	I. P. E.	12 18 5·48	− 2·26	3·22	7 43·08				
	4195	+ 28 56	N	d c − 1·6	11 22·75	− 1·49	21·26	N	d c − 1·4	19 6·26	− 1·91	4·35	43·09				
	4218	+ 10 23	S	b + 1·1 a − 0·2	14 53·24	− 1·50	51·74	S	b − 0·9 a + 63·4	22 36·20	− 1·43	34·77	43·03				
	4228	+ 10 57	S	s Q − 1·48	17 23·66	− 1·50	22·16	S	s Q − 1·79	25 6·65	− 1·44	5·21	43·05				
	4240	+ 23 17	S		19 17·48	− 1·49	15·99	S		26 60·80	− 1·74	59·06	43·07	m s 7 43·070	+ 0·015	+ 0·003	7 43·088
	4250	+ 9 27	S		21 28·32	− 1·50	26·82	S		29 11·28	− 1·40	9·88	43·06				
	4260	+ 21 43	S		23 34·23	− 1·49	32·74	S		31 17·51	− 1·70	15·81	43·07				
	4267	+ 11 5	S		25 56·76	− 1·50	55·26	S		33 39·78	− 1·44	38·34	43·08				
	4282	+ 44 46	N		29 12·46	− 1·50	10·96	N		36 56·52	− 2·46	54·06	43·10				
Mar. 12	4010	+ 38 34	N	I. P. E.	11 36 23·70	+ 1·43	25·13	N	I. P. E.	11 44 6·52	+ 1·73	8·25	7 43·12				
	4018	+ 41 35	N	d c − 1·6	37 56·24	+ 1·43	57·67	N	d c − 1·4	45 39·08	+ 1·73	40·81	43·14				
	4031	+ 16 19	S	b + 0·2 a + 1·6	39 49·57	+ 1·45	51·02	S	b − 1·4 a − 2·7	47 32·41	+ 1·72	34·13	43·11				
	4039	+ 4 9	S	s Q + 1·48	42 24·14	+ 1·45	25·59	S	s Q + 1·79	50 7·03	+ 1·71	8·74	43·15				
	4049	+ 4 19	S		44 7·35	+ 1·45	8·80	S		51 50·30	+ 1·71	52·01	43·21	m s 7 43·164	+ 0·018	+ 0·003	7 43·185
	4055	+ 4 18	S		45 20·90	+ 1·45	22·35	S		53 3·81	+ 1·71	5·52	43·17				
	4066	+ 22 7	S		48 27·18	+ 1·44	28·62	S		56 10·08	+ 1·72	11·80	43·18				
	4100	+ 27 57	N		54 59·67	+ 1·45	61·12	N		12 2 42·61	+ 1·71	44·32	43·20				
	4110	+ 21 12	S		56 22·32	+ 1·44	23·76	S		4 5·24	+ 1·72	6·96	43·20				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND AGRA (W), *Lat.* 27° 10′, *Long.* 5h 12m 14s.																	
Astronomical Date	Star		Transits Observed at E *By Campbell, with Telescope No.* 2					Transits Observed at W *By Heaviside, with Telescope No.* 1					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s{\cdot}055$ $H_N - H_S = +0^s{\cdot}060$	$\delta L_N + \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 12	4188	+39 41	N	*I. P. E.*	12 10 18·47	−1·53	16·94	N	*I. P. E.*	12 18 1·86	−1·85	0·01	7 43·07				
	4195	+28 56	N	d c − 1·6	11 19·60	−1·51	18·09	N	d c − 1·4	19 3·02	−1·87	1·15	43·06				
	4207	+26 34	N	b + 0·2 a + 1·6	13 17·25	−1·51	15·74	N	b − 1·4 a − 2·7	20 60·66	−1·87	58·79	43·05				
	4223	+25 14	N	s Q − 1·48	15 23·14	−1·52	21·62	N	s Q − 1·79	23 6·58	−1·86	4·72	43·10				
	4228	+10 57	S		17 20·48	−1·51	18·97	S		25 3·98	−1·87	2·11	43·14	m s 7 43·090	+ 0·018	+ 0·003	7 43·111
	4240	+23 17	S		19 14·33	−1·52	12·81	S		26 57·81	−1·85	55·96	43·15				
	4250	+ 9 27	S		21 25·18	−1·51	23·67	S		29 8·65	−1·87	6·78	43·11				
	4260	+21 43	S		23 31·15	−1·52	29·63	S		31 14·55	−1·86	12·69	43·06				
	4267	+11 5	S		25 53·57	−1·51	52·06	S		33 37·05	−1·87	35·18	43·12				
	4282	+44 46	N		29 9·39	−1·54	7·85	N		36 52·73	−1·84	50·89	43·04				
Mar. 18	4010	+38 34	N	*I. P. E.*	11 36 20·01	+1·38	21·39	N	*I. P. E.*	11 44 3·03	+1·65	4·68	7 43·29				
	4018	+41 35	N	d c − 1·6	37 52·55	+1·38	53·93	N	d c − 1·4	45 35·55	+1·63	37·18	43·25				
	4031	+16 19	S	b − 0·8 a + 3·8	39 45·88	+1·43	47·31	S	b − 1·2 a + 10·8	47 28·70	+1·77	30·47	43·16				
	4039	+ 4 9	S	s Q + 1·48	42 20·44	+1·45	21·89	S	s Q + 1·78	50 3·31	+1·83	5·14	43·25				
	4049	+ 4 19	S		44 3·64	+1·45	5·09	S		51 46·56	+1·82	48·38	43·29	m s 7 43·230	+ 0·021	+ 0·003	7 43·254
	4055	+ 4 18	S		45 17·19	+1·45	18·64	S		53 0·04	+1·82	1·86	43·22				
	4066	+22 7	S		48 23·48	+1·42	24·90	S		56 6·42	+1·74	8·16	43·26				
	4100	+27 57	N		54 55·98	+1·41	57·39	N		12 2 38·90	+1·70	40·60	43·21				
	4110	+21 12	S		56 18·73	+1·42	20·15	S		4 1·54	+1·75	3·29	43·14				
Mar. 13	4188	+39 41	N	*I. P. E.*	12 10 14·84	−1·58	13·26	N	*I. P. E.*	12 17 58·34	−1·92	56·42	7 43·16				
	4195	+28 56	N	d c − 1·6	11 15·89	−1·55	14·34	N	d c − 1·4	18 59·44	−1·86	57·58	43·24				
	4207	+26 34	N	b − 0·8 a + 3·8	13 13·57	−1·54	12·03	N	b − 1·2 a + 10·8	20 57·03	−1·85	55·18	43·15				
	4228	+10 57	S	s Q − 1·48	17 16·78	−1·52	15·26	S	s Q − 1·78	24 60·21	−1·77	58·44	43·18				
	4240	+23 17	S		19 10·66	−1·54	9·12	S		26 54·10	−1·82	52·28	43·16	m s 7 43·174	+ 0·021	+ 0·003	7 43·198
	4250	+ 9 27	S		21 21·45	−1·52	19·93	S		29 4·82	−1·77	3·05	43·12				
	4260	+21 43	S		23 27·39	−1·54	25·85	S		31 10·85	−1·82	9·03	43·18				
	4267	+11 5	S		25 49·84	−1·52	48·32	S		33 33·27	−1·77	31·50	43·18				
	4282	+44 46	N		29 5·66	−1·59	4·07	N		36 49·23	−1·96	47·27	43·20				

Note. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5ʰ 19ᵐ 58ˢ: AND AGRA (W), *Lat.* 27° 10′, *Long.* 5ʰ 12ᵐ 14ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s{\cdot}055$, $H_N - H_S = +0{\cdot}060$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 15	4010	+ 38 34	N	I. P. W.	11 36 12·30	+ 1·42	13·72	N	I. P. W.	11 43 54·88	+ 1·65	56·53	7 42·81				
	4018	+ 41 35	N	d c + 0·1	37 44·85	+ 1·39	46·24	N	d c − 1·3	45 27·43	+ 1·62	29·05	42·81				
	4031	+ 16 19	S	b + 1·5 a + 12·9	39 38·04	+ 1·54	39·58	S	b − 0·5 a + 16·0	47 20·51	+ 1·82	22·33	42·75				
	4039	+ 4 9	S	s Q + 1·47	42 12·63	+ 1·60	14·23	S	s Q + 1·79	49 55·04	+ 1·89	56·93	42·70				
	4049	+ 4 19	S		43 55·87	+ 1·60	57·47	S		51 38·27	+ 1·89	40·16	42·69	m s 7 42·762	+ 0·021	+ 0·003	7 42·786
	4055	+ 4 18	S		45 9·40	+ 1·60	11·00	S		52 51·78	+ 1·89	53·67	42·67				
	4066	+ 22 7	S		48 15·66	+ 1·52	17·18	S		55 58·25	+ 1·78	60·03	42·85				
	4100	+ 27 57	N		54 48·19	+ 1·49	49·68	N		12 2 30·70	+ 1·74	32·44	42·76				
	4110	+ 21 12	S		56 10·83	+ 1·52	12·35	S		3 53·38	+ 1·79	55·17	42·82				
Mar. 15	4188	+ 39 41	N	I. P. W.	12 10 7·04	− 1·53	5·51	N	I. P. W.	12 17 50·18	− 1·94	48·24	7 42·73				
	4195	+ 28 56	N	d c + 0·1	11 8·04	− 1·46	6·58	N	d c − 1·3	18 51·28	− 1·84	49·44	42·86				
	4207	+ 26 34	N	b + 1·5 a + 12·9	13 5·73	− 1·44	4·29	N	b − 0·5 a + 16·0	20 48·96	− 1·83	47·13	42·84				
	4223	+ 25 14	N	s Q − 1·47	15 11·56	− 1·44	10·12	N	s Q − 1·79	22 54·71	− 1·82	52·89	42·77				
	4228	+ 10 57	S		17 8·91	− 1·37	7·54	S		24 51·97	− 1·73	50·24	42·70	m s 7 42·747	+ 0·021	+ 0·003	7 42·771
	4240	+ 23 17	S		19 2·76	− 1·43	1·33	S		26 45·94	− 1·80	44·14	42·81				
	4250	+ 9 27	S		21 13·61	− 1·37	12·24	S		28 56·64	− 1·72	54·92	42·68				
	4260	+ 21 43	S		23 19·58	− 1·42	18·16	S		31 2·69	− 1·79	0·90	42·74				
	4267	+ 11 5	S		25 42·04	− 1·37	40·67	S		33 25·03	− 1·73	23·30	42·63				
	4282	+ 44 46	N		28 57·90	− 1·57	56·33	N		36 41·04	− 2·00	39·04	42·71				
Mar. 17	4010	+ 38 34	N	I. P. W.	11 36 4·79	+ 1·41	6·20	N	I. P. W.	11 43 47·89	+ 1·11	49·00	7 42·80				
	4018	+ 41 35	N	d c + 0·1	37 37·36	+ 1·38	38·74	N	d c − 1·3	45 20·53	+ 1·02	21·55	42·81				
	4031	+ 16 19	S	b + 1·7 a + 19·4	38 30·47	+ 1·60	32·07	S	b − 0·2 a + 48·0	46 13·25	+ 1·61	14·86	42·79				
	4039	+ 4 9	S	s Q + 1·50	42 5·03	+ 1·69	6·72	S	s Q + 1·43	49 47·68	+ 1·82	49·50	42·78				
	4049	+ 4 19	S		43 48·27	+ 1·69	49·96	S		51 30·93	+ 1·82	32·75	42·79	m s 7 42·831	+ 0·017	+ 0·003	7 42·851
	4066	+ 22 7	S		48 8·11	+ 1·56	9·67	S		55 51·13	+ 1·50	52·63	42·96				
	4100	+ 27 57	N		54 40·70	+ 1·51	42·21	N		12 2 23·69	+ 1·37	25·06	42·85				
	4110	+ 21 12	S		56 3·32	+ 1·56	4·88	S		3 46·23	+ 1·52	47·75	42·87				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

*ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat. 23° 10′, Long. 5h 19m 58s*: AND AGRA (W), *Lat. 27° 10′, Long. 5h 12m 14s*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference: Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.055$, $H_N - H_S = +0^s.060$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 12	4188	+39 41	N	I. P. E.	12 10 18·47	−1·53	16·94	N	I. P. E.	12 18 1·86	−1·85	0·01	7 43·07				
	4195	+28 56	N	d c − 1·6	11 19·60	−1·51	18·09	N	d c − 1·4	19 3·02	−1·87	1·15	43·06				
	4207	+26 34	N	b + 0·2 a + 1·6	13 17·25	−1·51	15·74	N	b − 1·4 a − 2·7	20 60·66	−1·87	58·79	43·05				
	4223	+25 14	N	s Q − 1·48	15 23·14	−1·52	21·62	N	s Q − 1·79	23 6·58	−1·86	4·72	43·10				
	4228	+10 57	S		17 20·48	−1·51	18·97	S		25 3·98	−1·87	2·11	43·14	m s 7 43·090	+ 0·018	+ 0·003	7 43·111
	4240	+23 17	S		19 14·33	−1·52	12·81	S		26 57·81	−1·85	55·96	43·15				
	4250	+ 9 27	S		21 25·18	−1·51	23·67	S		29 8·65	−1·87	6·78	43·11				
	4260	+21 43	S		23 31·15	−1·52	29·63	S		31 14·55	−1·86	12·69	43·06				
	4267	+11 5	S		25 53·57	−1·51	52·06	S		33 37·05	−1·87	35·18	43·12				
	4282	+44 46	N		29 9·39	−1·54	7·85	N		36 52·73	−1·84	50·89	43·04				
Mar. 13	4010	+38 34	N	I. P. E.	11 36 20·01	+1·38	21·39	N	I. P. E.	11 44 3·03	+1·65	4·68	7 43·29				
	4018	+41 35	N	d c − 1·6	37 52·55	+1·38	53·93	N	d c − 1·4	45 35·55	+1·63	37·18	43·25				
	4031	+16 19	S	b − 0·8 a + 3·8	39 45·88	+1·43	47·31	S	b − 1·2 a + 10·8	47 28·70	+1·77	30·47	43·16				
	4039	+ 4 9	S	s Q + 1·48	42 20·44	+1·45	21·89	S	s Q + 1·78	50 3·31	+1·83	5·14	43·25				
	4049	+ 4 19	S		44 3·64	+1·45	5·09	S		51 46·56	+1·82	48·38	43·29	m s 7 43·230	+ 0·021	+ 0·003	7 43·254
	4055	+ 4 18	S		45 17·19	+1·45	18·64	S		53 0·04	+1·82	1·86	43·22				
	4066	+22 7	S		48 23·48	+1·42	24·90	S		56 6·42	+1·74	8·16	43·26				
	4100	+27 57	N		54 55·98	+1·41	57·39	N		12 2 38·90	+1·70	40·60	43·21				
	4110	+21 12	S		56 18·73	+1·42	20·15	S		4 1·54	+1·75	3·29	43·14				
Mar. 13	4188	+39 41	N	I. P. E.	12 10 14·84	−1·58	13·26	N	I. P. E.	12 17 58·34	−1·92	56·42	7 43·16				
	4195	+28 56	N	d c − 1·6	11 15·89	−1·55	14·34	N	d c − 1·4	18 59·44	−1·86	57·58	43·24				
	4207	+26 34	N	b − 0·8 a + 3·8	13 13·57	−1·54	12·03	N	b − 1·2 a + 10·8	20 57·03	−1·85	55·18	43·15				
	4228	+10 57	S	s Q − 1·48	17 16·78	−1·52	15·26	S	s Q − 1·78	24 60·21	−1·77	58·44	43·18	m s 7 43·174	+ 0·021	+ 0·003	7 43·198
	4240	+23 17	S		19 10·66	−1·54	9·12	S		26 54·10	−1·82	52·28	43·16				
	4250	+ 9 27	S		21 21·45	−1·52	19·93	S		29 4·82	−1·77	3·05	43·12				
	4260	+21 43	S		23 27·39	−1·54	25·85	S		31 10·85	−1·82	9·03	43·18				
	4267	+11 5	S		25 49·84	−1·52	48·32	S		33 33·27	−1·77	31·50	43·18				
	4282	+44 46	N		29 5·66	−1·59	4·07	N		36 49·23	−1·96	47·27	43·20				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND AGRA (W), *Lat.* 27° 10′, *Long.* 5h 12m 14s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s{\cdot}055$, $H_N - H_S = +0{\cdot}060$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 15	4010	+38 34	N	I. P. W.	11 36 12·30	+1·42	13·72	N	I. P. W.	11 43 54·88	+1·65	56·53	7 42·81				
	4018	+41 35	N	d c + 0·1	37 44·85	+1·39	46·24	N	d c − 1·3	45 27·43	+1·62	29·05	42·81				
	4031	+16 19	S	b + 1·5 a + 12·9	39 38·04	+1·54	39·58	S	b − 0·5 a + 16·0	47 20·51	+1·82	22·33	42·75				
	4039	+ 4 9	S	s Q + 1·47	42 12·63	+1·60	14·23	S	s Q + 1·79	49 55·04	+1·89	56·93	42·70				
	4049	+ 4 19	S		43 55·87	+1·60	57·47	S		51 38·27	+1·89	40·16	42·69	m s 7 42·762	+ 0·021	+ 0·003	7 42·786
	4055	+ 4 18	S		45 9·40	+1·60	11·00	S		52 51·78	+1·89	53·67	42·67				
	4066	+22 7	S		48 15·66	+1·52	17·18	S		55 58·25	+1·78	60·03	42·85				
	4100	+27 57	N		54 48·19	+1·49	49·68	N		12 2 30·70	+1·74	32·44	42·76				
	4110	+21 12	S		56 10·83	+1·52	12·35	S		3 53·38	+1·79	55·17	42·82				
Mar. 15	4188	+39 41	N	I. P. W.	12 10 7·04	−1·53	5·51	N	I. P. W.	12 17 50·18	−1·94	48·24	7 42·73				
	4195	+28 56	N	d c + 0·1	11 8·04	−1·46	6·58	N	d c − 1·3	18 51·28	−1·84	49·44	42·86				
	4207	+26 34	N	b + 1·5 a + 12·9	13 5·73	−1·44	4·29	N	b − 0·5 a + 16·0	20 48·96	−1·83	47·13	42·84				
	4223	+25 14	N	s Q − 1·47	15 11·56	−1·44	10·12	N	s Q − 1·79	22 54·71	−1·82	52·89	42·77				
	4228	+10 57	S		17 8·91	−1·37	7·54	S		24 51·97	−1·73	50·24	42·70				
	4240	+23 17	S		19 2·76	−1·43	1·33	S		26 45·94	−1·80	44·14	42·81	m s 7 42·747	+ 0·021	+ 0·003	7 42·771
	4250	+ 9 27	S		21 13·61	−1·37	12·24	S		28 56·64	−1·72	54·92	42·68				
	4260	+21 43	S		23 19·58	−1·42	18·16	S		31 2·69	−1·79	0·90	42·74				
	4267	+11 5	S		25 42·04	−1·37	40·67	S		33 25·03	−1·73	23·30	42·63				
	4282	+44 46	N		28 57·90	−1·57	56·33	N		36 41·04	−2·00	39·04	42·71				
Mar. 17	4010	+38 34	N	I. P. W.	11 36 4·79	+1·41	6·20	N	I. P. W.	11 43 47·89	+1·11	49·00	7 42·80				
	4018	+41 35	N	d c + 0·1	37 37·36	+1·38	38·74	N	d c − 1·3	45 20·53	+1·02	21·55	42·81				
	4031	+16 19	S	b + 1·7 a + 19·4	38 30·47	+1·60	32·07	S	b − 0·2 a + 48·0	46 13·25	+1·61	14·86	42·79				
	4039	+ 4 9	S	s Q + 1·50	42 5·03	+1·69	6·72	S	s Q + 1·43	49 47·68	+1·82	49·50	42·78				
	4049	+ 4 19	S		43 48·27	+1·69	49·96	S		51 30·93	+1·82	32·75	42·79	m s 7 42·831	+ 0·017	+ 0·003	7 42·851
	4066	+22 7	S		48 8·11	+1·56	9·67	S		55 51·13	+1·50	52·63	42·96				
	4100	+27 57	N		54 40·70	+1·51	42·21	N		12 2 23·69	+1·37	25·06	42·85				
	4110	+21 12	S		56 3·32	+1·56	4·88	S		3 46·23	+1·52	47·75	42·87				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

*ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND AGRA (W), *Lat.* 27° 10′, *Long.* 5h 12m 14s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	E: Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	W: Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference of Corrected Times (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Peral. Equations $C_N - C_S = + 0^s{\cdot}055$, $H_N - H_S = + 0{\cdot}060$	$\delta L_N + \rho$
		Transits observed at E: *By Campbell, with Telescope No. 2*						Transits observed at W: *By Heaviside, with Telescope No. 1*									
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 17	4188	+ 39 41	N	*I. P. W.*	12 9 59·58	− 1·60	57·98	N	*I. P. W.*	12 17 42·61	− 1·78	40·83	7 42·85				
	4195	+ 28 56	N	d; c + 0·1	10 60·58	− 1·50	59·08	N	d; c − 1·3	18 43·43	− 1·51	41·92	42·84				
	4207	+ 26 34	N	b + 1·7; a + 19·4	12 58·19	− 1·48	56·71	N	b − 0·2; a + 48·0	20 41·06	− 1·47	39·59	42·88				
	4223	+ 25 14	N	s	15 4·07	− 1·47	2·60	N	s	22 46·95	− 1·42	45·53	42·93				
	4228	+ 10 57	S	Q − 1·50	17 1·40	− 1·36	0·04	S	Q − 1·43	24 44·00	− 1·16	42·84	42·80	m s 7 42·847	+ 0·017	+ 0·003	7 42·867
	4240	+ 23 17	S		18 55·30	− 1·45	53·85	S		26 38·14	− 1·38	36·76	42·91				
	4250	+ 9 27	S		21 6·05	− 1·35	4·70	S		28 48·62	− 1·13	47·49	42·79				
	4260	+ 21 43	S		23 12·07	− 1·44	10·63	S		30 54·84	− 1·35	53·49	42·86				
	4267	+ 11 5	S		25 34·52	− 1·36	33·16	S		33 17·07	− 1·16	15·91	42·75				
	4282	+ 44 46	N		28 50·50	− 1·67	48·83	N		36 33·63	− 1·94	31·69	42·86				
Mar. 20	4018	+ 41 35	N	*I. P. W.*	11 37 29·56	+ 1·37	30·93	N	*I. P. W.*	11 45 12·48	+ 1·32	13·80	7 42·87				
	4031	+ 16 19	S	d; c + 0·1	39 22·71	+ 1·55	24·26	S	d; c − 1·3	47 5·65	+ 1·38	7·03	42·77				
	4039	+ 4 9	S	b − 3·2; a + 13·3	41 57·29	+ 1·61	58·90	S	b − 1·7; a + 3·4	49 40·29	+ 1·40	41·69	42·79				
	4049	+ 4 19	S	s	43 40·53	+ 1·61	42·14	S	s	51 23·55	+ 1·40	24·95	42·81	m s 7 42·785	+ 0·013	+ 0·004	7 42·802
	4055	+ 4 18	S	Q + 1·58	44 54·09	+ 1·61	55·70	S	Q + 1·44	52 36·95	+ 1·40	38·35	42·65				
	4066	+ 22 7	S		48 0·42	+ 1·51	1·93	S		55 43·32	+ 1·38	44·70	42·77				
	4100	+ 27 57	N		54 32·90	+ 1·48	34·38	N		12 2 15·87	+ 1·37	17·24	42·86				
	4110	+ 21 12	S		55 55·60	+ 1·51	57·11	S		3 38·49	+ 1·38	39·87	42·76				
Mar. 20	4188	+ 39 41	N	*I. P. W.*	12 9 52·02	− 1·77	50·25	N	*I. P. W.*	12 17 34·59	− 1·55	33·04	7 42·79				
	4195	+ 28 56	N	d; c + 0·1	10 53·06	− 1·69	51·37	N	d; c − 1·3	18 35·68	− 1·51	34·17	42·80				
	4207	+ 26 34	N	b − 3·2; a + 13·3	12 50·74	− 1·67	49·07	N	b − 1·7; a + 3·4	20 33·38	− 1·51	31·87	42·80				
	4223	+ 25 14	N	s	14 56·59	− 1·67	54·92	N	s	22 39·27	− 1·51	37·76	42·84				
	4228	+ 10 57	S	Q − 1·58	16 53·90	− 1·58	52·32	S	Q − 1·44	24 36·55	− 1·49	35·06	42·74	m s 7 42·783	+ 0·013	+ 0·003	7 42·799
	4240	+ 23 17	S		18 47·79	− 1·66	46·13	S		26 30·45	− 1·50	28·95	42·82				
	4250	+ 9 27	S		20 58·55	− 1·57	56·98	S		28 41·17	− 1·49	39·68	42·70				
	4260	+ 21 43	S		23 4·59	− 1·65	2·94	S		30 47·16	− 1·50	45·66	42·72				
	4267	+ 11 5	S		25 27·00	− 1·58	25·42	S		33 9·69	− 1·49	8·20	42·78				
	4282	+ 44 46	N		28 43·00	− 1·83	41·17	N		36 25·57	− 1·56	24·01	42·84				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s : AND AGRA (W), *Lat.* 27° 10′, *Long.* 5h 12m 14s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.055$ $H_N - H_S = +0^s.060$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 21	4010	+38 34	N	I. P. W.	11 35 54·69	+1·31	56·00	N	I. P. W.	11 43 37·69	+1·38	39·07	7 43·07				
	4018	+41 35	N	d c + 0·1	37 27·23	+1·28	28·51	N	d c − 1·3	45 10·15	+1·38	11·53	43·02				
	4031	+16 19	S	b − 3·9 a +13·2	39 20·38	+1·46	21·84	S	b − 0·3 a + 1·9	47 3·35	+1·41	4·76	42·92				
	4039	+ 4 9	S	s Q +1·51	41 54·97	+1·53	56·50	S	s Q +1·44	49 37·96	+1·42	39·38	42·88				
	4049	+ 4 19	S		43 38·11	+1·53	39·64	S		51 21·18	+1·42	22·60	42·96	m s 7 42·976	+ 0·012	+ 0·003	7 42·991
	4055	+ 4 18	S		45 51·67	+1·53	53·20	S		53 34·73	+1·42	36·15	42·95				
	4066	+22 7	S		47 58·01	+1·43	59·44	S		55 41·04	+1·40	42·44	43·00				
	4100	+27 57	N		54 30·62	+1·39	32·01	N		12 2 13·63	+1·40	15·03	43·02				
	4110	+21 12	S		55 53·27	+1·43	54·70	S		3 36·26	+1·40	37·66	42·96				
Mar. 21	4195	+28 56	N	I. P. W.	12 10 50·62	−1·64	48·98	N	I. P. W.	12 18 33·37	−1·48	31·89	7 42·91				
	4207	+26 34	N	d c + 0·1	11 48·33	−1·62	46·71	N	d c − 1·3	19 31·11	−1·48	29·63	42·92				
	4223	+25 14	N	b − 3·9 a +13·2	14 54·17	−1·62	52·55	N	b − 0·3 a + 1·9	22 36·93	−1·48	35·45	42·90				
	4228	+10 57	S	s Q −1·51	16 51·47	−1·53	49·94	S	s Q −1·44	24 34·35	−1·47	32·88	42·94				
	4240	+23 17	S		18 45·42	−1·61	43·81	S		26 28·11	−1·48	26·63	42·82	m s 7 42·923	+ 0·012	+ 0·003	7 42·938
	4250	+ 9 27	S		20 56·05	−1·52	54·53	S		28 38·94	−1·47	37·47	42·94				
	4260	+21 43	S		23 2·09	−1·59	0·50	S		30 44·96	−1·48	43·48	42·98				
	4267	+11 5	S		25 24·53	−1·53	23·00	S		33 7·39	−1·47	5·92	42·92				
	4282	+44 46	N		28 40·52	−1·78	38·74	N		36 23·23	−1·51	21·72	42·98				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = + 0^s.071$ $H_N - H_S = + 0.059$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 28	3932	+ 17 27	S	*I. P. W.*	11 25 44·27	+ 1·54	45·81	S	*I. P. W.*	11 56 47·30	+ 1·37	48·67	31 2·86	m s 31 2·835	+ 0·155	− 0·006	31 2·984
	3937	+ 28 26	N	d c + 0·9 b + 2·3 a − 11·1 s Q + 1·50	27 15·68	+ 1·61	17·29	N	d c − 4·0 b − 2·4 a + 4·8 s Q + 1·51	58 18·76	+ 1·34	20·10	2·81				
Mar. 28	4010	+ 38 34	N	*I. P. W.*	11 43 23·61	− 1·33	22·28	N	*I. P. W.*	12 14 26·94	− 1·73	25·21	31 2·93	m s 31 2·993	+ 0·155	− 0·007	31 3·141
	4018	+ 41 35	N	d c + 0·9	44 56·09	− 1·29	54·80	N	d c − 4·0	15 59·53	− 1·74	57·79	2·99				
	4031	+ 16 19	S	b + 2·3 a − 11·1	46 49·60	− 1·46	48·14	S	b − 2·4 a + 4·8	17 52·73	− 1·64	51·09	2·95				
	4039	+ 4 9	S	s Q − 1·50	49 24·26	− 1·51	22·75	S	s Q − 1·51	20 27·39	− 1·61	25·78	3·03				
	4049	+ 4 19	S		51 7·48	− 1·51	5·97	S		22 10·60	− 1·61	8·99	3·02				
	4055	+ 4 18	S		52 21·05	− 1·51	19·54	S		23 24·10	− 1·61	22·49	2·95				
	4066	+ 22 7	N		55 27·22	− 1·43	25·79	N		26 30·43	− 1·67	28·76	2·97				
			S		55 27·14	− 1·43	25·71	S		26 30·42	− 1·67	28·75	3·04				
	4100	+ 27 57	N		12 1 59·61	− 1·40	58·21	N		33 2·93	− 1·68	1·25	3·04				
	4110	+ 21 12	S		3 22·35	− 1·43	20·92	S		34 25·59	− 1·66	23·93	3·01				
Mar. 29	3868	+ 44 8	N	*I. P. W.*	11 13 24·14	+ 1·77	25·91	N	*I. P. W.*	11 44 27·38	+ 1·45	28·83	31 2·92	m s 31 2·912	+ 0·156	− 0·008	31 3·060
	3877	+ 11 11	S	d c + 0·9	14 49·50	+ 1·50	51·00	S	d c − 4·0	45 52·54	+ 1·35	53·89	2·89				
	3886	+ 17 7	S	b + 2·7 a − 15·3	16 30·29	+ 1·53	31·82	S	b − 2·0 a − 9·1	47 33·39	+ 1·36	34·75	2·93				
	3894	+ 3 40	S	s Q + 1·49	17 50·18	+ 1·46	51·64	S	s Q + 1·53	48 53·21	+ 1·33	54·54	2·90				
	3894½†	+ 3 40	S		17 51·22	+ 1·46	52·68	S		48 54·23	+ 1·32	55·55	2·87				
	3900	+ 3 31	S		18 55·29	+ 1·45	56·74	S		49 58·21	+ 1·32	59·53	2·79				
	3913	+ 43 50	N		21 11·03	+ 1·77	12·80	N		52 14·33	+ 1·45	15·78	2·98				
	3919	+ 15 2	S		22 42·45	+ 1·52	43·97	S		53 45·57	+ 1·36	46·93	2·96				
	3932	+ 17 27	S		25 37·01	+ 1·53	38·54	S		56 40·08	+ 1·36	41·44	2·90				
	3937	+ 28 26	N		27 8·40	+ 1·62	10·02	N		58 11·60	+ 1·40	13·00	2·98				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s; AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.071$, $H_N - H_S = +0^s.059$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 29	4010	+38 34	N	I. P. W.	11 43 16·31	−1·26	15·05	N	I. P. W.	12 14 19·76	−1·65	18·11	31 3·06				
	4018	+41 35	N	d c + 0·9	44 48·78	−1·23	47·55	N	d c − 4·0	15 52·27	−1·63	50·64	3·09				
	4031	+16 19	S	b + 2·7 a −15·3	46 42·31	−1·45	40·86	S	b − 2·0 a − 9·1	17 45·66	−1·70	43·96	3·10				
	4039	+ 4 9	S	s Q −1·49	49 17·00	−1·52	15·48	S	s Q −1·53	20 20·38	−1·73	18·65	3·17				
	4049	+ 4 19	S		50 60·27	−1·52	58·75	S		22 3·63	−1·73	1·90	3·15	m s 31 3·087	+ 0·156	− 0·006	31 3·237
	4055	+ 4 18	S		52 13·81	−1·52	12·29	S		23 17·05	−1·73	15·32	3·03				
	4057	+43 42	N		53 13·37	−1·21	12·16	N		24 16·79	−1·61	15·18	3·02				
	4066	+22 7	N		55 19·94	−1·41	18·53	N		26 23·35	−1·69	21·66	3·13				
	4100	+27 57	N		12 1 52·38	−1·37	51·01	N		32 55·71	−1·66	54·05	3·04				
	4110	+21 12	S		3 15·10	−1·42	13·68	S		34 18·45	−1·69	16·76	3·08				
Mar. 30	3886	+17 7	S	I. P. W.	11 16 23·04	+1·47	24·51	S	I. P. W.	11 47 26·30	+1·30	27·60	31 3·09				
	3894	+ 3 40	S	d c + 0·9	17 42·92	+1·37	44·29	S	d c − 4·0	48 46·11	+1·22	47·33	3·04				
	3894½†	+ 3 40	S	b + 2·1 a −19·3	17 43·90	+1·37	45·27	S	b − 4·3 a −14·8	48 47·13	+1·22	48·35	3·08	m s 31 3·060	+ 0·156	− 0·009	31 3·207
	3900	+ 3 31	S	s Q +1·45	18 48·09	+1·36	49·45	S	s Q +1·53	49 51·21	+1·23	52·44	2·99				
	3918	+43 50	N		21 3·76	+1·75	5·51	N		52 7·15	+1·44	8·59	3·08				
	3919	+15 2	S		22 35·26	+1·46	36·72	S		53 38·48	+1·28	39·76	3·04				
	3937	+28 26	N		27 1·14	+1·56	2·70	N		58 4·45	+1·35	5·80	3·10				
Mar. 30	4010	+38 34	N	I. P. W.	11 43 8·98	−1·21	7·77	N	I. P. W.	12 14 12·46	−1·66	10·80	31 3·03				
	4018	+41 35	N	d c + 0·9	44 41·44	−1·18	40·26	N	d c − 4·0	15 45·03	−1·64	43·39	3·13				
	4031	+16 19	S	b + 2·1 a −19·3	46 35·03	−1·43	33·60	S	b − 4·3 a −14·8	17 38·51	−1·77	36·74	3·14				
	4039	+ 4 9	S	s Q −1·45	49 9·75	−1·53	8·22	S	s Q −1·53	20 13·15	−1·83	11·32	3·10				
	4049	+ 4 19	S		50 52·98	−1·53	51·45	S		21 56·39	−1·82	54·57	3·12				
	4055	+ 4 18	S		52 6·57	−1·53	5·04	S		23 9·90	−1·82	8·08	3·04	m s 31 3·096	+ 0·156	− 0·006	31 3·246
	4057	+43 42	N		53 5·96	−1·15	4·81	N		24 9·54	−1·62	7·92	3·11				
	4066	+22 7	N		55 12·75	−1·39	11·36	N		26 16·12	−1·74	14·38	3·02				
	4100	+27 57	N		12 1 45·04	−1·34	43·70	N		32 48·53	−1·71	46·82	3·12				
	4110	+21 12	S		3 7·81	−1·39	6·42	S		34 11·32	−1·75	9·57	3·15				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.
* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: **AND DEESA (W),** *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.071$, $H_N - H_S = +0^s.059$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 31	3862	+ 6 41	S	*I. P. E.*	11 11 51·98	+ 1·03	53·01	S	*I. P. E.*	11 42 54·98	+ 1·42	56·40	31 3·39				
	3868	+ 44 8	N	d c − 8·5	13 9·75	+ 1·37	11·12	N	d c − 0·5	44 12·80	+ 1·62	14·42	3·30				
	3877	+ 11 11	S	b − 2·2 a − 23·0	14 35·18	+ 1·07	36·25	S	b − 0·7 a − 11·7	45 38·23	+ 1·44	39·67	3·42				
	3886	+ 17 7	S	s Q + 1·43	16 16·02	+ 1·12	17·14	S	s Q + 1·53	47 19·02	+ 1·46	20·48	3·34				
	3894	+ 3 40	S		17 35·84	+ 1·01	36·85	S		48 38·88	+ 1·41	40·29	3·44				
	3894½†	+ 3 40	S		17 36·87	+ 1·01	37·88	S		48 39·90	+ 1·41	41·31	3·43	m s 31 3·386	+ 0·155	− 0·009	31 3·532
	3900	+ 3 31	S		18 41·00	+ 1·01	42·01	S		49 43·96	+ 1·41	45·37	3·36				
	3913	+ 43 50	N		20 56·70	+ 1·36	58·06	N		51 59·80	+ 1·61	61·41	3·35				
	3919	+ 15 2	S		22 28·15	+ 1·10	29·25	S		53 31·22	+ 1·46	32·68	3·43				
	3932	+ 17 27	S		25 22·72	+ 1·13	23·85	S		56 25·76	+ 1·47	27·23	3·38				
	3937	+ 28 26	N		26 54·07	+ 1·20	55·27	N		57 57·16	+ 1·52	58·68	3·41				
Mar. 31	4010	+ 38 34	N	*I. P. E.*	11 43 1·91	− 1·57	0·34	N	*I. P. E.*	12 14 5·24	− 1·48	3·76	31 3·42				
	4018	+ 41 35	N	d c − 8·5	44 34·40	− 1·53	32·87	N	d c − 0·5	15 37·72	− 1·46	36·26	3·39				
	4031	+ 16 19	S	b − 2·2 a − 23·0	46 27·97	− 1·74	26·23	S	b − 0·7 a − 11·7	17 31·24	− 1·60	29·64	3·41				
	4039	+ 4 9	S	s Q − 1·43	49 2·62	− 1·85	0·77	S	s Q − 1·53	20 5·91	− 1·64	4·27	3·50				
	4049	+ 4 19	S		50 45·87	− 1·85	44·02	S		21 49·17	− 1·64	47·53	3·51				
	4055	+ 4 18	S		51 59·45	− 1·85	57·60	S		23 2·64	− 1·64	1·00	3·40	m s 31 3·422	+ 0·155	− 0·007	31 3·570
	4057	+ 43 42	N		52 58·88	− 1·50	57·38	N		24 2·21	− 1·45	0·76	3·38				
	4066	+ 22 7	N		55 5·64	− 1·69	3·95	N		26 8·92	− 1·57	7·35	3·40				
			S		55 5·55	− 1·69	3·86	S		26 8·86	− 1·57	7·29	3·43				
	4100	+ 27 57	N		12 1 37·99	− 1·65	36·34	N		32 41·29	− 1·54	39·75	3·41				
	4110	+ 21 12	S		2 60·72	− 1·70	59·02	S		34 3·99	− 1·58	2·41	3·39				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference: Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.071$, $H_N - H_S = +0^s.059$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Apr. 1	3862	+ 6 41	S	*I. P. E.*	11 11 45·00	+0·93	45·93	S	*I. P. E.*	11 42 47·83	+1·39	49·22	31 3·29				
	3868	+44 8	N	d c − 8·5	13 2·74	+1·26	4·00	N	d c − 0·5	44 5·64	+1·63	7·27	3·27				
	3877	+11 11	S	b − 6·6 a −24·8	14 28·18	+0·96	29·14	S	b − 1·3 a −15·1	45 31·05	+1·41	32·46	3·32				
	3886	+17 7	S	s Q +1·43	16 8·99	+1·02	10·01	S	s Q +1·53	47 11·81	+1·44	13·25	3·24				
	3894	+ 3 40	S		17 28·86	+0·90	29·76	S		48 31·73	+1·36	33·09	3·33				
	3894½†	+ 3 40	S		17 29·87	+0·90	30·77	S		48 32·75	+1·36	34·11	3·34	m s 31 3·315	+ 0·157	− 0·009	31 3·463
	3900	+ 3 31	S		18 33·96	+0·90	34·86	S		49 36·85	+1·36	38·21	3·35				
	3913	+43 50	N		20 49·66	+1·25	50·91	N		51 52·63	+1·63	54·26	3·35				
	3919	+15 2	S		22 21·18	+1·00	22·18	S		53 24·04	+1·43	25·47	3·29				
	3932	+17 27	S		25 15·72	+1·02	16·74	S		56 18·65	+1·45	20·10	3·36				
	3937	+28 26	N		26 47·06	+1·10	48·16	N		57 49·96	+1·52	51·48	3·32				
Apr. 1	4010	+38 34	N	*I. P. E.*	11 42 54·88	−1·67	53·21	N	*I. P. E.*	12 13 58·11	−1·47	56·64	31 3·43				
	4018	+41 35	N	d c − 8·5	44 27·39	−1·64	25·75	N	d c − 0·5	15 30·59	−1·45	29·14	3·39				
	4031	+16 19	S	b − 6·6 a −24·8	46 20·95	−1·85	19·10	S	b − 1·3 a −15·1	17 24·14	−1·62	22·52	3·42				
	4039	+ 4 9	S	s Q −1·43	48 55·65	−1·95	53·70	S	s Q −1·53	19 58·76	−1·69	57·07	3·37				
	4049	+ 4 19	S		50 38·88	−1·95	36·93	S		21 42·03	−1·69	40·34	3·41				
	4055	+ 4 18	S		51 52·46	−1·95	50·51	S		22 55·54	−1·69	53·85	3·34	m s 31 3·365	+ 0·157	− 0·007	31 3·515
	4057	+43 42	N		52 51·94	−1·61	50·33	N		23 55·03	−1·43	53·60	3·27				
	4066	+22 7	N		54 58·64	−1·80	56·84	N		26 1·72	−1·58	0·14	3·30				
			S		54 58·52	−1·80	56·72	S		26 1·67	−1·58	0·09	3·37				
	4100	+27 57	N		12 1 30·97	−1·76	29·21	N		32 34·11	−1·54	32·57	3·36				
	4110	+21 12	S		2 53·70	−1·81	51·89	S		33 56·84	−1·59	55·25	3·36				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* $5^h\ 19^m\ 58^s$: AND DEESA (W), *Lat.* 24° 16′, *Long.* $4^h\ 48^m\ 54^s$.

Astronomical Date	Star		Transits Observed at E, By Campbell, with Telescope No. 2					Transits Observed at W, By Heaviside, with Telescope No. 1					Difference of Corrected Times (W − E)		Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s·071$, $H_N - H_S = +0^s·059$	$\delta L_N - \rho$
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1881		° ′			h m s	s	s			h m s	s	s	m s				
Apr. 8	3868	+44 8	N	*I. P. E.*	11 12 47·77	+1·33	49·10	N	*I. P. E.*	11 43 50·92	+1·39	52·31	31 3·21				
	3877	+11 11	S	d c − 8·5	14 13·26	+0·98	14·24	S	d c − 0·5	45 16·01	+1·50	17·51	3·27				
	3886	+17 7	S	b − 4·5 a − 28·0	15 54·11	+1·04	55·15	S	b − 2·5 a + 5·3	46 56·90	+1·49	58·39	3·24				
	3894	+ 3 40	S	s Q + 1·41	17 13·97	+0·91	14·88	S	s Q + 1·54	48 16·68	+1·52	18·20	3·32				
	3894½†	+ 3 40	S		17 15·00	+0·91	15·91	S		48 17·67	+1·52	19·19	3·28	m s 31 3·290	+ 0·164	− 0·008	31 3·446
	3900	+ 3 31	S		18 19·10	+0·91	20·01	S		49 21·80	+1·52	23·32	3·31				
	3913	+43 50	N		20 34·76	+1·33	36·09	N		51 38·00	+1·39	39·39	3·30				
	3919	+15 2	S		22 6·24	+1·02	7·26	S		53 9·08	+1·49	10·57	3·31				
	3932	+17 27	S		25 0·80	+1·05	1·85	S		56 3·68	+1·48	5·16	3·31				
	3937	+28 26	N		26 32·13	+1·14	33·27	N		57 35·16	+1·46	36·62	3·35				
Apr. 8	4010	+38 34	N	*I. P. E.*	11 42 39·92	−1·58	38·34	N	*I. P. E.*	12 13 43·38	−1·66	41·72	31 3·38				
	4018	+41 35	N	d c − 8·5	44 12·43	−1·53	10·90	N	d c − 0·5	15 15·91	−1·68	14·23	3·33				
	4031	+16 19	S	b − 4·5 a − 28·0	46 6·02	−1·79	4·23	S	b − 2·5 a + 5·3	17 9·14	−1·59	7·55	3·32				
	4039	+ 4 9	S	s Q − 1·41	48 40·74	−1·90	38·84	S	s Q − 1·54	19 43·71	−1·56	42·15	3·31				
	4049	+ 4 19	S		50 24·00	−1·90	22·10	S		21 26·96	−1·56	25·40	3·30				
	4055	+ 4 18	S		51 37·47	−1·90	35·57	S		22 40·48	−1·56	38·92	3·35	m s 31 3·311	+ 0·164	− 0·007	31 3·468
	4057	+43 42	N		52 36·92	−1·49	35·43	N		23 40·39	−1·69	38·70	3·27				
	4066	+22 7	N		54 43·68	−1·73	41·95	N		25 46·83	−1·61	45·22	3·27				
			S		54 43·60	−1·73	41·87	S		25 46·73	−1·61	45·12	3·25				
	4100	+27 57	N		12 1 16·03	−1·67	14·36	N		32 19·28	−1·62	17·66	3·30				
	4110	+21 12	S		2 38·73	−1·74	36·99	S		33 41·93	−1·60	40·33	3·34				

NOTE. $1^d = 0^s·0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations. † This star is not given in the B. A. Catalogue.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Table columns 1–8: Star, and Transits Observed at E (By Campbell, with Telescope No. 2)

Astronomical Date	Star: B.A.C. Number	Star: Declination	E: Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time
1881		° ′			h m s	s	s
Mar. 28	4318	+17 43	S	I. P. W.	12 15 54·13	+1·55	55·68
	4319	+17 45	S	d c + 0·9	16 4·48	+1·55	6·03
	4329	+13 4	S	b + 2·3 a − 11·1	17 28·44	+1·52	29·96
	4340	+4 3	S	s	19 13·58	+1·49	15·07
	4345	+38 57	N	Q + 1·50	20 3·38	+1·68	5·06
	4346	+38 58	N		20 4·67	+1·68	6·35
	4364	+21 55	N		25 22·53	+1·57	24·10
			S		25 22·43	+1·57	24·00
	4388	+23 15	N		30 12·03	+1·58	13·61
			S		30 11·90	+1·58	13·48
	4393	+28 12	N		31 48·72	+1·60	50·32
	4403	+17 29	S		33 33·63	+1·54	35·17
Mar. 28	4472	+5 47	S	I. P. W.	12 45 49·43	−1·51	47·92
	4479	+37 39	N	d c + 0·9	48 9·86	−1·33	8·53
	4499	+14 25	S	b + 2·3 a − 11·1	52 16·15	−1·47	14·68
	4504	+11 26	S	s	52 58·87	−1·48	57·39
	4536	+37 47	N	Q − 1·50	59 8·52	−1·33	7·19
	4559	+11 21	S		13 3 21·99	−1·48	20·51
	4566	+23 6	N		5 4·04	−1·42	2·62
			S		5 4·00	−1·42	2·58
	4575	+23 18	N		7 47·28	−1·42	45·86
			S		7 47·17	−1·42	45·75

Table columns 9–18: Transits Observed at W (By Heaviside, with Telescope No. 1), and results (star identified by B.A.C. Number)

B.A.C. Number	W: Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference of Corrected Times (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.071$, $H_N - H_S = +0^s.059$	$\delta L_N + \rho$
			h m s	s	s	m s				
4318	S	I. P. W.	12 46 57·37	+1·36	58·73	31 3·05				
4319	S	d c − 4·0	47 7·72	+1·36	9·08	3·05				
4329	S	b − 2·4 a + 4·8	48 31·57	+1·39	32·96	3·00				
4340	S	s	50 16·64	+1·41	18·05	2·98				
4345	N	Q + 1·51	51 6·81	+1·28	8·09	3·03				
4346	N		51 8·12	+1·28	9·40	3·05	m s 31 3·021	+ 0·266	− 0·007	31 3·280
4364	N		56 25·78	+1·35	27·13	3·03				
	S		56 25·72	+1·35	27·07	3·07				
4388	N		13 1 15·22	+1·35	16·57	2·96				
	S		1 15·09	+1·35	16·44	2·96				
4393	N		2 51·99	+1·34	53·33	3·01				
4403	S		4 36·86	+1·37	38·23	3·06				
4472	S	I. P. W.	13 16 52·56	−1·62	50·94	31 3·02				
4479	N	d c − 4·0	19 13·36	−1·72	11·64	3·11				
4499	S	b − 2·4 a + 4·8	23 19·47	−1·63	17·84	3·16				
4504	S	s	24 2·16	−1·63	0·53	3·14				
4536	N	Q − 1·51	30 12·02	−1·73	10·29	3·10				
4559	S		34 25·33	−1·63	23·70	3·19	m s 31 3·136	+ 0·266	− 0·007	31 3·395
4566	N		36 7·40	−1·67	5·73	3·11				
	S		36 7·41	−1·67	5·74	3·16				
4575	N		38 50·69	−1·67	49·02	3·16				
	S		38 50·63	−1·67	48·96	3·21				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

*ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.071$, $H_N - H_S = +0.059$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 29	4318	+17 43	S	I. P. W.	12 15 41.80	+1.54	43.34	S	I. P. W.	12 46 45.09	+1.36	46.45	31 3.11				
	4319	+17 45	S	d c + 0.9	15 52.17	+1.54	53.71	S	d c − 4.0	46 55.45	+1.36	56.81	3.10				
	4329	+13 4	S	b + 2.7 a −15.3	17 16.08	+1.51	17.59	S	b − 2.0 a − 9.1	48 19.34	+1.35	20.69	3.10				
	4340	+ 4 3	S	s Q + 1.49	19 1.32	+1.46	2.78	S	s Q + 1.53	50 4.46	+1.33	5.79	3.01				
	4345	+38 57	N		19 51.04	+1.72	52.76	N		50 54.44	+1.42	55.86	3.10				
	4346	+38 58	N		19 52.28	+1.72	54.00	N		50 55.71	+1.42	57.13	3.13	m s 31 3.098	+ 0.265	− 0.007	31 3.356
	4364	+21 55	N		25 10.20	+1.57	11.77	N		56 13.54	+1.37	14.91	3.14				
			S		25 10.10	+1.57	11.67	S		56 13.41	+1.37	14.78	3.11				
	4388	+23 15	N		29 59.57	+1.58	61.15	N		13 1 2.86	+1.38	4.24	3.09				
			S		29 59.53	+1.58	61.11	S		1 2.81	+1.38	4.19	3.08				
	4393	+28 12	N		31 36.36	+1.61	37.97	N		2 39.67	+1.40	41.07	3.10				
	4403	+17 29	S		33 21.27	+1.53	22.80	S		4 24.54	+1.36	25.90	3.10				
Mar. 29	4472	+ 5 47	S	I. P. W.	12 45 37.08	−1.51	35.57	S	I. P. W.	13 16 40.46	−1.73	38.73	31 3.16				
	4479	+37 39	N	d c + 0.9	47 57.49	−1.28	56.21	N	d c − 4.0	18 61.03	−1.64	59.39	3.18				
	4499	+14 25	S	b + 2.7 a −15.3	52 3.84	−1.46	2.38	S	b − 2.0 a − 9.1	23 7.20	−1.71	5.49	3.11				
	4504	+11 26	S	s Q − 1.49	52 46.52	−1.48	45.04	S	s Q − 1.53	23 49.88	−1.71	48.17	3.13				
	4513	+24 51	N		54 40.92	−1.39	39.53	N		25 44.35	−1.68	42.67	3.14				
	4526	+24 58	N		56 37.07	−1.39	35.68	N		27 40.49	−1.68	38.81	3.13	m s 31 3.154	+ 0.265	− 0.006	31 3.413
	4536	+37 47	N		58 56.11	−1.28	54.83	N		29 59.64	−1.65	57.99	3.16				
	4559	+11 21	S		13 3 9.65	−1.48	8.17	S		34 13.05	−1.71	11.34	3.17				
	4566	+23 6	N		4 51.64	−1.40	50.24	N		35 55.09	−1.68	53.41	3.17				
			S		4 51.63	−1.40	50.23	S		35 55.07	−1.68	53.39	3.16				
	4575	+23 18	N		7 34.89	−1.40	33.49	N		38 38.32	−1.68	36.64	3.15				
			S		7 34.78	−1.40	33.38	S		38 38.25	−1.68	36.57	3.19				

Note. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = + 0^s.071$, $H_N - H_S = + 0^s.059$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 30	4318	+17 43	S	I. P. W.	12 15 29.59	+1.48	31.07	S	I. P. W.	12 46 32.87	+1.29	34.16	31 3.09				
	4319	+17 45	S	d c + 0.9	15 39.95	+1.48	41.43	S	d c − 4.0	46 43.21	+1.29	44.50	3.07				
	4329	+13 4	S	b + 2.1 a −19.3	17 3.88	+1.44	5.32	S	b − 4.3 a −14.8	48 7.16	+1.27	8.43	3.11				
	4340	+ 4 3	S	s Q + 1.45	18 49.12	+1.37	50.49	S	s Q + 1.53	49 52.28	+1.23	53.51	3.02				
	4345	+38 57	N		19 38.81	+1.69	40.50	N		50 42.14	+1.40	43.54	3.04				
	4346	+38 58	N		19 40.09	+1.69	41.78	N		50 43.41	+1.40	44.81	3.03				
	4364	+21 55	N		24 57.97	+1.51	59.48	N		56 1.28	+1.32	2.60	3.12	m s 31 3.101	+ 0.254	− 0.007	31 3.348
			S		24 57.97	+1.51	59.48	S		56 1.23	+1.32	2.55	3.07				
	4388	+23 15	N		29 47.33	+1.52	48.85	N		13 0 50.74	+1.33	52.07	3.22				
			S		29 47.31	+1.52	48.83	S		0 50.68	+1.33	52.01	3.18				
	4393	+28 12	N		31 24.13	+1.56	25.69	N		2 27.47	+1.35	28.82	3.13				
	4403	+17 29	S		33 9.03	+1.48	10.51	S		4 12.35	+1.29	13.64	3.13				
Mar. 30	4472	+ 5 47	S	I. P. W.	12 45 24.85	−1.52	23.33	S	I. P. W.	13 16 28.27	−1.82	26.45	31 3.12				
	4479	+37 39	N	d c + 0.9	47 45.19	−1.22	43.97	N	d c − 4.0	18 48.74	−1.66	47.08	3.11				
	4499	+14 25	S	b + 2.1 a −19.3	51 51.57	−1.45	50.12	S	b − 4.3 a −14.8	22 55.06	−1.78	53.28	3.16				
	4504	+11 26	S	s Q − 1.45	52 34.28	−1.47	32.81	S	s Q − 1.53	23 37.77	−1.80	35.97	3.16				
	4513	+24 51	N		54 28.68	−1.37	27.31	N		25 32.10	−1.74	30.36	3.05				
	4526	+24 58	N		56 24.75	−1.36	23.39	N		27 28.27	−1.74	26.53	3.14	m s 31 3.127	+ 0.254	− 0.006	31 3.375
	4536	+37 47	N		58 43.86	−1.22	42.64	N		29 47.42	−1.68	45.74	3.10				
	4559	+11 21	S		13 2 57.45	−1.47	55.98	S		33 60.86	−1.80	59.06	3.08				
	4566	+23 6	N		4 39.38	−1.39	37.99	N		35 42.91	−1.74	41.17	3.18				
			S		4 39.34	−1.39	37.95	S		35 42.89	−1.74	41.15	3.20				
	4575	+23 18	N		7 22.71	−1.39	21.32	N		38 26.14	−1.75	24.39	3.07				
			S		7 22.54	−1.39	21.15	S		38 26.05	−1.75	24.30	3.15				

NOTE. 1d = 0s.0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5ʰ 19ᵐ 58ˢ : AND DEESA (W), *Lat.* 24° 16′, *Long.* 4ʰ 48ᵐ 54ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	(W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.071$, $H_N - H_S = +0.059$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Mar. 31	4318	+17 43	S	I. P. E.	12 15 18·41	+1·13	19·54	S	I. P. E.	12 46 21·53	+1·46	22·99	31 3·45				
	4319	+17 45	S	d	15 28·79	+1·13	29·92	S	d	46 31·86	+1·47	33·33	3·41				
	4329	+13 4	S	c − 8·5 b − 2·2 a −23·0	16 52·73	+1·09	53·82	S	c − 0·5 b − 0·7 a −11·7	47 55·82	+1·45	57·27	3·45				
	4340	+ 4 3	S	s	18 37·85	+1·01	38·86	S	s	49 40·98	+1·42	42·40	3·54				
	4345	+38 57	N	Q + 1·43	19 27·63	+1·30	28·93	N	Q + 1·53	50 30·74	+1·59	32·33	3·40				
	4346	+38 58	N		19 28·90	+1·30	30·20	N		50 32·02	+1·59	33·61	3·41	m s 31 3·409	+ 0·240	− 0·007	31 3·642
	4364	+21 55	N		24 46·91	+1·17	48·08	N		55 50·01	+1·49	51·50	3·42				
			S		24 46·83	+1·17	48·00	S		55 49·82	+1·49	51·31	3·31				
	4388	+23 15	N		29 36·28	+1·17	37·45	N		13 0 39·39	+1·50	40·89	3·44				
			S		29 36·21	+1·17	37·38	S		0 39·26	+1·50	40·76	3·38				
	4393	+28 12	N		31 13·08	+1·20	14·28	N		2 16·06	+1·52	17·58	3·30				
	4403	+17 29	S		32 57·98	+1·13	59·11	S		4 1·04	+1·47	2·51	3·40				
Mar. 31	4472	+ 5 47	S	I. P. E.	12 45 13·74	−1·84	11·90	S	I. P. E.	13 16 16·95	−1·63	15·32	31 3·42				
	4479	+37 39	N	d	47 34·19	−1·57	32·62	N	d	18 37·33	−1·48	35·85	3·23				
	4499	+14 25	S	c − 8·5 b − 2·2 a −23·0	51 40·48	−1·76	38·72	S	c − 0·5 b − 0·7 a −11·7	22 43·73	−1·61	42·12	3·40				
	4504	+11 26	S	s	52 23·19	−1·79	21·40	S	s	23 26·35	−1·62	24·73	3·33				
	4513	+24 51	N	Q − 1·43	54 17·57	−1·67	15·90	N	Q − 1·53	25 20·84	−1·56	19·28	3·38				
	4526	+24 58	N		56 13·77	−1·67	12·10	N		27 16·94	−1·56	15·38	3·28	m s 31 3·335	+ 0·240	− 0·006	31 3·559
	4536	+37 47	N		58 32·85	−1·58	31·27	N		29 35·98	−1·48	34·50	3·23				
	4559	+11 21	S		13 2 46·34	−1·79	44·55	S		33 49·53	−1·62	47·91	3·36				
	4566	+23 6	N		4 28·38	−1·68	26·70	N		35 31·54	−1·56	29·98	3·28				
			S		4 28·34	−1·68	26·66	S		35 31·51	−1·56	29·95	3·29				
	4575	+23 18	N		7 11·62	−1·68	9·94	N		38 14·84	−1·56	13·28	3·34				
			S		7 11·48	−1·68	9·80	S		38 14·72	−1·56	13·16	3·36				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* 5h 19m 58s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	E: Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	W: Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference of Corrected Times (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $O_N - O_S = +0^s.071$, $H_N - H_S = +0^s.059$	$\delta L_N + \rho$
		° ′			h m s	s	s			h m s	s	s	m s				
1881 Apr. 1	4318	+17 43	S	I. P. E.	12 15 7·61	+1·03	8·64	S	I. P. E.	12 46 10·63	+1·43	12·06	31 3·42				
	4319	+17 45	S	d c − 8·5	15 18·00	+1·03	19·03	S	d c − 0·5	46 20·96	+1·45	22·41	3·38				
	4329	+13 4	S	b − 6·6 a −24·8	16 41·91	+0·99	42·90	S	b − 1·3 a −15·1	47 44·92	+1·42	46·34	3·44				
	4340	+ 4 3	S	s	18 27·06	+0·92	27·98	S	s	49 30·07	+1·37	31·44	3·46				
	4345	+38 57	N	Q +1·44	19 16·84	+1·21	18·05	N	Q +1·53	50 19·82	+1·59	21·41	3·36				
	4346	+38 58	N		19 18·10	+1·21	19·31	N		50 21·12	+1·59	22·71	3·40	m s 31 3·435	+ 0·234	− 0·007	31 3·662
	4364	+21 55	N		24 36·00	+1·07	37·07	N		55 38·98	+1·47	40·45	3·38				
			S		24 35·98	+1·07	37·05	S		55 38·91	+1·47	40·38	3·33				
	4388	+23 15	N		29 25·36	+1·07	26·43	N		13 0 28·48	+1·48	29·96	3·53				
			S		29 25·35	+1·07	26·42	S		0 28·46	+1·48	29·94	3·52				
	4393	+28 12	N		31 2·13	+1·10	3·23	N		2 5·20	+1·52	6·72	3·49				
	4403	+17 29	S		32 47·10	+1·03	48·13	S		3 50·19	+1·45	51·64	3·51				
Apr. 1	4472	+ 5 47	S	I. P. E.	12 45 2·88	−1·95	0·93	S	I. P. E.	13 16 6·00	−1·68	4·32	31 3·39				
	4479	+37 39	N	d c − 8·5	47 23·24	−1·68	21·56	N	d c − 0·5	18 26·38	−1·48	24·90	3·34				
	4499	+14 25	S	b − 6·6 a −24·8	51 29·63	−1·88	27·75	S	b − 1·3 a −15·1	22 32·86	−1·63	31·23	3·48				
	4504	+11 26	S	s	52 12·36	−1·91	10·45	S	s	23 15·47	−1·65	13·82	3·37				
	4513	+24 51	S	Q −1·44	54 6·66	−1·79	4·87	N	Q −1·53	25 9·86	−1·57	8·29	3·42				
	4526	+24 58	N		56 2·88	−1·79	1·09	N		27 5·99	−1·57	4·42	3·33	m s 31 3·361	+ 0·234	− 0·012	31 3·583
	4536	+37 47	N		58 21·93	−1·69	20·24	N		29 25·08	−1·48	23·60	3·36				
	4559	+11 21	S		13 2 35·51	−1·91	33·60	S		33 38·60	−1·65	36·95	3·35				
	4566	+23 6	N		4 17·51	−1·80	15·71	N		35 20·58	−1·58	19·00	3·29				
			S		4 17·45	−1·80	15·65	S		35 20·60	−1·58	19·02	3·37				
	4575	+23 18	N		6 60·78	−1·80	58·98	N		38 3·86	−1·58	2·28	3·30				
			S		6 60·64	−1·80	58·84	S		38 3·75	−1·58	2·17	3·33				

Transits Observed at E: *By Campbell, with Telescope No. 2*. Transits Observed at W: *By Heaviside, with Telescope No. 1*.

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

*ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

JUBBULPORE (E), *Lat.* 23° 10′, *Long.* $5^h\ 19^m\ 58^s$: AND DEESA (W), *Lat.* 24° 16′, *Long.* $4^h\ 48^m\ 54^s$.

Astronomical Date	Star: B.A.C. Number *	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s{\cdot}071$, $H_N - H_S = +0{\cdot}059$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Apr. 3	4318	+17 43	S	*I. P. E.*	12 14 46·10	+1·03	47·13	S	*I. P. E.*	12 45 49·06	+1·48	50·54	31 3·41				
	4319	+17 45	S	d; c − 8·5	14 56·50	+1·03	57·53	S	d; c − 0·5	45 59·42	+1·48	60·90	3·37				
	4329	+13 4	S	b − 4·5; a −28·0	16 20·41	+0·99	21·40	S	b − 2·5; a + 5·3	47 23·29	+1·49	24·78	3·38				
	4340	+ 4 3	S	s; Q +1·41	18 5·62	+0·91	6·53	S	s; Q +1·54	49 8·40	+1·52	9·92	3·39				
	4345	+38 57	N		18 55·28	+1·25	56·53	N		49 58·45	+1·42	59·87	3·34				
	4346	+38 58	N		18 56·54	+1·25	57·79	N		49 59·72	+1·42	61·14	3·35	m s 31 3·363	+ 0·230	− 0·007	31 3·586
	4364	+21 55	N		24 14·44	+1·09	15·53	N		55 17·47	+1·47	18·94	3·41				
			S		24 14·44	+1·09	15·53	S		55 17·35	+1·47	18·82	3·29				
	4388	+23 15	N		29 3·89	+1·09	4·98	N		13 0 6·91	+1·47	8·38	3·40				
			S		29 3·84	+1·09	4·93	S		0 6·77	+1·47	8·24	3·31				
	4393	+28 12	N		30 40·65	+1·14	41·79	N		1 43·68	+1·46	45·14	3·35				
	4403	+17 29	S		32 25·59	+1·04	26·63	S		3 28·50	+1·48	29·98	3·35				
Apr. 3	4472	+ 5 47	S	*I. P. E.*	12 44 41·35	−1·90	39·45	S	*I. P. E.*	13 15 44·31	−1·56	42·75	31 3·30				
	4479	+37 39	N	d; c − 8·5	47 1·65	−1·57	0·08	N	d; c − 0·5	18 5·09	−1·65	3·44	3·36				
	4499	+14 25	S	b − 4·5; a −28·0	51 8·08	−1·81	6·27	S	b − 2·5; a + 5·3	22 11·25	−1·59	9·66	3·39				
	4504	+11 26	S	s; Q −1·41	51 50·75	−1·84	48·91	S	s; Q −1·54	22 53·89	−1·58	52·31	3·40				
	4513	+24 51	N		53 45·11	−1·71	43·40	N		24 48·43	−1·61	46·82	3·42				
	4526	+24 58	N		55 41·29	−1·71	39·58	N		26 44·53	−1·61	42·92	3·34	m s 31 3·357	+ 0·230	− 0·006	31 3·581
	4536	+37 47	N		57 60·35	−1·58	58·77	N		29 3·79	−1·66	2·13	3·36				
	4559	+11 21	S		13 2 13·91	−1·84	12·07	S		33 17·08	−1·58	15·50	3·43				
	4566	+23 6	N		3 55·97	−1·72	54·25	N		34 59·16	−1·61	57·55	3·30				
			S		3 55·83	−1·72	54·11	S		34 59·11	−1·61	57·50	3·39				
	4575	+23 18	N		6 39·22	−1·72	37·50	N		37 42·35	−1·61	40·74	3·24				
			S		6 39·10	−1·72	37·38	S		37 42·34	−1·61	40·73	3·35				

NOTE. $1^d = 0^s{\cdot}0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

AGRA (E), *Lat.* 27° 10′, *Long.* $5^h\ 12^m\ 14^s$: AND DEESA (W), *Lat.* 24° 16′, *Long.* $4^h\ 48^m\ 54^s$.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.076$, $H_N - H_S = +0.051$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Apr. 10	4329	+13 4	S	I. P. E.	12 45 47·00	+1·55	48·55	S	I. P. E.	13 9 7·38	+1·56	8·94	23 20·39				
	4340	+ 4 3	S	d c − 1·2	47 32·03	+1·60	33·63	S	d c − 2·0	10 52·43	+1·63	54·06	20·43				
	4345	+38 57	N	b + 0·1 a +15·0	48 22·29	+1·38	23·67	N	b − 0·9 a +22·4	11 42·83	+1·27	44·10	20·43				
	4346	+38 58	N	s Q +1·50	48 23·55	+1·38	24·93	N	s Q +1·53	11 44·09	+1·27	45·36	20·43	m s 23 20·438	− 0·047	− 0·016	23 20·375
	4364	+21 55	S		53 41·17	+1·50	42·67	S		17 1·65	+1·48	3·13	20·46				
	4388	+23 15	S		58 30·68	+1·49	32·17	S		21 51·19	+1·47	52·66	20·49				
	4393	+28 12	N		13 0 7·64	+1·46	9·10	N		23 28·12	+1·42	29·54	20·44				
	4403	+17 29	S		1 52·40	+1·53	53·93	S		25 12·84	+1·52	14·36	20·43				
Apr. 10	4472	+ 5 47	S	I. P. E.	13 14 8·19	−1·41	6·78	S	I. P. E.	13 37 28·73	−1·44	27·29	23 20·51				
	4479	+37 39	N	d c − 1·2	16 29·04	−1·61	27·43	N	d c − 2·0	39 49·77	−1·76	48·01	20·58				
	4499	+14 25	S	b + 0·1 a +15·0	20 35·15	−1·45	33·70	S	b − 0·9 a +22·4	43 55·74	−1·51	54·23	20·53				
	4504	+11 26	S	s Q −1·50	21 17·80	−1·44	16·36	S	s Q −1·53	44 38·34	−1·49	36·85	20·49				
	4513	+24 51	S		23 12·38	−1·51	10·87	N		46 32·95	−1·61	31·34	20·47	m s 23 20·505	− 0·047	− 0·025	23 20·433
	4526	+24 58	S		25 8·57	−1·52	7·05	S		48 29·15	−1·61	27·54	20·49				
	4536	+37 47	N		27 27·91	−1·61	26·30	N		50 48·56	−1·76	46·80	20·50				
	4559	+11 21	S		31 41·09	−1·44	39·65	S		55 1·66	−1·49	0·17	20·52				
	4566	+23 6	S		33 23·24	−1·51	21·73	S		56 43·79	−1·59	42·20	20·47				
	4575	+23 18	S		36 6·49	−1·51	4·98	S		59 27·06	−1·59	25·47	20·49				
Apr. 11	4304	+28 12	N	I. P. E.	12 41 28·18	+1·47	29·65	N	I. P. E.	13 4 48·74	+1·52	50·26	23 20·61				
	4315	+28 11	N	d c − 1·2	43 52·84	+1·47	54·31	N	d c − 2·0	7 13·35	+1·52	14·87	20·56				
	4329	+13 4	S	b + 0·2 a +23·1	45 49·92	+1·55	51·47	S	b + 0·2 a − 3·0	9 10·63	+1·49	12·12	20·65				
	4340	+ 4 3	S	s Q +1·50	47 34·93	+1·60	36·53	S	s Q +1·55	10 55·72	+1·48	57·20	20·67				
	4345	+38 57	N		48 25·34	+1·39	26·73	N		11 45·70	+1·52	47·22	20·49	m s 23 20·606	− 0·052	− 0·011	23 20·543
	4346	+38 58	N		48 26·58	+1·39	27·97	N		11 46·95	+1·52	48·47	20·50				
	4364	+21 55	S		53 44·15	+1·50	45·65	S		17 4·76	+1·50	6·26	20·61				
	4388	+23 15	S		58 33·61	+1·49	35·10	S		21 54·28	+1·50	55·78	20·68				
	4393	+28 12	N		13 0 10·58	+1·47	12·05	N		23 31·21	+1·52	32·73	20·68				

NOTE. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

AGRA (E), *Lat.* 27° 10′, *Long.* 5h 12m 14s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.076$ $H_N - H_S = +0.051$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Apr.11	4472	+ 5 47	S	I.P.E.	13 14 11·18	−1·41	9·77	S	I.P.E.	13 37 32·02	−1·62	30·40	23 20·63				
	4479	+37 39	N	d c − 1·2	16 32·15	−1·60	30·55	N	d c − 2·0	39 52·66	−1·58	51·08	20·53				
	4499	+14 25	S	b + 0·2 a + 23·1	20 38·07	−1·45	36·62	S	b + 0·2 a − 3·0	43 58·96	−1·61	57·35	20·73				
	4504	+11 26	S	s Q − 1·50	21 20·75	−1·44	19·31	S	s Q − 1·55	44 41·58	−1·62	39·96	20·65				
	4536	+37 47	N		27 30·91	−1·60	29·31	N		50 51·49	−1·58	49·91	20·60	m s 23 20·624	− 0·052	− 0·019	23 20·553
	4559	+11 21	S		31 44·05	−1·44	42·61	S		55 4·90	−1·62	3·28	20·67				
	4566	+23 6	S		33 26·22	−1·50	24·72	S		56 46·92	−1·60	45·32	20·60				
	4575	+23 18	S		36 9·47	−1·51	7·96	S		59 30·14	−1·60	28·54	20·58				
Apr.13	4304	+28 12	N	I.P.E.	12 41 34·65	+1·62	36·27	N	I.P.E.	13 4 55·45	+1·52	56·97	23 20·70				
	4315	+28 11	N	d c − 1·2	43 59·26	+1·62	60·88	N	d c − 2·0	7 20·05	+1·52	21·57	20·69				
	4329	+13 4	S	b + 5·6 a + 39·1	45 56·30	+1·85	58·15	S	b + 0·9 a − 5·1	9 17·31	+1·49	18·80	20·65				
	4340	+ 4 3	S	s Q + 1·53	47 41·29	+1·96	43·25	S	s Q + 1·54	11 2·45	+1·47	3·92	20·67				
	4345	+38 57	N		48 31·86	+1·43	33·29	N		11 52·35	+1·55	53·90	20·61	m s 23 20·647	− 0·056	− 0·013	23 20·578
	4346	+38 58	N		48 33·14	+1·43	34·57	N		11 53·64	+1·55	55·19	20·62				
	4364	+21 55	S		53 50·63	+1·72	52·35	S		17 11·54	+1·51	13·05	20·70				
	4388	+23 15	S		58 40·14	+1·70	41·84	S		22 0·92	+1·51	2·43	20·59				
	4393	+28 12	N		13 0 17·10	+1·62	18·72	N		23 37·83	+1·52	39·35	20·63				
	4403	+17 29	S		2 1·81	+1·78	3·59	S		25 22·70	+1·50	24·20	20·61				
Apr.13	4472	+ 5 47	S	I.P.E.	13 14 17·59	−1·12	16·47	S	I.P.E.	13 37 38·76	−1·61	37·15	23 20·68				
	4479	+37 39	N	d c − 1·2	16 38·78	−1·60	37·18	N	d c − 2·0	39 59·35	−1·55	57·80	20·62				
	4504	+11 26	S	b + 5·6 a + 39·1	21 27·37	−1·20	26·17	S	b + 0·9 a − 5·1	44 48·30	−1·60	46·70	20·53				
	4513	+24 51	S	s Q − 1·53	23 21·96	−1·38	20·58	S	s Q − 1·54	46 42·80	−1·57	41·23	20·65				
	4526	+24 58	S		25 18·16	−1·38	16·78	S		48 38·94	−1·57	37·37	20·59	m s 23 20·599	− 0·056	− 0·019	23 20·524
	4536	+37 47	N		27 37·64	−1·60	36·04	N		50 58·18	−1·55	56·63	20·59				
	4566	+23 6	S		33 32·84	−1·35	31·49	S		56 53·63	−1·57	52·06	20·57				
	4575	+23 18	S		36 16·12	−1·36	14·76	S		59 36·89	−1·57	35·32	20·56				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXIX. OBSERVATIONS OF TRANSITS WITH E CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N - \rho$.*

AGRA (E), *Lat.* 27° 10′, *Long.* 5h 12m 14s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E, By Campbell, with Telescope No. 2: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W, By Heaviside, with Telescope No. 1: Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = + 0^s{\cdot}076$ $H_N - H_S = + 0{\cdot}051$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Apr. 14	4315	+28 11	N	*I. P. W.*	12 44 3·24	+1·43	4·67	N	*I. P. W.*	13 7 23·61	+1·36	24·97	23 20·30				
	4329	+13 4	S	d c − 0·9	46 0·04	+1·83	·1·87	S	d c + 0·6	9 20·92	+1·31	22·23	20·36				
	4340	+ 4 3	S	b − 0·7 a +66·1	47 44·97	+2·06	47·03	S	b − 8·1 a −12·0	11 6·05	+1·28	7·33	20·30				
	4345	+38 57	N	s Q +1·51	48 35·87	+1·07	36·94	N	s Q +1·53	11 55·92	+1·41	57·33	20·39	m s 23 20·388	− 0·055	− 0·014	23 20·319
	4346	+38 58	N		48 37·12	+1·07	38·19	N		11 57·19	+1·41	58·60	20·41				
	4364	+21 55	S		53 54·41	+1·61	56·02	S		17 15·09	+1·33	16·42	20·40				
	4388	+23 15	S		58 43·86	+1·58	45·44	S		22 4·60	+1·34	5·94	20·50				
	4393	+28 12	N		13 0 20·91	+1·43	22·34	N		23 41·40	+1·36	42·76	20·42				
	4403	+17 29	S		2 5·52	+1·73	7·25	S		25 26·34	+1·32	27·66	20·41				
Apr. 14	4472	+ 5 47	S	*I. P. W.*	13 14 21·19	−1·00	20·19	S	*I. P. W.*	13 37 42·40	−1·78	40·62	23 20·43				
	4479	+37 39	N	d c − 0·9	16 42·74	−1·90	40·84	N	d c + 0·6	40 2·98	−1·65	1·33	20·49				
	4499	+14 25	S	b − 0·7 a +66·1	20 48·24	−1·21	47·03	S	b − 8·1 a −12·0	44 9·27	−1·76	7·51	20·48				
	4504	+11 26	S	s Q −1·51	21 30·87	−1·15	29·72	S	s Q −1·53	44 52·01	−1·76	50·25	20·53				
	4513	+24 51	S		23 25·64	−1·48	24·16	N		46 46·42	−1·71	44·71	20·55	m s 23 20·486	− 0·055	− 0·025	23 20·406
	4526	+24 58	S		25 21·89	−1·49	20·40	S		48 42·62	−1·71	40·91	20·51				
	4536	+37 47	N		27 41·54	−1·89	39·65	N		51 1·74	−1·65	0·09	20·44				
	4559	+11 21	S		31 54·15	−1·14	53·01	S		55 15·24	−1·76	13·48	20·47				
	4566	+23 6	S		33 36·49	−1·44	35·05	S		56 57·26	−1·72	55·54	20·49				
	4575	+23 18	S		36 19·76	−1·44	18·32	S		59 40·51	−1·72	38·79	20·47				
Apr. 15	4304	+28 12	N	*I. P. W.*	12 41 41·85	+1·45	43·30	N	*I. P. W.*	13 5 1·94	+1·63	3·57	23 20·27				
	4315	+28 11	N	d c − 0·9	44 6·49	+1·45	7·94	N	d c + 0·6	7 26·62	+1·63	28·25	20·31				
	4329	+13 4	S	b − 0·1 a +68·8	46 3·31	+1·87	5·18	S	b + 3·3 a −22·7	9 24·03	+1·47	25·50	20·32				
	4340	+ 4 3	S	s Q +1·51	47 48·23	+2·10	50·33	S	s Q +1·49	11 9·19	+1·40	10·59	20·26				
	4345	+38 57	N		48 39·19	+1·07	40·26	N		11 58·83	+1·77	60·60	20·34	m s 23 20·315	− 0·053	− 0·013	23 20·249
	4346	+38 58	N		48 40·45	+1·07	41·52	N		12 0·09	+1·77	1·86	20·34				
	4364	+21 55	S		53 57·74	+1·63	59·37	S		17 18·06	+1·56	19·62	20·25				
	4388	+23 15	S		58 47·19	+1·60	48·79	S		22 7·58	+1·57	9·15	20·36				
	4393	+28 12	N		13 0 24·21	+1·45	25·66	N		23 44·41	+1·63	46·04	20·38				
	4403	+17 29	S		2 8·82	+1·76	10·58	S		25 29·38	+1·52	30·90	20·32				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

AGRA (E), *Lat.* 27° 10′, *Long.* 5h 12m 14s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of E Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s\cdot076$, $H_N - H_S = +0\cdot051$	$\delta L_N - \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Apr. 15	4472	+ 5 47	S	I. P. W.	13 14 24·47	−0·97	23·50	S	I. P. W.	13 37 45·45	−1·57	43·88	23 20·38				
	4479	+37 39	N	d c − 0·9	16 46·08	−1·89	44·19	N	d c + 0·6	40 5·75	−1·23	4·52	20·33				
	4499	+14 25	S	b − 0·1 a +68·8	20 51·56	−1·18	50·38	S	b + 3·3 a −22·7	44 12·21	−1·49	10·72	20·34				
	4504	+11 26	S	s Q −1·51	21 34·17	−1·11	33·06	S	s Q −1·49	44 55·03	−1·52	53·51	20·45				
	4513	+24 51	S		23 29·02	−1·46	27·56	S		46 49·27	−1·38	47·89	20·33	m s 23 20·357	−0·053	−0·032	23 20·272
	4526	+24 58	S		25 25·18	−1·47	23·71	N		48 45·46	−1·38	44·08	20·37				
	4536	+37 47	S		27 44·87	−1·90	42·97	N		51 4·60	−1·23	3·37	20·40				
	4559	+11 21	S		31 57·48	−1·11	56·37	S		55 18·24	−1·53	16·71	20·34				
	4566	+23 6	S		33 39·83	−1·41	38·42	S		56 60·17	−1·41	58·76	20·34				
	4575	+23 18	S		36 23·13	−1·42	21·71	S		59 43·41	−1·41	42·00	20·29				
Apr. 16	4304	+28 12	N	I. P. W.	12 41 45·01	+1·48	46·49	N	I. P. W.	13 5 5·27	+1·59	6·86	23 20·37				
	4315	+28 11	N	d c − 0·9	44 9·71	+1·48	11·19	N	d c + 0·6	7 29·96	+1·59	31·55	20·36				
	4329	+13 4	S	b + 2·0 a +69·4	46 6·51	+1·89	8·40	S	b + 2·2 a − 5·1	9 27·13	+1·54	28·67	20·27				
	4340	+ 4 3	S	s Q +1·49	47 51·42	+2·12	53·54	S	s Q +1·50	11 12·25	+1·52	13·77	20·23				
	4345	+38 57	N		48 42·38	+1·11	43·49	N		12 2·23	+1·62	3·85	20·36	m s 23 20·325	−0·051	−0·013	23 20·261
	4346	+38 58	N		48 43·67	+1·11	44·78	N		12 3·49	+1·62	5·11	20·33				
	4364	+21 55	S		54 0·93	+1·67	2·60	S		17 21·35	+1·56	22·91	20·31				
	4388	+23 15	S		58 50·46	+1·63	52·09	S		22 10·88	+1·56	12·44	20·35				
	4393	+28 12	N		13 0 27·41	+1·48	28·89	N		23 47·66	+1·59	49·25	20·36				
	4403	+17 29	S		2 12·00	+1·79	13·79	S		25 32·55	+1·55	34·10	20·31				
Apr. 16	4472	+ 5 47	S	I. P. W.	13 14 27·60	−0·90	26·70	S	I. P. W.	13 37 48·51	−1·48	47·03	23 20·33				
	4479	+37 39	N	d c − 0·9	16 49·23	−1·81	47·42	N	d c + 0·6	40 9·11	−1·39	7·72	20·30				
	4499	+14 25	S	b + 2·0 a +69·4	20 54·70	−1·11	53·59	S	b + 2·2 a − 5·1	44 15·33	−1·46	13·87	20·28				
	4504	+11 26	S	s Q −1·49	21 37·35	−1·05	36·30	S	s Q −1·50	44 58·05	−1·47	56·58	20·28				
	4513	+24 51	S		23 32·19	−1·39	30·80	S		46 52·54	−1·43	51·11	20·31	m s 23 20·317	−0·051	−0·019	23 20·247
	4536	+37 47	N		27 48·02	−1·82	46·20	N		51 7·91	−1·39	6·52	20·32				
	4559	+11 21	S		31 60·60	−1·04	59·56	S		55 21·36	−1·47	19·89	20·33				
	4566	+23 6	S		33 42·97	−1·34	41·63	S		57 3·46	−1·44	2·02	20·39				
	4575	+23 18	S		36 26·26	−1·35	24·91	S		59 46·66	−1·44	45·22	20·31				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

AGRA (E), *Lat.* 27° 10′, *Long.* 5h 12m 14s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.076$, $H_N - H_S = +0.051$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Apr. 10	4729	+19 48	S	I. P. E.	13 45 7·20	+1·52	8·72	S	I. P. E.	14 8 27·56	+1·50	29·06	23 20·34				
	4731	+19 28	S	d c − 1·2	45 21·70	+1·52	23·22	S	d c − 2·0	8 42·07	+1·50	43·57	20·35				
	4747	+36 4	N	b + 0·1 a + 15·0	47 51·37	+1·41	52·78	N	b − 0·9 a + 22·4	11 11·78	+1·32	13·10	20·32				
	4758	+39 20	N	s Q + 1·50	49 48·06	+1·38	49·44	N	s Q + 1·53	13 8·54	+1·27	9·81	20·37				
	4766	+ 8 59	S		52 24·76	+1·58	26·34	S		15 45·13	+1·59	46·72	20·38	m s 23 20·346	+ 0·180	− 0·014	23 20·512
	4771	+ 8 47	S		53 2·08	+1·58	3·66	S		16 22·34	+1·59	23·93	20·27				
	4785	+19 46	S		55 48·42	+1·52	49·94	S		19 8·81	+1·50	10·31	20·37				
	4797	+36 44	N		58 14·13	+1·40	15·53	N		21 34·58	+1·31	35·89	20·36				
	4809	+27 12	N		14 1 57·44	+1·47	58·91	N		25 17·83	+1·43	19·26	20·35				
Apr. 10	4897	+38 18	N	I. P. E.	14 19 22·40	−1·61	20·79	N	I. P. E.	14 42 43·00	−1·77	41·23	23 20·44				
	4906	+37 46	N	d c − 1·2	20 43·80	−1·61	42·19	N	d c − 2·0	44 4·39	−1·76	2·63	20·44				
	4917	+46 58	N	b + 0·1 a + 15·0	22 47·66	−1·71	45·95	N	b − 0·9 a + 22·4	46 8·36	−1·92	6·44	20·49				
	4926	+14 56	S	s Q − 1·50	25 31·94	−1·46	30·48	S	s Q − 1·53	48 52·46	−1·52	50·94	20·46				
	4933	+16 52	S		26 34·48	−1·47	33·01	S		49 55·00	−1·54	53·46	20·45	m s 23 20·438	+ 0·180	− 0·008	23 20·610
	4942	+40 7	N		29 47·98	−1·63	46·35	N		53 8·61	−1·80	6·81	20·46				
	4943	+39 44	N		29 59·08	−1·62	57·46	N		53 19·67	−1·80	17·87	20·41				
	4953	+25 29	S		31 49·41	−1·52	47·89	S		55 9·94	−1·61	8·33	20·44				
	4962	+27 33	N		33 37·80	−1·53	36·27	N		56 58·34	−1·63	56·71	20·44				
	4969	+27 25	N		34 16·56	−1·53	15·03	N		57 37·01	−1·63	35·38	20·35				
Apr. 11	4729	+19 48	S	I. P. E.	13 44 56·11	+1·52	57·63	S	I. P. E.	14 8 16·66	+1·49	18·15	23 20·52				
	4731	+19 28	S	d c − 1·2	45 10·58	+1·52	12·10	S	d c − 2·0	8 31·18	+1·49	32·67	20·57				
	4747	+36 4	N	b + 0·2 a + 23·1	47 40·34	+1·42	41·76	N	b + 0·2 a − 3·0	11 0·66	+1·52	2·18	20·42	m s 23 20·540	+ 0·176	− 0·015	23 20·701
	4758	+39 20	N	s Q + 1·50	49 37·00	+1·39	38·39	N	s Q + 1·55	12 57·41	+1·52	58·93	20·54				
	4766	+ 8 59	S		52 13·65	+1·58	15·23	S		15 34·40	+1·48	35·88	20·65				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

AGRA (E), *Lat.* 27° 10′, *Long.* 5h 12m 14s: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4h 48m 54s.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.076$, $H_N - H_S = +0.051$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Apr. 13	4729	+19 48	S	*I. P. E.*	13 44 34·36	+1·75	36·11	S	*I. P. E.*	14 7 55·06	+1·50	56·56	23 20·45				
	4747	+36 4	N	d c − 1·2	47 18·66	+1·49	20·15	N	d c − 2·0	10 39·15	+1·53	40·68	20·53				
	4758	+39 20	N	b + 5·6 a +39·1	49 15·44	+1·42	16·86	N	b + 0·9 a − 5·1	12 35·86	+1·55	37·41	20·55				
	4766	+ 8 59	S	s Q +1·53	51 51·84	+1·89	53·73	S	s Q +1·54	15 12·72	+1·48	14·20	20·47				
	4771	+ 8 47	S		52 29·16	+1·90	31·06	S		15 50·04	+1·48	51·52	20·46	m s 23 20·480	+ 0·176	− 0·011	23 20·645
	4785	+19 46	S		55 15·54	+1·75	17·29	S		18 36·34	+1·50	37·84	20·55				
	4797	+36 44	N		57 41·45	+1·48	42·93	N		21 1·84	+1·53	3·37	20·44				
	4803	+32 19	N		59 4·41	+1·56	5·97	N		22 24·88	+1·53	26·41	20·44				
	4809	+27 12	N		14 1 24·68	+1·63	26·31	N		24 45·22	+1·52	46·74	20·43				
Apr. 13	4897	+38 18	N	*I. P. E.*	14 18 49·93	−1·62	48·31	N	*I. P. E.*	14 42 10·26	−1·54	8·72	23 20·41				
	4906	+37 46	N	d c − 1·2	20 11·33	−1·60	9·73	N	d c − 2·0	43 31·71	−1·55	30·16	20·43				
	4917	+46 58	N	b + 5·6 a +39·1	22 15·42	−1·83	13·59	N	b + 0·9 a − 5·1	45 35·48	−1·51	33·97	20·38				
	4926	+14 56	S	s Q −1·53	24 59·30	−1·24	58·06	S	s Q −1·54	48 20·06	−1·59	18·47	20·41				
	4933	+16 52	S		26 1·80	−1·27	0·53	S		49 22·54	−1·58	20·96	20·43	m s 23 20·408	+ 0·176	− 0·008	23 20·576
	4942	+40 7	N		29 15·63	−1·66	13·97	N		52 35·88	−1·53	34·35	20·38				
	4943	+39 44	N		29 26·70	−1·65	25·05	N		52 46·94	−1·53	45·41	20·36				
	4953	+25 29	S		31 16·86	−1·39	15·47	S		54 37·44	−1·57	35·87	20·40				
	4962	+27 33	N		33 5·27	−1·43	3·84	N		56 25·82	−1·56	24·26	20·42				
	4969	+27 25	N		33 43·94	−1·43	42·51	N		57 4·53	−1·56	2·97	20·46				
Apr. 14	4729	+19 48	S	*I. P. W.*	13 44 23·63	+1·67	25·30	S	*I. P. W.*	14 7 44·27	+1·33	45·60	23 20·30				
	4731	+19 28	S	d c − 0·9	44 38·09	+1·68	39·77	S	d c + 0·6	7 58·79	+1·33	60·12	20·35				
	4747	+36 4	N	b − 0·7 a +66·1	47 8·11	+1·18	9·29	N	b − 8·1 a −12·0	10 28·25	+1·40	29·65	20·36				
	4758	+39 20	N	s Q +1·51	49 4·87	+1·06	5·93	N	s Q +1·53	12 24·88	+1·41	26·29	20·36				
	4766	+ 8 59	S		51 40·92	+1·93	42·85	S		15 1·92	+1·29	3·21	20·36	m s 23 20·341	+ 0·179	− 0·013	23 20·507
	4771	+ 8 47	S		52 18·24	+1·94	20·18	S		15 39·17	+1·29	40·46	20·28				
	4785	+19 46	S		55 4·77	+1·67	6·44	S		18 25·43	+1·33	26·76	20·32				
	4797	+36 44	N		57 30·88	+1·16	32·04	N		20 51·03	+1·40	52·43	20·39				
	4803	+32 19	N		58 53·71	+1·31	55·02	N		22 14·00	+1·39	15·39	20·37				
	4809	+27 12	N		14 1 13·99	+1·46	15·45	N		24 34·40	+1·37	35·77	20·32				

NOTE. 1d = 0s·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

AGRA (E), *Lat.* 27° 10′, *Long.* $5^h\ 12^m\ 14^s$: AND **DEESA** (W), *Lat.* 24° 16′, *Long.* $4^h\ 48^m\ 54^s$.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.076$, $H_N - H_S = +0.051$	$\delta L_N + \rho$ *
1881		° ′			h m s	s	s			h m s	s	s	m s				
Apr. 14	4897	+38 18	N	I. P. W.	14 18 39·43	−1·92	37·51	N	I. P. W.	14 41 59·36	−1·65	57·71	23 20·20				
	4906	+37 46	N	d c − 0·9	19 60·80	−1·90	58·90	N	d c + 0·6	43 20·81	−1·65	19·16	20·26				
	4917	+46 58	N	b − 0·7 a +66·1	22 4·96	−2·29	2·67	N	b − 8·1 a −12·0	45 24·53	−1·59	22·94	20·27				
	4926	+14 56	S	s Q −1·51	24 48·45	−1·23	47·22	S	s Q −1·53	48 9·15	−1·75	7·40	20·18				
	4933	+16 52	S		25 50·92	−1·27	49·65	S		49 11·61	−1·74	9·87	20·22	m s 23 20·247	+ 0·179	− 0·008	23 20·418
	4942	+40 7	N		29 5·05	−2·00	3·05	N		52 24·98	−1·64	23·34	20·29				
	4943	+39 44	N		29 16·13	−1·98	14·15	N		52 35·99	−1·65	34·34	20·19				
	4953	+25 29	S		31 6·11	−1·50	4·61	S		54 26·59	−1·70	24·89	20·28				
	4962	+27 33	N		32 54·55	−1·57	52·98	N		56 14·99	−1·70	13·29	20·31				
	4969	+27 25	N		33 33·26	−1·57	31·69	N		56 53·65	−1·69	51·96	20·27				
Apr. 15	4729	+19 48	S	I. P. W.	13 44 12·45	+1·70	14·15	S	I. P. W.	14 7 32·93	+1·54	34·47	23 20·32				
	4731	+19 28	S	d c − 0·9	44 26·97	+1·71	28·68	S	d c + 0·6	7 47·40	+1·54	48·94	20·26				
	4747	+36 4	N	b − 0·1 a +68·8	46 57·07	+1·19	58·26	N	b + 3·3 a −22·7	10 16·76	+1·73	18·49	20·23				
	4758	+39 20	N	s Q +1·51	48 53·82	+1·06	54·88	N	s Q +1·49	12 13·35	+1·77	15·12	20·24				
	4766	+ 8 59	S		51 29·79	+1·97	31·76	S		14 50·50	+1·44	51·94	20·18	m s 23 20·241	+ 0·184	− 0·013	23 20·412
	4771	+ 8 47	S		52 7·12	+1·98	9·10	S		15 27·86	+1·44	29·30	20·20				
	4785	+19 46	S		54 53·65	+1·70	55·35	S		18 14·05	+1·54	15·59	20·24				
	4797	+36 44	N		57 19·84	+1·16	21·00	N		20 39·47	+1·74	41·21	20·21				
	4803	+32 19	N		58 42·58	+1·32	43·90	N		22 2·56	+1·69	4·25	20·35				
	4809	+27 12	N		14 1 2·94	+1·48	4·42	N		24 22·98	+1·62	24·60	20·18				
Apr. 15	4897	+38 18	N	I. P. W.	14 18 28·30	−1·92	26·38	N	I. P. W.	14 41 47·77	−1·22	46·55	23 20·17				
	4906	+37 46	N	d c − 0·9	19 49·72	−1·90	47·82	N	d c + 0·6	43 9·14	−1·23	7·91	20·09				
	4917	+46 58	N	b − 0·1 a +68·8	21 53·88	−2·30	51·58	N	b + 3·3 a −22·7	45 12·80	−1·07	11·73	20·15				
	4926	+14 56	S	s Q −1·51	24 37·28	−1·19	36·09	S	s Q −1·49	47 57·68	−1·48	56·20	20·11				
	4933	+16 52	S		25 39·82	−1·24	38·58	S		48 60·21	−1·47	58·74	20·16	m s 23 20·153	+ 0·184	− 0·008	23 20·329
	4942	+40 7	N		28 53·99	−1·99	52·00	N		52 13·42	−1·20	12·22	20·22				
	4943	+39 44	N		29 5·01	−1·97	3·04	N		52 24·40	−1·20	23·20	20·16				
	4953	+25 29	S		30 54·98	−1·48	53·50	S		54 15·05	−1·38	13·67	20·17				
	4962	+27 33	N		32 43·46	−1·55	41·91	N		56 3·42	−1·36	2·06	20·15				
	4969	+27 25	N		33 22·11	−1·55	20·56	N		56 42·07	−1·36	40·71	20·15				

Note. $1^d = 0^s.0225$. Transcribing Equation *nil*, all records having been transcribed by the same person.

* ρ is the retardation of an electric signal between the stations.

TABLE XXX. OBSERVATIONS OF TRANSITS WITH W CLOCK, AND DEDUCTION OF THE APPARENT DIFFERENCE OF LONGITUDES, $\delta L_N + \rho$.*

AGRA (E), *Lat.* 27° 10′, *Long.* 5ʰ 12ᵐ 14ˢ: AND DEESA (W), *Lat.* 24° 16′, *Long.* 4ʰ 48ᵐ 54ˢ.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.076$, $H_N - H_S = +0.051$	$\delta L_N + \rho$
1881		° ′			h m s	s	s			h m s	s	s	m s				
Apr. 16	4729	+19 48	S	*I. P. W.*	13 44 0·95	+1·74	2·69	S	*I. P. W.*	14 7 21·28	+1·55	22·83	23 20·14				
	4731	+19 28	S	d c − 0·9	44 15·42	+1·74	17·16	S	d c + 0·6	7 35·81	+1·55	37·36	20·20				
	4747	+36 4	N	b + 2·0 a +69·4	46 45·49	+1·22	46·71	N	b + 2·2 a − 5·1	10 5·29	+1·61	6·90	20·19				
	4758	+39 20	N	s Q +1·49	48 42·24	+1·10	43·34	N	s Q +1·50	12 1·91	+1·62	3·53	20·19				
	4766	+ 8 59	S		51 18·27	+2·00	20·27	S		14 38·86	+1·53	40·39	20·12	m s 23 20·166	+ 0·191	− 0·013	23 20·344
	4771	+ 8 47	S		51 55·58	+2·00	57·58	S		15 16·21	+1·53	17·74	20·16				
	4785	+19 46	S		54 42·11	+1·74	43·85	S		18 2·47	+1·55	4·02	20·17				
	4797	+36 44	N		57 8·28	+1·20	9·48	N		20 28·06	+1·61	29·67	20·19				
	4803	+32 19	N		58 31·15	+1·35	32·50	N		21 51·04	+1·60	52·64	20·14				
	4809	+27 12	N		14 0 51·33	+1·51	52·84	N		24 11·41	+1·59	13·00	20·16				
Apr. 16	4897	+38 18	N	*I. P. W.*	14 18 16·73	−1·84	14·89	N	*I. P. W.*	14 41 36·36	−1·38	34·98	23 20·09				
	4906	+37 46	N	d c − 0·9	19 38·02	−1·82	36·20	N	d c + 0·6	42 57·70	−1·39	56·31	20·11				
	4917	+46 58	N	b + 2·0 a +69·4	21 42·27	−2·23	40·04	N	b + 2·2 a − 5·1	45 1·49	−1·34	0·15	20·11				
	4926	+14 56	S	s Q −1·49	24 25·67	−1·12	24·55	S	s Q −1·50	47 46·06	−1·46	44·60	20·05				
	4933	+16 52	S		25 28·15	−1·17	26·98	S		48 48·53	−1·46	47·07	20·09	m s 23 20·082	+ 0·191	− 0·008	23 20·265
	4942	+40 7	N		28 42·47	−1·91	40·56	N		52 1·95	−1·38	0·57	20·01				
	4943	+39 44	N		28 53·41	−1·90	51·51	N		52 12·94	−1·38	11·56	20·05				
	4953	+25 29	S		30 43·37	−1·51	41·86	S		54 3·41	−1·43	1·98	20·12				
	4962	+27 33	N		32 31·86	−1·48	30·38	N		55 51·80	−1·41	50·39	20·01				
	4969	+27 25	N		33 10·43	−1·48	8·95	N		56 30·54	−1·41	29·13	20·18				

NOTE. 1ᵈ = 0ˢ·0225. Transcribing Equation *nil*, all records having been transcribed by the same person.

*ρ is the retardation of an electric signal between the stations.

Arc	Approximate Difference of Longitude	Intervals between Nights of Observations	Rate Corrections for both Clocks Deduced from Transits Observed at both Stations, *viz.*: α, Corrections for the Intervals between Nights of Observations, and β, Hourly Corrections for Nights of Observations, Interpolated by means of the Quantities α. α at E Station for		α at W Station for		Astronomical Dates of Observations	β for		Correction to Observed Difference of Times of Transit for		Remarks
			E Clock	W Clock	E Clock	W Clock		E Clock	W Clock	E Clock	W Clock	
Bombay (E), and Deesa (W)	2m 31s	1880	s	s	s	s	1880	s	s	s	s	
		December 13 to 14	−12·71	−40·60	−12·74	−40·58	December 13	−0·530	−1·694	− 0·022	− 0·071	
		„ 14 „ 16	−25·45	−80·87	−25·41	−80·93	„ 14	− ·530	−1·688	− ·022	− ·071	
		„ 16 „ 17	−12·89	−40·23	−12·97	−40·22	„ 16	− ·534	−1·681	− ·022	− ·071	
		„ 17 „ 18	−12·84	−39·91	−12·76	−39·80	„ 17	− ·536	−1·669	− ·023	− ·070	
		„ 18 „ 19	−12·07	−40·07	−12·05	−40·04	„ 18	− ·518	−1·665	− ·022	− ·070	
		......	...	...	...	...	„ 19	− ·488	−1·673	− ·020	− ·070	
Deesa (E), and Kurrachee (W)	20m 41s	1881					1881					
		January 5 to 6	+ 7·80	− 2·22	+ 7·68	− 2·43	January 5	+0·314	−0·102	+ 0·108	− 0·035	For W Clock the mean of the two first values of α was used to obtain β for 5th, 6th and 7th January; and the mean of the three last values of α was used to obtain β for 8th, 9th and 10th January.
		„ 6 „ 7	+ 8·25	− 2·55	+ 8·18	− 2·55	„ 6	+ ·333	− ·102	+ ·115	− ·035	
		„ 7 „ 8	+ 8·34	− 1·61	+ 8·58	− 1·38	„ 7	+ ·348	− ·102	+ ·120	− ·035	
		„ 8 „ 9	+ 8·64	− 1·37	+ 8·68	− 1·35	„ 8	+ ·357	− ·049	+ ·123	− ·017	
		„ 9 „ 10	+ 9·26	− 0·66	+ 9·19	− 0·73	„ 9	+ ·373	− ·049	+ ·129	− ·017	
		......	...	...	...	...	„ 10	+ ·396	− ·049	+ ·137	− ·017	
Bombay (E), and Kurrachee (W)	23m 12s	January 17 to 18	+20·23	+ 0·07	+20·26	− 0·03	January 17	+0·845	−0·003	+ 0·327	− 0·001	
		„ 18 „ 19	+20·22	+ 0·23	+20·14	+ 0·22	„ 18	+ ·842	+ ·005	+ ·326	+ ·002	
		„ 19 „ 20	+19·83	+ 0·03	+19·84	+ 0·02	„ 19	+ ·833	+ ·005	+ ·322	+ ·002	
		„ 20 „ 21	+19·69	− 0·02	+19·67	− 0·07	„ 20	+ ·823	·000	+ ·319	·000	
		„ 21 „ 23	+39·17	− 0·33	+39·11	− 0·49	„ 21	+ ·817	− ·006	+ ·316	− ·002	
		......	...	...	...	...	„ 23	+ ·812	− ·013	+ ·314	− ·005	
Jubbulpore (E), and Bombay (W)	28m 33s	February 6 to 7	+17·13	+14·49	+17·27	+14·51	February 6	+0·717	+0·598	+ 0·341	+ 0·285	
		„ 7 „ 8	+17·23	+14·80	+17·16	+14·83	„ 7	+ ·716	+ ·611	+ ·341	+ ·291	
		„ 8 „ 9	+17·18	+14·76	+17·24	+14·76	„ 8	+ ·717	+ ·616	+ ·341	+ ·293	
		„ 9 „ 10	+17·23	+14·32	+17·14	+14·31	„ 9	+ ·717	+ ·606	+ ·341	+ ·288	
		„ 10 „ 13	+52·04	+44·30	+52·00	+44·27	„ 10	+ ·720	+ ·606	+ ·343	+ ·288	
		„ 13 „ 14	+17·14	+14·55	+17·18	+14·54	„ 13	+ ·719	+ ·611	+ ·342	+ ·291	
		......	...	...	...	...	„ 14	+ ·711	+ ·602	+ ·338	+ ·287	

Arc	Approximate Difference of Longitude	Intervals between Nights of Observations	Rate Corrections for both Clocks Deduced from Transits Observed at both Stations, *viz.*: α, Corrections for the Intervals between Nights of Observations, and β, Hourly Corrections for Nights of Observations, Interpolated by means of the Quantities α.									Remarks
			α at E Station for		α at W Station for		Astronomical Dates of Observations	β for		Correction to Observed Difference of Times of Transit for		
			E Clock	W Clock	E Clock	W Clock		E Clock	W Clock	E Clock	W Clock	
		1881	s	s	s	s	1881	s	s	s	s	
Jubbulpore (E), and Bolarum (W)	$5^m 43^s$	Feb. 23 to 24	+17·64	+27·12	+17·66	+27·05	February 23	+0·730	+1·139	+ 0·069	+ 0·108	
		„ 24 „ 25	+17·87	+26·61	+17·96	+26·62	„ 24	+ ·741	+1·119	+ ·070	+ ·106	
		„ 25 „ 28	+52·08	+79·72	+52·00	+79·78	„ 25	+ ·735	+1·109	+ ·070	+ ·105	
		„ 28 „ Mar. 2	+35·48	+53·44	+35·50	+53·38	„ 28	+ ·731	+1·111	+ ·069	+ ·106	
		March 2 „ 3	+18·07	+26·67	+18·04	+26·62	March 2	+ ·746	+1·112	+ ·071	+ ·106	
		......	...	...	...	...	„ 3	+ ·759	+1·109	+ ·072	+ ·105	
Jubbulpore (E), and Agra (W)	$7^m 44^s$	March 11 to 12	+ 8·95	+ 3·17	+ 8·92	+ 3·14	March 11	+0·370	+0·120	+ 0·048	+ 0·015	
		„ 12 „ 13	+ 9·08	+ 3·73	+ 8·98	+ 3·64	„ 12	+ ·374	+ ·143	+ ·048	+ ·018	
		„ 13 „ 15	+17·46	+ 7·71	+17·88	+ 8·16	„ 13	+ ·372	+ ·160	+ ·048	+ ·021	
		„ 15 „ 17	+17·63	+ 7·51	+17·58	+ 7·43	„ 15	+ ·368	+ ·160	+ ·047	+ ·021	
		„ 17 „ 20	+23·92	+ 7·74	+23·87	+ 7·79	„ 17	+ ·350	+ ·132	+ ·045	+ ·017	
		„ 20 „ 21	+ 7·63	+ 2·43	+ 7·53	+ 2·26	„ 20	+ ·324	+ ·103	+ ·042	+ ·013	
		......	...	...	...	...	„ 21	+ ·308	+ ·093	+ ·040	+ ·012	
Jubbulpore (E), and Deesa (W)	$31^m 4^s$	March 28 to 29	+ 7·25	+12·35	+ 7·14	+12·29	March 28	+0·299	+0·514	+ 0·155	+ 0·266	
		„ 29 „ 30	+ 7·29	+12·25	+ 7·23	+12·26	„ 29	+ ·302	+ ·512	+ ·156	+ ·265	
		„ 30 „ 31	+ 7·41	+11·42	+ 7·09	+11·18	„ 30	+ ·302	+ ·491	+ ·156	+ ·254	
		„ 31 „ Apr. 1	+ 7·11	+10·97	+ 7·17	+10·93	„ 31	+ ·300	+ ·463	+ ·155	+ ·240	
		April 1 „ 3	+14·88	+21·49	+14·92	+21·54	April 1	+ ·304	+ ·452	+ ·157	+ ·234	
		......	...	...	...	...	„ 3	+ ·316	+ ·444	+ ·164	+ ·230	
Agra (E), and Deesa (W)	$23^m 20^s$	April 10 to 11	− 2·97	+11·08	− 3·12	+10·89	April 10	−0·121	+0·462	− 0·047	+ 0·180	
		„ 11 „ 13	− 6·68	+21·54	− 6·72	+21·57	„ 11	− ·134	+ ·453	− ·052	+ ·176	
		„ 13 „ 14	− 3·65	+10·87	− 3·45	+11·01	„ 13	− ·144	+ ·453	− ·056	+ ·176	
		„ 14 „ 15	− 3·33	+11·09	− 3·24	+11·19	„ 14	− ·142	+ ·460	− ·055	+ ·179	
		„ 15 „ 16	− 3·23	+11·53	− 3·21	+11·60	„ 15	− ·135	+ ·473	− ·053	+ ·184	
		......	...	...	...	...	„ 16	− ·132	+ ·491	− ·051	+ ·191	

TABLE XXXII. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL

AND THE RETARDATION OF SIGNALS, ρ.

FROM THE OBSERVATIONS OF TRANSITS AT BOTH STATIONS WITH THE SAME CLOCK, SEASON 1880–81.

BOMBAY (E), AND DEESA (W)

Astronomical Date		Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with E Clock $= \delta L_N - \rho$	W Clock $= \delta L_N + \rho$
1880			m s	m s
December	13	I. P. E.	2 31·615	2 31·792
"	"	"	31·696	31·744
"	14	"	31·705	31·745
"	"	"	31·672	31·733
"	16	"	31·647	31·810
"	"	"	31·684	31·780
"	17	I. P. W.	31·681	31·768
"	"	"	31·756	31·838
"	18	"	31·652	31·719
"	"	"	31·628	31·666
"	19	"	31·648	31·678
"	"	"	31·620	...
Mean Values by observations I. P. E.			2 31·670	2 31·767
" I. P. W.			31·664	31·734
General Means			2 31·667	2 31·751

Whence	δL_N	= 2 31·709
Correction for Relative Personal Equation, $C_N - H_N$		= + 0·031
	ΔL_N	= 2 31·740
Again	δL_S	= 2 31·732
Correction for Relative Personal Equation, $C_S - H_S$		= − 0·009
	ΔL_S	= 2 31·723

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 2^m\ 31^s{\cdot}732$$

$$\rho = +\ 0{\cdot}042$$

DEESA (E), AND KURRACHEE (W)

Astronomical Date		Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with E Clock $= \delta L_N - \rho$	W Clock $= \delta L_N + \rho$
1881			m s	m s
January	5	I. P. W.	20 40·461	20 40·570
"	"	"	40·543	40·613
"	6	"	40·605	40·774
"	"	"	40·642	40·786
"	7	"	40·635	40·754
"	"	"	40·732	40·828
"	8	I. P. E.	40·316	40·513
"	"	"	40·426	40·496
"	9	"	40·347	40·473
"	"	"	40·359	40·513
"	10	"	40·441	40·508
"	"	"	40·367	40·605
Mean Values by observations I. P. E.			20 40·376	20 40·518
" I. P. W.			40·603	40·721
General Means			20 40·490	20 40·619

Whence	δL_N	= 20 40·555
Correction for Relative Personal Equation, $H_N - C_N$		= − 0·031
	ΔL_N	= 20 40·524
Again	δL_S	= 20 40·541
Correction for Relative Personal Equation, $H_S - C_S$		= + 0·009
	ΔL_S	= 20 40·550

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 20^m\ 40^s{\cdot}537$$

$$\rho = +\ 0{\cdot}065$$

TABLE XXXII. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL

AND THE RETARDATION OF SIGNALS, ρ

FROM THE OBSERVATIONS OF TRANSITS AT BOTH STATIONS WITH THE SAME CLOCK, SEASON 1880–81.

BOMBAY (E), AND KURRACHEE (W)

Astronomical Date	Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with E Clock $= \delta L_N - \rho$	W Clock $= \delta L_N + \rho$
1881		m s	m s
January 17	*I. P. E.*	23 12·068	23 12·197
" "	"	12·058	12·158
" 18	"	12·069	12·299
" "	"	12·017	12·268
" 19	"	12·126	12·289
" "	"	12·099	12·286
" 20	*I. P. W.*	12·132	12·258
" "	"	12·086	12·328
" 21	"	12·153	12·326
" "	"	12·097	12·368
" 23	"	12·159	12·451
" "	"	12·233	12·551
Mean Values by observations *I. P. E.*		23 12·073	23 12·250
" *I. P. W.*		12·143	12·380
General Means		23 12·108	23 12·315

Whence ... ... δL_N = 23m 12s·212

Correction for Relative Personal Equation, $H_N - C_N$ = − 0·031

ΔL_N = 23 12·181

Again ... ... δL_S = 23 12·181

Correction for Relative Personal Equation, $H_S - C_S$ = + 0·009

ΔL_S = 23 12·190

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 23^m\ 12^s{\cdot}186$$

$$\rho = +\ 0{\cdot}104$$

JUBBULPORE (E), AND BOMBAY (W)

Astronomical Date	Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with E Clock $= \delta L_N - \rho$	W Clock $= \delta L_N + \rho$
1881		m s	m s
February 6	*I. P. E.*	28 31·772	28 31·921
" "	"	...	31·955
" 7	"	31·610	31·988
" "	"	31·751	31·885
" 8	"	31·730	31·862
" "	"	31·760	31·939
" 9	"	31·670	31·870
" "	"	31·691	31·938
" 10	*I. P. W.*	31·802	31·824
" "	"	31·752	31·999
" 13	"	31·868	31·980
" "	"	31·757	31·978
" 14	"	31·781	31·933
" "	"	31·815	32·029
Mean Values by observations *I. P. E.*		28 31·712	28 31·920
" *I. P. W.*		31·796	31·957
General Means		28 31·754	28 31·939

Whence ... ... δL_N = 28m 31s·846

Correction for Relative Personal Equation, $H_N - C_N$ = − 0·084

ΔL_N = 28 31·762

Again ... ... δL_S = 28 31·838

Correction for Relative Personal Equation, $H_S - C_S$ = − 0·038

ΔL_S = 28 31·800

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 28^m\ 31^s{\cdot}781$$

$$\rho = +\ 0.092$$

TABLE XXXII. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL AND THE RETARDATION OF SIGNALS, ρ FROM THE OBSERVATIONS OF TRANSITS AT BOTH STATIONS WITH THE SAME CLOCK, SEASON 1880-81.

JUBBULPORE (E), AND BOLARUM (W)

Astronomical Date		Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with E Clock $= \delta L_N - \rho$	W Clock $= \delta L_N + \rho$
1881			m s	m s
February	23	I. P. W.	5 42·869	5 43·051
„	„	„	42·934	43·077
„	24	„	42·880	43·099
„	„	„	42·886	43·163
„	25	„	42·774	43·068
„	„	„	42·809	43·156
„	28	I. P. E.	42·868	43·064
„	„	„	42·876	43·040
March	2	„	42·883	43·088
„	„	„	42·822	43·114
„	8	„	42·882	43·078
„	„	„	42·893	43·195
Mean Values by observations I. P. E.			5 42·871	5 43·097
„ I. P. W.			42·859	43·102
General Means			5 42·865	5 43·099

Whence ... ... δL_N = 5ᵐ 42ˢ·982
Correction for Relative Personal Equation, $H_N - C_N$ = − 0·084

ΔL_N = 5 42·898

Again ... ... δL_S = 5 42·975
Correction for Relative Personal Equation, $H_S - O_S$ = − 0·038

ΔL_S = 5 42·937

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 5^m\ 42^s{\cdot}918$$

$$\rho = +\ 0{\cdot}117$$

JUBBULPORE (E), AND AGRA (W)

Astronomical Date		Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with E Clock $= \delta L_N - \rho$	W Clock $= \delta L_N + \rho$
1881			m s	m s
March	11	I. P. E.	7 42·915	7 43·109
„	„	„	43·003	43·088
„	12	„	42·941	43·185
„	„	„	43·028	43·111
„	13	„	43·056	43·254
„	„	„	43·106	43·198
„	15	I. P. W.	42·654	42·786
„	„	„	42·680	42·771
„	17	„	....	42·851
„	„	„	42·699	42·867
„	20	„	42·647	42·802
„	„	„	42·746	42·799
„	21	„	42·812	42·991
„	„	„	42·786	42·938
Mean Values by observations I. P. E.			7 43·008	7 43·158
„ I. P. W.			42·718	42·851
General Means			7 42·863	7 43·004

Whence ... ... δL_N = 7ᵐ 42ˢ·934
Correction for Relative Personal Equation, $O_N - H_N$ = + 0·084

ΔL_N = 7 43·018

Again ... ... δL_S = 7 42·929
Correction for Relative Personal Equation, $O_S - H_S$ = + 0·038

ΔL_S = 7 42·967

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 7^m\ 42^s{\cdot}993$$

$$\rho = +\ 0{\cdot}071$$

TABLE XXXII. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL

AND THE RETARDATION OF SIGNALS, ρ

FROM THE OBSERVATIONS OF TRANSITS AT BOTH STATIONS WITH THE SAME CLOCK, SEASON 1880–81.

JUBBULPORE (E), AND DEESA (W)

Astronomical Date		Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with E Clock $= \delta L_N - \rho$	Apparent Difference of Longitude by Stars of North Aspect, by Observations with W Clock $= \delta L_N + \rho$
1881			m s	m s
March	28	I. P. W.	31 2·984	31 3·280
„	„	„	3·141	3·395
„	29	„	3·060	3·356
„	„	„	3·237	3·413
„	30	„	3·207	3·348
„	„	„	3·246	3·375
„	31	I. P. E.	3·532	3·642
„	„	„	3·570	3·559
April	1	„	3·463	3·662
„	„	„	3·515	3·583
„	3	„	3·446	3·586
„	„	„	3·468	3·581
Mean Values by observations I. P. E.			31 3·499	31 3·602
„ I. P. W.			3·146	3·361
General Means			31 3·323	31 3·481

Whence ... ... δL_N = 31ᵐ 3·402ˢ

Correction for Relative Personal Equation, $C_N - H_N$ = + 0·084

ΔL_N = 31 3·486

Again ... ... δL_S = 31 3·414

Correction for Relative Personal Equation, $C_S - H_S$ = + 0·038

ΔL_S = 31 3·452

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 31^m\ 3^s{\cdot}469$$

$$\rho = +\ 0{\cdot}079$$

AGRA (E), AND DEESA (W)

Astronomical Date		Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with E Clock $= \delta L_N - \rho$	Apparent Difference of Longitude by Stars of North Aspect, by Observations with W Clock $= \delta L_N + \rho$
1881			m s	m s
April	10	I. P. E.	23 20·375	23 20·512
„	„	„	20·433	20·610
„	11	„	20·543	20·701
„	„	„	20·553	....
„	13	„	20·578	20·645
„	„	„	20·524	20·576
„	14	I. P. W.	20·319	20·507
„	„	„	20·406	20·418
„	15	„	20·249	20·412
„	„	„	20·272	20·329
„	16	„	20·261	20·344
„	„	„	20·247	20·265
Mean Values by observations I. P. E.			23 20·501	23 20·609
„ I. P. W.			20·292	20·379
General Means			23 20·397	23 20·494

Whence ... ... δL_N = 23ᵐ 20·445ˢ

Correction for Relative Personal Equation, $C_N - H_N$ = + 0·084

ΔL_N + 23 20·529

Again ... ... δL_S = 23 20·470

Correction for Relative Personal Equation, $C_S - H_S$ = + 0·038

ΔL_S = 23 20·508

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 23^m\ 20^s{\cdot}519$$

$$\rho = +\ 0{\cdot}049$$

PART I.

APPENDIX.

TABLE XXXII. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL AND THE RETARDATION OF SIGNALS, ρ

FROM THE OBSERVATIONS OF TRANSITS AT BOTH STATIONS WITH THE SAME CLOCK, SEASON 1880–81.

JUBBULPORE (E), AND DEESA (W)

Astronomical Date		Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with E Clock $= \delta L_N - \rho$	W Clock $= \delta L_N + \rho$
1881			m s	m s
March	28	*I. P. W.*	31 2·984	31 3·280
„	„	„	3·141	3·395
„	29	„	3·060	3·356
„	„	„	3·237	3·413
„	30	„	3·207	3·348
„	„	„	3·246	3·375
„	31	*I. P. E.*	3·532	3·642
„	„	„	3·570	3·559
April	1	„	3·463	3·662
„	„	„	3·515	3·583
„	3	„	3·446	3·586
„	„	„	3·468	3·581
Mean Values by observations *I. P. E.*			31 3·499	31 3·602
„ *I. P. W.*			3·146	3·361
General Means			31 3·323	31 3·481

Whence	δL_N	=	m s 31 3·402
Correction for Relative Personal Equation, $C_N - H_N$		=	+ 0·084
	ΔL_N	=	31 3·486
Again	δL_S	=	31 3·414
Correction for Relative Personal Equation, $C_S - H_S$		=	+ 0·038
	ΔL_S	=	31 3·452

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 31^m\ 3^s{\cdot}469$$

$$\rho = +\ 0{\cdot}079$$

AGRA (E), AND DEESA (W)

Astronomical Date		Instrumental Position at both Stations	Apparent Difference of Longitude by Stars of North Aspect, by Observations with E Clock $= \delta L_N - \rho$	W Clock $= \delta L_N + \rho$
1881			m s	m s
April	10	*I. P. E.*	23 20·375	23 20·512
„	„	„	20·433	20·610
„	11	„	20·543	20·701
„	„	„	20·553	....
„	13	„	20·578	20·645
„	„	„	20·524	20·576
„	14	*I. P. W.*	20·319	20·507
„	„	„	20·406	20·418
„	15	„	20·249	20·412
„	„	„	20·272	20·329
„	16	„	20·261	20·344
„	„	„	20·247	20·265
Mean Values by observations *I. P. E.*			23 20·501	23 20·609
„ *I. P. W.*			20·292	20·379
General Means			23 20·397	23 20·494

Whence	δL_N	=	m s 23 20·445
Correction for Relative Personal Equation, $C_N - H_N$		=	+ 0·084
	ΔL_N	+	23 20·529
Again	δL_S	=	23 20·470
Correction for Relative Personal Equation, $C_S - H_S$		=	+ 0·038
	ΔL_S	=	23 20·508

Finally

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 23^m\ 20^s{\cdot}519$$

$$\rho = +\ 0{\cdot}049$$

PART I.

APPENDIX.

PART I.

APPENDIX.

1.

Determination of the Geodetic Elements of Longitude Stations.

All the points used as longitude stations were connected with fixed stations of the Great Trigonometrical Survey in order to determine their geodetic latitudes and longitudes. The longitude stations at Madras, Bangalore, Mangalore, Bombay, Vizagapatam and Deesa were situated so close to fixed stations that simple linear measurements sufficed for their connection, and with respect to these stations all the data required, with the resulting deduced elements, will be found in *Table C*.

To fix the longitude stations at Bolarum, Bellary, Kurrachee, Jubbulpore and Agra special triangulation was necessary in each case. These were all executed by Mr. James Bond, Assistant Surveyor; the results are given in *Tables A, B* and *C*, and explanatory diagrams will be found in Plate V.

The latitudes, longitudes and azimuths were computed by the formulæ given on pages 121 to 124, Volume II of the *Account of the Operations of the Great Trigonometrical Survey of India*, using the elements of the figure of the earth which will be found on page 127 of that volume. All the elements of trigonometrical stations employed are final, and either have been, or will shortly be, published in the printed records of the Great Trigonometrical Survey of India. In the case of those already published precise references are given. All the stations used were clearly identified, and their exact positions were recovered without any doubt. At Vizagapatam and Jubbulpore check methods of connection exactly agreed in results with those given.

2.

Descriptions of Points used for Longitude Stations.

MADRAS. The longitude station was 65 feet due north from the axis of the Meridian Circle of the Madras Observatory, which latter point was fixed in connection with the principal triangulation of the Madras Longitudinal Series, Great Trigonometrical Survey (*vide Table C*).

BANGALORE. The longitude station was 38 feet due north from the south-west end of the Bangalore Base-line of the Great Trigonometrical Survey (*vide Table C*).

MANGALORE. The longitude station was 63 feet due south from the Mangalore station of the Great Trigonometrical Survey (*vide Table C*).

BOMBAY. The longitude station was on the premises of the Colába Observatory, 55 feet north, and 53 feet east from the Colába station of the Bombay Island Triangulation of the Great Trigonometrical Survey (*vide Table C*). The transit telescope of the Colába Observatory was found by measurement to be 193 feet, = $0^{s}\cdot134$, west of the longitude station.

VIZAGAPATAM. The longitude station was 26 feet north, and 349 feet east from Meppen h. s., a secondary station of the Bider Longitudinal Series of the Great Trigonometrical Survey (*vide Table C*).

DEESA. The longitude station was 89 feet south, and 56 feet west from the Deesa Telegraph Office station of the Kurrachee Longitudinal Series of the Great Trigonometrical Survey (*vide Table C*).

BOLARUM. The longitude station was in the enclosure of the P. W. D. Office, 246 feet due north from the P.W.D. Office station. It was marked by a masonry pillar 18 inches square, founded about 12 inches below the surface of the ground, and standing about 24 inches above it. The P. W. D. Office station was a point fixed on the roof of the Bolarum Office of the Public Works Department, in connection with the neighbouring hill stations Naubatpahár and Lachmapur of the Hyderabad Minor Series, an off-shoot from the Great Arc Series of the Great Trigonometrical Survey (*vide Tables A, B* and *C*). The station was marked by a circle and dot engraved on the surface of the roof, and covered by a pillar about 15 inches square and 12 inches high. Bolarum is the cantonment for a portion of the garrison of Hyderabad, the capital of the Nizam.

BELLARY. The longitude station was in the enclosure of the Telegraph Office, 97 feet due north from the Telegraph Office station. The Telegraph Office station was a point on the upper portion of the roof of the Telegraph Office, Bellary, fixed by means of triangulation emanating from the neighbouring hill stations Hŏnnúr and Gadĕkal of the Great Arc Series, Great Trigonometrical Survey (*vide Tables A, B, C,* and figs. 1 and 2, Plate V). It was marked by a circle and dot engraved on the roof, while a second circle and dot was engraved on the northern parapet of the building, 20 feet 10 inches due north from the former.

KURRACHEE. The longitude station was situate in the enclosure of the Telegraph Office, 61 feet north, and 152 feet west from the Telegraph Office station. It was 34 feet 6 inches S. E. from the centre of the doorway of the store-room; and 73 feet N.N.W. from the N.W. corner of the block of dwelling quarters standing in the angle between Macleod Road and Telegraph Road. The Telegraph Office station was a point on the eastern terrace of the upper storey of the block of dwelling quarters referred to above, fixed by one triangle in connection with the neighbouring hill stations, A, and Mutráni, of the Great Trigonometrical Survey (*vide Tables A, B* and *C*). The station was marked by a circle and dot engraved on the floor of the terrace, at distances of 5 feet 8 inches, 14 feet 2 inches, 28 feet 9 inches, and 34 feet 4 inches from the N.E., N.W., S.W., and S.E. angles of the terrace respectively.

JUBBULPORE. The longitude station was in the enclosure of the Telegraph Office, 87 feet due north from the Telegraph Office station. The Telegraph Office station was fixed by two triangles emanating from the stations Karaundi H.S., and Jubbulpore Hill Mark, of the Jubbulpore Meridional Series, Great Trigonometrical Survey (*vide Tables A, B, C,* and fig. 3, Plate V), and was 84 feet 6 inches from the S. W. corner of the Telegraph store-rooms, the bearing of which point from the station was 27° east of north. It was marked by a masonry pillar about 12 inches square, founded about 18 inches below the ground level, and standing 3 feet 6 inches above the surface.

AGRA. The longitude station was in the enclosure of the Telegraph Office, 233 feet due south from the Telegraph Office station. The Telegraph Office station was situate on the upper portion of the roof of the Telegraph Office, and fixed by triangulation emanating from the neighbouring hill stations, Madhoni and Usira of the Great Arc Series, Section 24° to 30°, Great Trigonometrical Survey (*vide Tables A, B, C,* and fig. 4, Plate V). It was marked by a circle and dot engraved on the surface of the roof, at the following measured distances, *viz*., 47 feet 10 inches, and 40 feet 0 inches, respectively, from the outer N.W. and S.W. corners of the building; and 16 feet 6 inches, 17 feet 4 inches, respectively, from the N.W. and S.W. corners of the upper portion of the roof.

3.

Comparison of Geodetic with Electro-Telegraphic Arcs of Longitude.

In *Table D* all the arcs of longitude measured by the electro-telegraphic method, during seasons 1875-76, 1876-77 and 1880-81, are collated with the corresponding geodetic values, and the differences are shewn.

4.

Circuit Errors of Observed Arcs of Longitude.

The Electro-Longitude operations have always been carried on in triangular circuits, so that each measured arc of longitude is checked by the sum, or difference, of two others, and the difference between its measured and deduced values affords a 'circuit error', which may be regarded as an indication of the degree of accuracy of the results obtained. In *Table E* the circuit error is taken out for each simple triangular circuit completed during the seasons 1875-76, 1876-77 and 1880-81.

5.

Results of Idiometer Observations made during Season 1880-81.

In *Table F* an abstract is given of all the idiometer observations made during season 1880-81 by Lieut.-Colonel Campbell and Major Heaviside, and the resulting N − S equation of each observer is compared with that obtained from his observations of zenith stars. The first two columns show the arc of longitude and date. The next four columns are devoted to the results of observations by Colonel Campbell, and the four succeeding to those of Major Heaviside. Under the head C_n, C_s, H_n and H_s the actual *errors* of observation by the idiometer are given for each observer, the subscripts n and s indicating directions of apparent motion of the idiometer star, corresponding to those of real stars of north and south aspect, respectively. Each quantity entered under C_n, C_s, H_n, or H_s is the mean of four observations with the idiometer, taken so as to eliminate instrumental errors both of the idiometer, and of the chronograph used in connection therewith. $C_n - C_s$, and $H_n - H_s$ are the values of the observers' N − S equations as deduced from the idiometer observations, and these are collated with the corresponding values—$C_N - C_S$, and $H_N - H_S$—of the same equations as obtained from star observations. The means of the N − S equations, deduced from the idiometers and from stars, are taken out for each arc, and small differences will be found between the latter, and the corresponding values given in *Table XXVIII*, owing to different methods having been employed in computing them.

In the last three columns of *Table F* the values of the relative personal equations $C_n - H_n$, and $C_s - H_s$, deduced from the idiometer results C_n, C_s, H_n and H_s, are collated with the corresponding equations $C_N - H_N$, and $C_S - H_S$ obtained from star observations as given in *Table XXVII*. In the last column are also entered the relative equations $C_n - H_n$, and $C_s - H_s$ deduced from idiometer observations at the same times as those by special star observations—by divided transits—abstracted from *Table XXVII*. There are remarkable discrepancies between the results obtained by the two methods on these occasions, showing a fairly constant difference between the respective values of the relative personal equations deduced. The observations taken with the idiometers were not so numerous as they should have been in order to afford reliable results, but they afford some evidence, that if the relative personal equations of two observers can be once determined by star and idiometer observations taken at the same time, indications of changes therein deduced from the idiometers alone may afterwards be accepted with confidence.

In *Table F* results are only given for six of the eight arcs measured during season 1880-81, because idiometer observations for the last two—*viz.*, Jubbulpore–Deesa and Agra–Deesa—were not available.

TABLE A. TRIANGULATION FOR THE CONNECTION OF LONGITUDE STATIONS.

COMPUTATION OF TRIANGLES.

Longitude Station to be fixed	Theodolite used	No. of Triangle	Names of Stations		Observed Angles			Corrections for: Spherical Excess	Corrections for: Observation Error	Corrected Angles			Distance in Log Feet
	Inch				°	′	″	″	″	°	′	″	
BOLARUM	12	1	Naubatpahár	h.s.	57	56	43·0	− 0·1	+ 0·5	57	56	43·4	4·6807721
			Lachmapur	„	44	17	19·1	− 0·1	+ 0·5	44	17	19·5	4·5966370
			Bolarum P. W. D. Office	s.	77	45	56·7	− 0·2	+ 0·6	77	45	57·1	4·7426340*
			Sums	...	179	59	58·8	− 0·4	+ 1·6	180	0	0·0	
BELLARY	12	2	Hŏnnúr	H.S.	70	55	40·9	− 0·7	+ 0·3	70	55	40·5	5·0376609
			Gadĕkal	„	59	47	55·3	− 0·7	+ 0·3	59	47	54·9	4·9988249
			Kategudda	s.	49	16	25·0	− 0·6	+ 0·2	49	16	24·6	4·9417526*
			Sums	...	180	0	1·2	− 2·0	+ 0·8	180	0	0·0	
	„	3	Hŏnnúr	H.S.	70	20	45·7	− 0·7	0·0	70	20	45·0	5·0392896
			Gadĕkal	„	60	51	50·1	− 0·7	0·0	60	51	49·4	5·0066037
			Sessions Court	s.	48	47	26·2	− 0·6	0·0	48	47	25·6	4·9417526*
			Sums	...	180	0	2·0	− 2·0	0·0	180	0	0·0	
	„	4	Hŏnnúr	H.S.	71	49	0·4	− 0·7	+ 0·4	71	49	0·1	5·0479187
			Gadĕkal	„	60	6	29·4	− 0·7	+ 0·3	60	6	29·0	5·0081688
			Railway Station	s.	48	4	31·2	− 0·6	+ 0·3	48	4	30·9	4·9417526*
			Sums	...	180	0	1·0	− 2·0	+ 1·0	180	0	0·0	
	„	† 5	Hŏnnúr	H.S.	1	28	14·7	0·0	+ 0·4	1	28	15·1	3·4210621
			Sessions Court	s.	...	...		...	...	97	15	21·4	5·0081689
			Railway Station	„	...	...		...	...	81	16	23·5	5·0066037
			Sums	...	...	...		...	...	180	0	0·0	
	„	† 6	Gadĕkal	H.S.	1	3	54·8	0·0	− 0·3	1	3	54·5	3·3164138
			Sessions Court	s.	...	...		...	...	78	3	47·0	5·0376609
			Kategudda	„	...	...		...	...	100	52	18·5	5·0392895
			Sums	...	...	...		...	...	180	0	0·0	
	„	7	Sessions Court	s.	67	58	50·5	0·0	− 0·1	67	58	50·4	3·4271555
			Railway Station	„	45	56	7·1	0·0	0·0	45	56	7·1	3·3165089
			Kategudda	„	66	5	2·5	0·0	0·0	66	5	2·5	3·4210621
			Sums	...	180	0	0·1	0·0	− 0·1	180	0	0·0	

* Taken from the results of the final reduction of the Triangulation of the Great Trigonometrical Survey in Southern India not yet published.

† Triangles Nos. 5 and 6 were each computed by two sides and the included angle.

TABLE A. TRIANGULATION FOR THE CONNECTION OF LONGITUDE STATIONS.

COMPUTATION OF TRIANGLES.—(*Continued*).

Longitude Station to be fixed	Theodolite used	No. of Triangle	Names of Stations	Observed Angles	Corrections for		Corrected Angles	Distance in Log Feet
					Spherical Excess	Observation Error		
				° ′ ″	″	″	° ′ ″	
BELLARY	Inch 12	8	Sessions Court s.	67 58 50·5	0·0	− 0·1	67 58 50·4	3·4270604
			Kategudda "	66 5 2·5	0·0	0·0	66 5 2·5	3·4209670
			Railway Station "	45 56 7·1	0·0	0·0	45 56 7·1	3·3164138
			Sums ...	180 0 0·1	0·0	− 0·1	180 0 0·0	
	"	9	Kategudda s.	17 36 31·0	0·0	+ 0·1	17 36 31·1	3·1264093
			Railway Station "	19 35 20·2	0·0	+ 0·1	19 35 20·3	3·1710594
			Telegraph Office "	142 48 8·4	0·0	+ 0·2	142 48 8·6	3·4271080*
			Sums ...	179 59 59·6	0·0	+ 0·4	180 0 0·0	
KURRACHEE	5	10	A: H.S.	47 59 35	0	− 3	47 59 32	4·4079803
			Mutráni "	53 52 42	0	− 3	53 52 39	4·4442414
			Telegraph Office s.	78 7 52	0	− 3	78 7 49	4·5275730†
			Sums ...	180 0 9	0	− 9	180 0 0	
JUBBULPORE	5	11	Karaundi H.S.	42 59 47	0	− 7	42 59 40	3·978693
			Jubbulpore Hill Mark	105 2 11	0	− 7	105 2 4	4·129829
			Sid-toria s.	31 58 23	0	− 7	31 58 16	3·868814‡
			Sums ...	180 0 21	0	−21	180 0 0	
	"	12	Jubbulpore Hill Mark	47 42 33	0	− 5	47 42 28	3·863912
			Sid-toria s.	57 49 21	0	− 5	57 49 16	3·922413
			Telegraph Office "	74 28 22	0	− 6	74 28 16	3·978693
			Sums ...	180 0 16	0	−16	180 0 0	
AGRA	12	13	Madhoni H.S.	24 53 31·3	− 0·3	− 1·5	24 53 29·5	4·7329264
			Usira "	45 27 53·9	− 0·4	− 1·4	45 27 52·1	4·9617229
			Panj Mahal s.	109 38 40·3	− 0·4	− 1·5	109 38 38·4	5·0827042§
			Sums ...	180 0 5·5	− 1·1	− 4·4	180 0 0·0	
	"	14	Usira H.S.	31 35 43·8	− 0·1	− 0·2	31 35 43·5	4·4580199
			Panj Mahal s.	67 46 19·8	− 0·1	− 0·2	67 46 19·5	4·7052207
			Dura "	80 37 57·4	− 0·1	− 0·3	80 37 57·0	4·7329264
			Sums ...	180 0 1·0	− 0·3	− 0·7	180 0 0·0	

* The mean distance Kategudda s. to Railway Station s., deduced from Triangles Nos. 7 and 8, is used for Triangle No. 9.

† For distance A: H.S. to Mutráni H.S. *vide* Triangle No. 204, page $47—_D$ of the Great Indus Series, Synoptical Vol. I.

‡ " Karaundi H.S. to Jubbulpore Hill Mark *vide* Triangle No. 84, page $17—_E$ of the Jubbulpore Meridional Series, Synoptical Vol. IX.

§ " Madhoni H.S. to Usira H.S. *vide* Triangle No. 37, page $15—_A$ of the Great Arc Meridional Series, Section 24° to 30°, Synoptical Vol. II.

TABLE A. TRIANGULATION FOR THE CONNECTION OF LONGITUDE STATIONS.

COMPUTATION OF TRIANGLES.—(*Continued*).

Longitude Station to be fixed	Theodolite used	No. of Triangle	Names of Stations		Observed Angles	Corrections for Spherical Excess	Corrections for Observation Error	Corrected Angles	Distance in Log Feet
					° ′ ″	″	″	° ′ ″	
	Inch		Panj Mahal	s.	60 30 1·4	− 0·2	− 2·8	60 29 58·4	4·9646304
	12	15	Dura	„	103 46 23·6	− 0·2	− 2·8	103 46 20·6	5·0122661
			Akbar's Tomb	„	15 43 43·9	− 0·1	− 2·8	15 43 41·0	4·4580199
			Sums	...	180 0 8·9	− 0·5	− 8·4	180 0 0·0	
			Panj Mahal	s.	16 7 45·6	− 0·1	− 1·3	16 7 44·2	4·5514386
	„	16	Akbar's Tomb	„	37 15 40·8	− 0·2	− 1·3	37 15 39·3	4·8897815
			Barára	„	126 36 38·0	− 0·2	− 1·3	126 36 36·5	5·0122661
			Sums	...	180 0 4·4	− 0·5	− 3·9	180 0 0·0	
			Akbar's Tomb	s.	84 37 26·4	− 0·1	+ 0·3	84 37 26·6	4·6313300
	„	17	Barára	„	39 27 0·4	0·0	+ 0·3	39 27 0·7	4·4362967
			Moti Masjid	„	55 55 32·5	− 0·1	+ 0·3	55 55 32·7	4·5514386
			Sums	...	179 59 59·3	− 0·2	+ 0·9	180 0 0·0	
			Akbar's Tomb	s.	88 9 28·9	− 0·1	+ 1·6	88 9 30·4	4·6840686
AGRA	„	18	Barára	„	44 24 39·4	− 0·1	+ 1·5	44 24 40·8	4·5292699
			Táj Mahal Mínár	„	47 25 47·3	− 0·1	+ 1·6	47 25 48·8	4·5514386
			Sums	...	179 59 55·6	− 0·3	+ 4·7	180 0 0·0	
			Barára	s.	4 57 39·0	0·0	− 1·8	4 57 37·2	3·8313903
	„	19	Táj Mahal Mínár	„	33 3 32·2	0·0	− 1·9	33 3 30·3	4·6313346
			Moti Masjid	„	141 58 54·4	0·0	− 1·9	141 58 52·5	4·6840686
			Sums	...	180 0 5·6	0·0	− 5·6	180 0 0·0	
			Akbar's Tomb	s.	3 32 2·5	0·0	+ 3·1	3 32 5·6	3·8314498
	„	20	Táj Mahal Mínár	„	14 22 15·1	0·0	+ 3·1	14 22 18·2	4·4362946
			Moti Masjid	„	162 5 33·1	0·0	+ 3·1	162 5 36·2	4·5292699
			Sums	...	179 59 50·7	0·0	+ 9·3	180 0 0·0	
			Táj Mahal Mínár	s.	44 57 25·1	0·0	− 1·9	44 57 23·2	3·8358228
	„	21	Moti Masjid	„	90 39 42·6	0·0	− 2·0	90 39 40·6	3·9866393
			Telegraph Office	„	44 22 58·1	0·0	− 1·9	44 22 56·2	3·8314201*
			Sums	...	180 0 5·8	0·0	− 5·8	180 0 0·0	

* The mean distance Táj Mahal Mínár s. to Moti Masjid s., deduced from Triangles Nos. 19 and 20, is used for Triangle No. 21.

TABLE B. TRIANGULATION FOR THE CONNECTION OF LONGITUDE STATIONS. GEODETIC LATITUDES, LONGITUDES AND AZIMUTHS.

Longitude Station to be fixed	Name of Station	No. of Triangle	Latitude North	Longitude East of Greenwich	Azimuth
			° ′ ″	° ′ ″	° ′ ″
	Naubatpahár . h.s.*		17 24 19·02	78 30 39·87	Of Lachmapur h.s. 147 59 59·79
BOLARUM	Lachmapur „ *		17 32 3·86	78 25 37·05	„ Naubatpahár „ 327 58 28·88
	Bolarum P.W.D. Office s.	1	17 30 11·21	78 33 38·47	
	Hŏnnúr H.S.*		14 55 18·96	77 8 29·78	Of Gadĕkal H.S. 214 16 34·22
	Gadĕkal „ *		15 7 15·46	77 16 52·59	„ Hŏnnúr „ 34 18 44·54
	Kategudda s.	2	15 8 32·24	76 58 21·90	„ „ „ 323 18 15·4
BELLARY	Railway Station „	4	15 8 40·03	76 57 55·80	„ „ „ 322 24 48·9
	Sessions Court „	8	15 8 52·65	76 58 19·38	„ „ „ 323 53 10·2
	Telegraph Office „	9	15 8 32·10	76 58 6·76	
	A: H.S.†		24 55 21·93	67 1 42·35	Of Mutráni H.S. 292 43 58·23
KURRACHEE	Mutráni „ †		24 53 12·83	67 7 19·90	„ A: „ 112 46 20·38
	Telegraph Office s.	10	24 51 1·84	67 3 22·05	
	Karaundi H.S.‡		23 10 40·02	80 2 10·52	Of Jubbulpore Hill Mark 63 49 12
	Jubbulpore Hill Mark‡		23 10 7·70	80 0 59·42	„ Karaundi H.S. 243 48 44
JUBBULPORE	Sid-toria s.	11	23 11 18·66	79 59 52·16	„ Jubbulpore Hill Mark 318 46 14
	Telegraph Office „	12	23 10 9·24	79 59 29·79	
	Madhoni H.S.§		27 13 49·65	77 28 8·26	Of Usira H.S. 326 49 52·98
	Usira „ §		26 57 6·22	77 40 19·76	„ Madhoni „ 146 55 26·11
	Panj Mahal s.	13	27 5 49·20	77 42 28·12	„ Usira „ 12 24 17·1
	Dura „	14	27 3 7·55	77 46 49·43	„ Panj Mahal s. 124 39 56·2
AGRA	Akbar's Tomb „	15	27 13 12·63	77 59 33·51	„ „ „ 64 15 46·8
	Barára „	16	27 7 58·47	77 56 34·60	„ Akbar's Tomb „ 206 58 45·8
	Moti Masjid „	17	27 10 47·74	78 3 48·92	„ „ „ 122 24 38·3
	Táj Mahal Mínár „	18	27 10 30·91	78 5 1·64	„ „ „ 118 53 7·0
	Telegraph Office „	21	27 9 42·24	78 3 29·07	

* The geodetic elements of these stations are taken from the results of the final reduction of the Triangulation of the Great Trigonometrical Survey in Southern India not yet published.

† For geodetic elements of A: H.S. and Mutráni H.S. *vide* page 47—$_D$ of the Great Indus Series, Synoptical Vol. I.

‡ „ „ Karaundi H.S. and Jubbulpore Hill Mark *vide* pages 25—$_E$, 32—$_E$ and 33—$_E$ of the Jubbulpore Meridional Series, Syn. Vol. IX.

§ „ „ Madhoni H.S. and Usira H.S. *vide* page 20—$_A$ of the Great Arc Meridional Series, Section 24° to 30°, Synoptical Vol. II.

TABLE C. DEDUCTION OF THE GEODETIC ELEMENTS OF THE LONGITUDE STATIONS.

Name of Station	Geodetic Latitude	Geodetic Longitude	Remarks
	° ′ ″	° ′ ″	
Madras Observatory (Meridian Circle) s.*	13 4 3·11	80 17 21·51	
Reduction to Longitude Station ...	+ 0·64	0·00	The Longitude Station was 65 feet due north from the Meridian Circle of the Madras Observatory s. (*vide* page 251).
Madras Longitude Station	13 4 3·75	80 17 21·51	
Bangalore, S. W. End of Base-line S.* ...	13 0 40·91	77 37 27·37	
Reduction to Longitude Station ...	+ 0·38	0·00	The Longitude Station was 38 feet due north from the S.W. End of the Base-line S. (*vide* page 251).
Bangalore Longitude Station	13 0 41·29	77 37 27·37	
Mangalore S.*	12 52 14·76	74 53 9·89	
Reduction to Longitude Station ...	− 0·62	0·00	The Longitude Station was 63 feet due south from the Mangalore S. (*vide* page 251).
Mangalore Longitude Station	12 52 14·14	74 53 9·89	
Colába (Bombay) s.*	18 53 48·94	72 51 15·72	
Reduction to Longitude Station ...	+ 0·55	+ 0·55	The Longitude Station was 55 feet north and 53 feet east from the Colába s. (*vide* page 251).
Bombay Longitude Station	18 53 49·49	72 51 16·27†	
Meppen h.s.	17 41 21·83	83 19 43·39	*Vide* page 59—*D*, Synoptical Vol. X, G. T. Survey of India.
Reduction to Longitude Station ...	+ 0·26	+ 3·61	The Longitude Station was 26 feet north and 349 feet east from Meppen h.s. (*vide* page 251).
Vizagapatam Longitude Station ...	17 41 22·09	83 19 47·00	
Deesa Telegraph Office s.* ...	24 15 30·23	72 13 32·64	
Reduction to Longitude Station ...	− 0·88	− 0·61	The Longitude Station was 89 feet south and 56 feet west from the Telegraph Office s. (*vide* page 252).
Deesa Longitude Station	24 15 29·35	72 13 32·03	
Bolarum, P.W.D. Office s. ...	17 30 11·21	78 33 38·47	Fixed by special triangulation (*vide Tables A* and *B*).
Reduction to Longitude Station ...	+ 2·44	0·00	The Longitude Station was 246 feet due north from the P.W.D. Office s. (*vide* page 252).
Bolarum Longitude Station	17 30 13·65	78 33 38·47	
Bellary Telegraph Office s. ...	15 8 32·10	76 58 6·76	Fixed by special triangulation (*vide Tables A* and *B*).
Reduction to Longitude Station ...	+ 0·96	0·00	The Longitude Station was 97 feet due north from the Telegraph Office s. (*vide* page 252).
Bellary Longitude Station	15 8 33·06	76 58 6·76	

NOTE.—The meridional circle of the Madras Observatory was the primary origin of longitudes of the Great Trigonometrical Survey, and was taken as 80° 17′ 21″ east of Greenwich, as determined in 1815. In 1840 Colonel Everest adopted his Observatory at Kaliánpur in Central India as a second origin of longitudes, placing it in 77° 41′ 44″·75 by calculation from Madras through the triangulation which had been executed up to date by himself and Colonel Lambton, most of which was subsequently revised, and the whole has now been finally reduced. The value 80° 17′ 21″·51 above adopted is derived from the final results of the triangulation applied differentially to the value adopted above for Kaliánpur as explained in the preface to this volume.

The geodetic elements of all the other stations have been finally determined in the same manner, but the results for the stations marked with an * have not yet been published.

TABLE C. DEDUCTION OF THE GEODETIC ELEMENTS OF THE LONGITUDE STATIONS.

Name of Station	Geodetic Latitude	Geodetic Longitude	Remarks
	° ′ ″	° ′ ″	
Kurrachee Telegraph Office s. ...	24 51 1·84	67 3 22·05	Fixed by special triangulation (*vide Tables A* and *B*).
Reduction to Longitude Station ...	+ 0·60	− 1·65	The Longitude Station was 61 feet north and 152 feet west from the Telegraph Office s. (*vide* page 252).
Kurrachee Longitude Station	24 51 2·44	67 3 20·40	
Jubbulpore Telegraph Office s. ...	23 10 9·24	79 59 29·79	Fixed by special triangulation (*vide Tables A* and *B*).
Reduction to Longitude Station ...	+ 0·86	0·00	The Longitude Station was 87 feet due north from the Telegraph Office s. (*vide* page 252).
Jubbulpore Longitude Station ...	23 10 10·10	79 59 29·79	
Agra Telegraph Office s. ...	27 9 42·24	78 3 29·07	Fixed by special triangulation (*vide Tables A* and *B*).
Reduction to Longitude Station ...	− 2·31	0·00	The Longitude Station was 233 feet due south from the Telegraph Office s. (*vide* page 252).
Agra Longitude Station	27 9 39·93	78 3 29·07	

TABLE D. COMPARISON OF GEODETIC AND ELECTRO-TELEGRAPHIC VALUES OF EACH ARC OF LONGITUDE MEASURED DURING SEASONS 1875-76, 1876-77 AND 1880-81.

Season of Observation	Name of Arc	Geodetic Value (*vide Table C*)	Electro-telegraphic Value (*Tables XIX, XX, XXI* and *XXXII*)	Difference by Subtracting the Electro-telegraphic from the Geodetic Value	
		m s	m s	s	″
1875-76	Bolarum–Bombay	22 49·480	22 48·848	+ 0·632	+ 9·480
	Bellary–Bombay	16 27·366	16 26·957	+ 0·409	+ 6·135
	Bolarum–Bellary	6 22·114	6 21·884	+ 0·230	+ 3·450
	Madras–Bolarum	6 54·869	6 54·691	+ 0·178	+ 2·670
	Madras–Bellary	13 16·983	13 16·564	+ 0·419	+ 6·285
	Bangalore–Bellary	2 37·374	2 37·362	+ 0·012	+ 0·180
1876-77	Vizagapatam–Madras	12 9·699	12 9·785	− 0·086	− 1·290
	Vizagapatam–Bellary	25 26·683	25 26·389	+ 0·294	+ 4·410
	Mangalore–Bombay	8 7·575	8 7·369	+ 0·206	+ 3·090
1880-81	Bombay–Deesa	2 30·949	2 31·732	− 0·783	−11·745
	Deesa–Kurrachee	20 40·775	20 40·537	+ 0·238	+ 3·570
	Bombay–Kurrachee	23 11·725	23 12·186	− 0·461	− 6·915
	Jubbulpore–Bombay	28 32·901	28 31·781	+ 1·120	+16·800
	Jubbulpore–Bolarum	5 43·421	5 42·918	+ 0·503	+ 7·545
	Jubbulpore–Agra	7 44·048	7 42·993	+ 1·055	+15·825
	Jubbulpore–Deesa	31 3·851	31 3·469	+ 0·382	+ 5·730
	Agra–Deesa	23 19·803	23 20·519	− 0·716	−10·740

TABLE E. CIRCUIT ERRORS OBTAINED BY COMPARING THE OBSERVED AND DEDUCED VALUES OF ONE ARC IN EACH TRIANGULAR CIRCUIT.

Number of Circuit	Name of Arc	Values of Δ L from *Tables XIX, XX, XXI* and *XXXII*	Circuit Error (α) – (β)
		m s	s
1	Bolarum–Bellary	6 21·884	
	Bellary–Bombay	16 26·957	
	(α) Bolarum–Bombay, deduced	22 48·841	
	(β) „ observed	22 48·848	– 0·007
2	Madras–Bolarum	6 54·691	
	Bolarum–Bellary	6 21·884	
	(α) Madras–Bellary, deduced	13 16·575	
	(β) „ observed	13 16·564	+ 0·011
3	Vizagapatam–Madras	12 9·785	
	Madras–Bellary	13 16·564	
	(α) Vizagapatam–Bellary, deduced	25 26·349	
	(β) „ observed	25 26·389	– 0·040
4	Jubbulpore–Bolarum	5 42·918	
	Bolarum–Bombay	22 48·848	
	(α) Jubbulpore–Bombay, deduced	28 31·766	
	(β) „ observed	28 31·781	– 0·015
5	Jubbulpore–Bombay	28 31·781	
	Bombay–Deesa	2 31·732	
	(α) Jubbulpore–Deesa, deduced	31 3·513	
	(β) „ observed	31 3·469	+ 0·044
6	Bombay–Deesa	2 31·732	
	Deesa–Kurrachee	20 40·537	
	(α) Bombay–Kurrachee, deduced	23 12·269	
	(β) „ observed	23 12·186	+ 0·083
7	Jubbulpore–Agra	7 42·993	
	Agra–Deesa	23 20·519	
	(α) Jubbulpore–Deesa, deduced	31 3·512	
	(β) „ observed	31 3·469	+ 0·043
	Circuit Error, Arithmetic Mean ...		0·035

TABLE F. ABSTRACT OF THE RESULTS OF IDIOMETER OBSERVATIONS, SEASON 1880-81 AND COMPARISON OF PERSONAL EQUATIONS AS OBTAINED FROM STAR AND IDIOMETER OBSERVATIONS.

Arc	Date	Lieut.-Colonel Campbell's Observations				Major Heaviside's Observations				Relative Personal Equations		
		By the Idiometer			By Zenith Stars	By the Idiometer			By Zenith Stars	By Idiometer Results		By special Star Observations *vide Table XXVII* and by the Idiometer at the same times
		C_n	C_s	$C_n - C_s$	$C_N - C_S$	H_n	H_s	$H_n - H_s$	$H_N - H_S$	$C_n - H_n$	$C_s - H_s$	
		s	s	s	s	s	s	s	s	s	s	
Bombay and Deesa	1880 Dec. 13	+0·13	+0·08	+0·05	+0·06	+0·12	+0·10	+0·02	0·00	+0·01	−0·02	November 1880
	„ 14	·17	·14	·03	·02	·09	·07	·02	+ ·03	·08	+ ·07	By Stars
	„ 16	·15	·11	·04	·06	·09	·07	·02	·01	·06	·04	$C_N - H_N = + 0^s{\cdot}012$
	„ 17	·15	·12	·03	·05	·10	·07	·03	·01	·05	·05	$C_S - H_S = - 0{\cdot}050$
	„ 18	·15	·12	·03	·04	·07	·06	·01	·02	·08	·06	By Idiometer
	„ 19	·13	·11	·02	·05	·10	·02	·08	·05	·03	·09	$C_n - H_n = - 0^s{\cdot}042$
	Means	...	...	+0·033	+0·047	...	...	+0·030	+0·020	+0·052	+0·048	$C_s - H_s = - 0{\cdot}100$
Deesa and Kurrachee	1881 Jan. 5	+0·18	+0·14	+0·04	+0·05	+0·06	+0·05	+0·01	−0·03	+0·12	+0·09	
	„ 6	·17	·12	·05	·04	·06	·05	·01	+ ·02	·11	·07	
	„ 7	...	...	...	...	·07	·05	·02	·01	...	...	
	„ 8	·15	·13	·02	·00	·07	·02	·05	·07	·08	·11	
	„ 9	·17	·12	·05	·02	·08	·07	·01	·01	·09	·05	
	„ 10	·18	·12	·06	·01	·08	·07	·01	− ·01	·10	·05	
	Means	...	...	+0·044	+0·024	...	...	+0·018	+0·012	+0·100	+0·074	
Bombay and Kurrachee	Jan. 17	+0·16	+0·14	+0·02	+0·06	+0·08	+0·07	+0·01	+0·02	+0·08	+0·07	
	„ 18	·15	·13	·02	·05	·06	·03	·03	·03	·09	·10	
	„ 19	...	...	...	...	·07	·05	·02	·04	...	...	
	„ 20	·14	·10	·04	·02	·06	·04	·02	·02	·08	·06	
	„ 21	·14	·10	·04	·09	...	...	...	...	...	...	January 1881
	„ 23	·07	·05	·02	·05	...	...	...	...	...	...	By Stars
	Means	...	...	+0·028	+0·054	...	...	+0·020	+0·028	+0·083	+0·077	$C_N - H_N = + 0^s{\cdot}050$
Jubbulpore and Bombay	Feb. 6	...	...	...	...	+0·07	+0·05	+0·02	+0·04	...	...	$C_S - H_S = + 0{\cdot}033$
	„ 7	+0·14	+0·11	+0·03	+0·06	·09	·08	·01	·05	+0·05	+0·03	By Idiometer
	„ 8	·17	·11	·06	·04	·08	·08	·00	− ·01	·09	·03	$C_n - H_n = - 0^s{\cdot}015$
	„ 9	·14	·10	·04	·04	·08	·05	·03	+ ·06	·06	·05	$C_s - H_s = - 0{\cdot}032$
	„ 10	·13	·11	·02	·04	·13	·07	·06	·04	·00	·04	
	„ 13	·14	·09	·05	·01	·08	·07	·01	·02	·06	·02	
	„ 14	·14	·10	·04	·06	·07	·05	·02	·03	·07	·05	
	Means	...	...	+0·040	+0·042	...	...	+0·021	+0·033	+0·055	+0·037	

TABLE F. ABSTRACT OF THE RESULTS OF IDIOMETER OBSERVATIONS, SEASON 1880-81 AND COMPARISON OF PERSONAL EQUATIONS AS OBTAINED FROM STAR AND IDIOMETER OBSERVATIONS.

Arc	Date	Lieut.-Colonel Campbell's Observations				Major Heaviside's Observations				Relative Personal Equations		
		By the Idiometer			By Zenith Stars	By the Idiometer			By Zenith Stars	By Idiometer Results		By special Star Observations *vide Table XXVII* and by the Idiometer at the same times
		C_n	C_s	$C_n - C_s$	$C_N - C_S$	H_n	H_s	$H_n - H_s$	$H_N - H_S$	$C_n - H_n$	$C_s - H_s$	
	1881	s	s	s	s	s	s	s	s	s	s	
Bolarum and Jubbulpore	Feb. 23	+0·12	+0·09	+0·03	+0·04	+0·08	+0·06	+0·02	+0·04	+0·04	+0·03	
	„ 24	·12	·08	·04	·06	·08	·05	·03	·06	·04	·03	
	„ 25	·13	·08	·05	·08	·08	·04	·04	·03	·05	·04	
	„ 28	·11	·07	·04	·07	·08	·05	·03	·06	·03	·02	
	Mar. 2	·11	·07	·04	·05	·08	·04	·04	·07	·03	·03	
	„ 3	·12	·08	·04	·04	·08	·01	·07	·06	·04	·07	
	Means	...	...	+0·040	+0·057	...	...	+0·038	+0·053	+0·038	+0·037	
Jubbulpore and Agra	Mar. 11	+0·14	+0·12	+0·02	+0·04	+0·06	+0·04	+0·02	+0·09	+0·08	+0·08	April 1881
	„ 12	·16	·11	·05	·06	·10	·05	·05	·08	·06	·06	By Stars
	„ 13	·12	·09	·03	·03	·10	·06	·04	·04	·02	·03	$C_N - H_N = + 0^s{\cdot}118$
	„ 15	·16	·12	·04	·07	·08	·03	·05	·08	·08	·09	$C_S - H_S = + 0{\cdot}043$
	„ 17	·18	·14	·04	·07	·08	·04	·04	− ·04	·10	·10	By Idiometer
	„ 20	·12	·09	·03	·08	·08	·06	·02	+ ·07	·04	·03	$C_n - H_n = + 0^s{\cdot}017$
	„ 21	...	...	...	...	·10	·07	·03	·08	...	...	$C_s - H_s = - 0{\cdot}010$
	Means	...	...	+0·035	+0·058	...	...	+0·036	+0·057	+0·063	+0·065	

ELECTRO-TELEGRAPHIC LONGITUDES

PART II.

BOMBAY-ADEN-SUEZ

BY

SUB-MARINE CABLES.

DESCRIPTION OF THE OPERATIONS

WITH

DETAILS OF THE SYSTEM OF OBSERVING

AND OF

REDUCING THE OBSERVATIONS

1877.

CHAPTER I.

DIFFERENCES OF LONGITUDE BETWEEN BOMBAY, ADEN AND SUEZ DETERMINED BY MEANS OF THE SUB-MARINE CABLES.

1.

Introductory.

The necessary sanction having been obtained from the Government of India, for extending the electro-longitude operations to Suez, by means of the sub-marine cables in order to connect the Bombay longitude station with a point at Suez, the longitude of which had already been determined by observations between it and Greenwich, the necessary preparations were entered upon by Captains Campbell and Heaviside in March 1877.

The instruments used were those described in Part I of this volume, but it was not possible to continue the system of observing which had been generally adopted when working by land telegraph lines in India—*viz.*, the practice of using the same clock for taking star transits at both stations of observation. The system of comparing clocks at fixed times each night, and observing transits with each clock locally between such comparisons, was therefore per-force adopted, and the Directors of the Eastern Telegraph Company very liberally conceded the free use of the cables for the time necessary to carry this out; but it was still necessary to devise a method by which the clock comparisons could be made, because it was not practicable to transmit clock signals, or indeed any other signals, from one station through the cable for record on the distant chronograph.

2.

The Thomson Syphon-Recorder.

The great object was to contrive a system of recording mechanically at both stations, signals sent alternately from each, so as to obtain a comparison of clocks free from any personal equation, such as might be expected to enter into any method of comparison depending on the personal observation of signals, either by eye or ear. The 'Thomson Syphon-Recorder', which was fortunately in use on the Bombay-Suez cable, offered the means of effecting this, and a few remarks descriptive of that beautiful instrument will not be out of place.

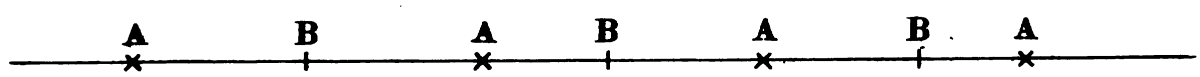
A very fine syphon of glass is suspended in the most delicate manner, so as to be affected by the currents passing through the cable, which jerk it in opposite directions according as they are positive or negative. The upper end of the syphon dips into a reservoir of ink (aniline blue) and the lower end is very nearly in contact with the paper tape on which the record is to be produced, but the calibre of the syphon is so very fine that the ink must be forced through it, which is done in the following way. At the top of the instrument there is a wheel, of about six inches diameter and nearly the same width, technically called the 'mouse-mill', which is driven by an electro-magnet below it. The motion of the mouse-mill serves two ends:—(1) it draws the paper tape past the syphon at a rate which can be regulated at pleasure; (2) it induces a powerful current of statical electricity, which is conducted by a sharp-pointed brass rod towards a disc of brass, the distance of which from the point of the rod can be varied, so as to regulate the quantity of electricity received by the disc from the rod. The disc is in connection with the ink reservoir, and thus the ink becomes electrified to a degree depending on the distance between the point of the rod and the disc. The insulation of the mouse-mill, and of the ink reservoir, must be very perfect because the static electricity, which is of high tension, will leak away through the slightest opening. The paper tape then affords the nearest conductor for the escape of the electricity in the ink to earth, and this suffices to force the ink through the syphon and across the small interval between it and the tape. When no current is passing through the cable the syphon remains at rest, and traces a straight line along the centre of the tape, which is called the 'zero line.' Positive and negative currents jerk the syphon aside in opposite directions, so as to mark signals on opposite sides of the zero line. When working the cable on the 'simplex' method, all signals transmitted and received are recorded on the tape, the former being very sharply defined as compared with the latter; but when arranged for 'duplex' working, the signals transmitted are not locally recorded.

3.

Method of Comparing Clocks by 'Longitude Signals.'

The first plan contemplated was, that at each station the signals transmitted through the cable should be recorded on the local chronograph, as well as on the paper tapes of the local and distant syphon-recorders—single signals being sent from each end alternately—and this method was named, comparison of clocks by 'longitude signals'. This arrangement would afford a record on the tape at each station of a series of received signals B, B, each occurring between two transmitted signals A, A, so that by measuring the intervals on the tape, and assuming uniformity of its motion, the former, B, B, might be interpolated in terms of the latter, A, A, see fig. 1, page (5). Now the signals A, A; B, B, being also recorded on the local chronographs, their exact local times become known, and thus the difference between the clocks might be arrived at by the observations at each station, only affected by retardation of signals, which would enter with different signs at the two ends, and might therefore be considered as cancelled when a mean of both results was taken. An apparent objection to this method, besides the fact of the reductions being laborious, was the necessity of trusting to uniformity in the rate of the tape; but experience afterwards proved that each series of signals (A, A; B, B) could be transmitted at intervals of less than three seconds, and that for such intervals the rate of the tape was quite sufficiently good. While considering the best method of arranging for the record on the chronograph of the signals transmitted through the cable, which presented some difficulties, another system for effecting the clock comparisons was devised, which promised many advantages over that by longitude signals.

Fig. 1.



4.

The 'Ink-arrest' Method of Comparing Clocks.

It has been already remarked, that great attention is always requisite to keep the ink reservoir of the syphon-recorders perfectly insulated, failing which the flow of ink is at once arrested. It was noticed as an interesting fact that a touch of the finger, or even of a pencil, on the reservoir sufficed to stop the flow of ink, and the inference was drawn that the clock might be so connected with the reservoir as to put the ink to earth at each second, thereby marking the seconds on the tape by breaks in the ink line. This was accomplished, with some little trouble owing to difficulties of insulation, by placing a polarised relay on the table beside the syphon-recorder, and passing the signals from the clock through the relay so as to work its armature at each beat. The contact-stud on one side of the armature was then connected with earth, and the armature itself was put in connection with the ink reservoir by a fine wire, so that at each beat of the clock the reservoir was put to earth, and a beautiful record of seconds on the tape, by means of little breaks in the ink line, was obtained.

The comparison of clocks then took the following form and was named, comparison by the 'ink-arrest' method. Hand signals by key were transmitted from each station in alternate series (instead of in series of alternate signals, as would be the case when employing longitude signals) and recorded on both recorder tapes, while on each tape the seconds were marked by the local clock, and thus the local and distant times of each signal could be found with great facility by comparing the two tapes. The advantages of this system over the former were several:—(1) the rate of the tape was only relied on for intervals of one second; (2) the results of the comparisons could be deduced with very much less labor; (3) a comparison could be carried on without in any way interfering with the work in the observatory, because the connection of the clock with the relay was under the control of an assistant in the Telegraph Office who made the comparisons when required, taking care to mark certain times on the tape—by a clock which had been compared with that of the observatory—in order that the observatory clock's record of seconds might be properly identified as regarded minutes. The beginning of each minute was of course marked on the recorder tape, just as on the chronograph sheets, by the omission of one signal. It is evident that nothing in the shape of a personal equation of observation enters into either of the two methods of comparing clocks above described, though it is possible that personal peculiarities of using the signalling key may produce minute variations in the retardation of the signals.

5.

Adoption and Subsequent Failure of the Ink-arrest Method.

The success of continued experiments with the ink-arrest method at Bombay before commencing operations was most satisfactory, and it was decided to adopt it for the observations, but when put in practice between Bombay and Aden great difficulties were found in working it. The difficulty of preserving the necessary insulation of the ink was greater than usual at Aden in consequence of the extreme dampness of the atmosphere, and it was found that while the electric tension was sufficiently great to *maintain* the flow of ink, it often failed to *start* it again after interruption. The result was great delay in making the comparisons, which interfered so seriously with work in the observatory, that for that reason alone it would have been advisable to make a change if possible; and, moreover, the amount of time during which the cable was occupied in effecting the comparisons, and the consequent interference with its ordinary business, was too great to be permitted to continue.

6.

Elaboration and Final Adoption of the Method of Comparison by Longitude Signals.

When describing the method of comparison by longitude signals, as being the first which was considered for use, mention was made of a difficulty in effecting the simultaneous transmission of the signals through the cable, and to the local chronograph, and this was the only thing that prevented the adoption of that system instead of the ink-arrest method, when the latter proved too troublesome to be continued. An arrangement was devised by Captain Campbell to get over this difficulty which proved so successful on trial that it was at once adopted, the necessary alterations being fortunately simple and easily carried out. The new method will now be described.

An ordinary polarised relay was introduced into the cable circuit, between the cable battery and earth, as shewn in fig. 2, page (7), so that every signal transmitted through the cable passed also through the coils of the relay, and worked its armature. The ordinary signalling key, K, used for the cable is double, the members being so connected with the battery that the use of one puts zinc to earth and copper to cable, giving positive current, while the other does the reverse and gives negative current, but owing to the position of the relay the effect on it was the same in either case. In the secondary circuit of the relay—*i. e.*, the circuit made and broken alternately by the armature action—one of the chronograph pen-coils, C, was included, so that the action of the armature made a signal on the local chronograph, and thus every signal transmitted by the cable was also recorded on the chronograph. It took very little time to carry out this arrangement at both stations, and it proved quite successful, removing entirely any difficulty in making the comparisons. The relay was placed close alongside of the syphon-recorder, and could be cut out of the cable circuit altogether by the transposition of a contact peg from P to Q. This was always done when the cable was used for talking purposes, but its omission in no way interfered with the cable's action, so that there was no risk of the ordinary business of the office being interfered with by the introduction of the relay.

It may be remarked, that in neither of the methods just described was there any connection between the cable and land lines, which would be strongly objected to, owing to the danger of introducing lightning discharges into the cable.

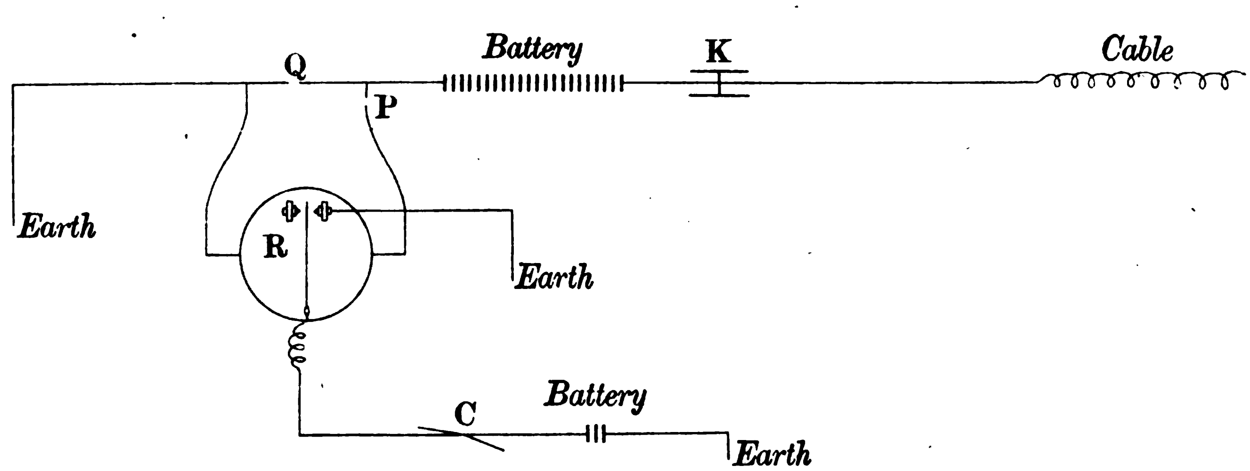
All the observations used in the reductions were obtained under the system of comparing clocks by longitude signals, and it may appear that a description of the ink-arrest process was therefore somewhat superfluous. It has been inserted because under more suitable climatic conditions it might prove practicable, and if so a large amount of labour in reducing the comparisons would be saved.

7.

Relative Advantages of Working on the 'Simplex' or 'Duplex' System.

When employing the simplex method of working, the connections of the cable for receiving, require alteration for sending signals, which is effected by a switch alongside of the signalling key. For clock comparisons by longitude signals therefore, the switch had to be moved after receiving every signal, and again after sending the return, and this was the only part of the process which gave any trouble, requiring some little practice at first. The use of the switch also interfered with the record, because, on putting it over after transmitting a signal, there always occurs a discharge from the condensers—technically known as a 'kick'—which causes a violent disturbance of the syphon. An exact copy of the tape record is given in figures 4 and 5, page (15), where the transmitted signals are marked (generally) *A*, or *B*, and those received *b*, or *a*, the unmarked digressions being the effects of the kick. The kick can only be traced on the tape at the distant end of the cable by a slight displacement of the zero line. It would be a great advantage to avoid the use of the switch, both in order to get rid of the kick and for the convenience of the signaller, and it is possible to do so by adopting a modification of the duplex system of working, in which the switch is never used. It is intended when working by duplex that the transmitted signals should not be marked on the local record-tape, but this is only absolutely the case when the electric balance (the secret of the duplex system) is perfect, and when that balance is thrown out, the transmitted signals are locally recorded in a degree depending on the amount of the disturbance. This exactly suited the purpose of clock comparisons, as the balance could be disturbed just sufficiently to obtain well-marked local signals, and it was tried with excellent results but found impracticable for a continuance, because, as the ordinary work of the cable was generally done on the simplex system, alterations were required for working by duplex which were not under the observers' control, and caused delay and trouble to the telegraph officials. The less perfect record of comparisons obtainable with the simplex arrangement was therefore always used.

Fig. 2.



8.

Clock Comparisons.

The retardation of a signal through a sub-marine cable is so large a quantity compared with that on a land line, that every precaution was called for which might assist in eliminating the effects of variations in its value, and thereby increase the safety of the assumption, which unfortunately cannot be avoided, that it equally affects signals in both directions. With this view systematic changes of the current used were introduced, and the comparisons were executed as under.

Each comparison consisted of four sets of signals, known as A,B,C,D exchanges, each of which should contain 32 individual signals, sent alternately from the two stations, positive and negative currents being generally used as shewn below;

For	A exchange,	current	from	E positive;	from W positive.
„	B	„	„	„ E negative;	„ W negative.
„	C	„	„	„ E positive;	„ W „
„	D	„	„	„ E negative;	„ W positive.

The whole operation only occupied about eight minutes from first to last.

9.

Reduction of the Clock Comparisons.

In the reduction of the clock comparisons the interpolation of the received, between transmitted signals seemed likely at first to prove very laborious, but as the work proceeded and settled habits of using the keys and switches were acquired, the regularity of signalling became so great that it was found quite feasible to effect the interpolation by means of a glass scale of converging lines, similar to that which is always used for reading the chronographic records. With such a scale the operation became very simple, the interval of B after A being read off at once in decimal parts of the interval A A, and converted into seconds by multiplying by the known (chronographic) time interval A A; *vide* fig. 1, page (5).

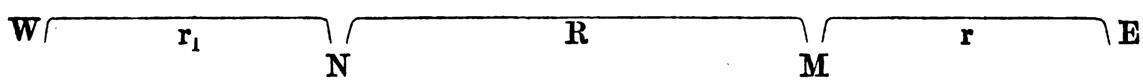
With regard to reading off the tape records of comparisons, the question arose as to which part of the disturbance in the zero line caused by the signal received through the cable should be used, and the choice lay between two; *viz.*, the first departure of the syphon from the zero line, which was designated the 'initial disturbance'; and its maximum divergence, which was called the 'crest'; *vide* figs. 4 and 5, page (15). The retardation of the latter is of course much greater than that of the former, but this affords no argument in favor of either so long as the constancy of both retardations is considered equally good. *Cœteris paribus*, the variations of the greater quantity must be more serious than those of the smaller, and there seems moreover good reason for suspecting more irregularity in the retardation of the crests, as this must surely be more dependent on the manner in which the key is used, the force with which contact is made, and the interval of time during which it is maintained—as also on the state of the batteries and condensers. For the above reasons the use of the initial disturbance of the received signals would be preferred, but unfortunately these are not nearly so well defined as the crests, and a much greater uncertainty of reading enters; on the whole however the balance of advantage seemed to be in favor of the initial disturbance, which was accordingly adopted as the signal. The foregoing remarks apply only to the signals on the tape record which are received through the cable (see *a*, *b*, figs. 4 and 5, page (15)). Of the transmitted signals *A*, *B*, (figs. 4 and 5) the first indication was always used, not only as more reliable in itself, but because it agrees most nearly with the corresponding signal on the local chronograph. As a large personal equation might probably obtain in reading these tape records, its effect was guarded against by the same person reading the whole set.

10.

The Effect of Retardation on Land Lines Connecting the Cable with the Observatories.

There is a feature in the retardation of signals, involved in the clock comparisons as carried out, which calls for recognition, although it can have had no appreciable effect on the work between Bombay, Aden and Suez. The situation

Fig. 3.



is sketched in fig. 3, showing the cable M N, with retardation R, lying between the land wires connecting the cable office and the observatory at each end, the retardations of which are called r, r_1. Now a signal made at M is recorded on the chronograph at E, and on the cable tape at N, after intervals r and R respectively, so that (R being always greater than r or r_1) the record at N is $R - r$ later than that at E. Again, the record of a similar signal at M is later than that at W by $R - r_1$. Thus it appears that this method cannot be used on the theory of equal retardation in both directions unless it may be assumed that $r = r_1$. As the distances between the office and the observatory were only about 3 miles at Bombay, 150 yards at Aden, and 1 mile at Suez, this assumption was of course safe, but the point might call for recognition in case of the system being carried out with long land lines between the ends of the cable, and the observatories.

11.

The Longitude Stations at Bombay, Aden and Suez.

The same station was used at Bombay for connection with Aden as had been employed in the measurement of the Indian arcs, the account of which is contained in Part I of this Volume.

The longitude station at Aden was placed close to the Eastern Telegraph Company's Office, at the shore end of the cable. Its latitude was fixed by astronomical observations, and it was connected by triangulation with some prominent points of the island, as also with the station at which pendulum observations were made by Captain Heaviside in 1873, and the point used by Lord Lindsay's party for chronometrical determinations of differential longitude with Suez, at the time of the Transit of Venus in 1874. A brief description of this triangulation with an abstract of the results obtained will be found in the Appendix.

At Suez the same point was adopted as that used for the observation of the Transit of Venus in 1874, when the observatory was placed on an elevated mound about 40 feet high, on which a building known as the Khedive's Chalet is situated. The longitude of this point was determined electrically in connection with Greenwich, for the reduction of the Transit of Venus observations, with results which will be found in the Appendix. This station was connected by a traverse with the point used by Lord Lindsay's party at Suez for the observations between Aden and Suez already alluded to, *vide* Appendix.

The mound on which the Suez station was situated is not natural but of artificial erection, and though its origin must be of ancient date, the made earth did not afford so good a foundation for the instrumental pillars as could be desired.

12.

Progress of the Observations.

All preliminaries having been settled as far as possible at Bombay, Captain Campbell sailed for Aden on April 16th, and arrived there on 23rd, when he found the preparations for observing nearly complete. It has been already described (Section 5, *ante*) how the great difficulty in carrying out the method of comparing clocks by the ink-arrest method as had been arranged in Bombay, led to its supersession by another system, and two days were lost owing to this failure. Low-lying clouds were very troublesome at Aden, interfering with observations for azimuth, both of circum-polar stars and of stars near the southern horizon, and the determination of deviation correction was consequently difficult, and not always so satisfactory as could be desired.

The observations between Aden and Bombay were brought to a close on the night of May 9th, and on the 14th Captains Campbell and Heaviside sailed for Suez and Aden respectively.

The former Officer reached Suez on May 20th, and experienced no delay in getting ready for observations. Captain Heaviside arrived at Aden on 21st, and occupied the station vacated by Captain Campbell, but difficulties of carrying the instruments caused some delay, and observations could not be begun until May 25th. Fortunately the weather at both stations was all that could be wished, and the observations being carried out without a check on six successive nights were closed on May 30th. The Suez party sailed for Bombay on June 1st, picking up Captain Heaviside and his party at Aden on the 7th, and reached Bombay on June 13th. It was a matter of much congratulation that the observations were completed with so little difficulty, considering the lateness of the season.

13.

Use of the Cables and Liberality of the Directors of the Eastern Telegraph Company.

There were two submarine cables throughout the distance between Bombay and Suez, but while the longitude observations were being made between Bombay and Aden only one of these was readily available, owing to a fault in the other which rendered working through it difficult, and therefore only the sound cable was used for longitude signals. Between Aden and Suez both the cables were equally used.

Much gratitude is due to the Directors of the Eastern Telegraph Company for their liberality in free concession of the use of the cables for the longitude observations, and also to the various local officials for the ready co-operation which they afforded throughout.

CHAPTER II.

DETAILED DESCRIPTION OF THE METHOD OF REDUCING THE OBSERVATIONS, WITH FULL EXPLANATIONS OF THE TABLES CONTAINING THE RESULTS.

1.

Table I.—"Abstract of Determinations of Collimation and Level Correction-Constants."

The determinations of collimation and level corrections were carried out exactly as in the case of land measurements, as fully explained in the first five sections of Chapter VI, Part I, and the results are embodied in *Table I*, which differs in no respect from the corresponding table of Part I.

2.

Table II.—"Deduction of Deviation Correction from Star Observations."*

The deviation correction was determined nightly by the observation of at least one pair of well-known circum-polar stars whenever possible, and the results are given in *Table II*, the arrangement of which is exactly the same as that of *Table II*, Part I, as explained in Section 8, Chapter VI, Part I.

Weights were assigned to the observed values of a_1 in accordance with the system followed

* In the heading of *Table II* the word "Error" was used by an oversight instead of "Correction."

during 1876-77, as explained in Section 11, Chapter VI, Part I. When only one value of a_1 was obtained on any night, its weight, not being required for combination, was omitted. Again at Suez, where there was generally a decided change in the azimuthal adjustment during the course of observations—partially due it is believed to bad foundations—it was considered best to use the arithmetic mean of the two values of deviation correction deduced for each night, and therefore no weights were required for these. The mean of a_1—when there is more than one value deduced—is entered for each night in the last column but one of the table, this mean being computed by combination weights when these are given.

3.

Difficulties in Determining the Deviation Correction at Aden.

It has been already mentioned, that at Aden, during the measurement Bombay–Aden, low-lying clouds gave very great trouble, and rendered the observations of any star near the pole, or of large southern declination, extremely uncertain. Owing to this cause, on 1st and 7th May no star observations for azimuth were obtained, and on 3rd May only an unsatisfactory value of deviation correction was secured from the observations of η Bootis, and β Centauri.

Comparative-azimuth star observations—as employed in the reductions contained in Part I—were unfortunately not available, as they were also lost on these nights. It may be noted here that such observations—though made—were not used at all for the reductions of the work at Bombay, Aden and Suez, because the determinations of azimuth by well-known stars were amply sufficient, except in the case of Captain Campbell's observations at Aden, when the series of comparative-azimuth star observations was so incomplete as to be useless.

Under these circumstances, in order to obtain deviation corrections for 1st and 3rd May, recourse was had to the readings of the collimators from 1st to 6th May, while the transit telescope was in position *I. P. W.*; and the second group of such readings, on 7th, 8th and 9th—when the transit telescope was *I. P. E.*—was used to deduce the deviation correction for 7th May. The two groups of readings cannot be combined, because there is no certainty that the collimation axis remains constant when the telescope is reversed on its pivots; indeed it may be considered certain that it is altered to some extent by the change of strains at the joints connecting the different parts of the instrument. The collimator readings are treated for this purpose in *Table III*, the arrangement of which will now be explained. It should be mentioned that the collimators were in the horizon of the transit telescope.

4.

Explanation of Table III.—"Deduction of Deviation Correction at Aden on 1st, 3rd and 7th May from Readings of Collimators."*

The first three columns give the dates, position of instrument, and values of deviation correction, a_1—abstracted from *Table II*—with their mean for all days, the imperfect value obtained on 3rd May not being included. Columns 4 and 5 contain the daily readings of North and South collimators—these readings being called here N and S—with their means, while columns 6 and 7 show the differences δN, and δS, the former obtained by subtracting the mean from each daily value of N, and the latter similarly from the values of S, but with the signs changed as will be presently explained. It must be noticed, that

* In the heading and also in the last column of *Table III* the word "Error" was used by an oversight instead of "Correction."

in taking the means of the quantities N and S those entered for 1st, 3rd and 7th May, on which days there were no corresponding values of a_1, were not used, as remarked in a foot-note to *Table III.* If this had not been attended to, the mean azimuthal position of the telescope as indicated by the collimator readings would have been compared with that afforded by the star observations for a different period. The quantities δN and δS are different values of the same thing, *viz.*, the difference between the azimuthal position of the telescope on each day, and its mean position on all days included in taking out the means of N and S, and when applied to the mean value of a_1 they will afford values of the absolute deviation correction on each day. This is done in the ninth column, the mean of δN and δS having been first taken out in the eighth column. The values of deviation correction for 1st and 7th May, deduced in this way from the collimator readings, are adopted for those days. For the 3rd May the value obtained in *Table III, viz.*, $-\ 7^{d}\cdot6$, is combined with the value, $-\ 8^{d}\cdot4$, which was derived from star observations in *Table II*, and their mean, $= -\ 8^{d}\cdot0$, finally adopted for that day.

It remains to explain the rule for the signs of δN and δS. The former, being derived from readings of an object to the north of the transit telescope, follow a law which is reversed in the case of the latter, obtained from readings of a southern point. If the telescope be turned in azimuth towards the east of north, the effect on its readings of a northern object is to increase, or decrease them, according as its position is *I. P. E.* or *I. P. W.*, respectively; hence if N on any day be less than the mean reading of the group in the position *I.P.W.*, it follows that the transit telescope must have been directed in azimuth on that day to a point north-east of its mean position on all days, and therefore δN must be applied with the negative sign to the mean of a_1 on all days to deduce the deviation correction for that day. The reverse of this reasoning applies when the position is *I.P.E.* It need hardly be remarked, that in carrying out the process of reduction contained in *Table III* it was necessary to assume the stability of the collimators for the whole period for which their readings were made use of, during which time they were of course carefully guarded against movement. The close accordance between the quantities δN and δS for each day affords evidence that this assumption was justifiable.

5.

Table IV.—" Values of Deviation Correction, a, Finally Adopted."*

In *Table IV* the values of the deviation correction, a, are abstracted from *Tables II* and *III* for convenience of reference. These are the quantities used throughout the reductions of star transits.

6.

Table V.—" Transcript and Reduction of Clock Comparisons."

Table V contains the transcript of the clock comparisons, as read off the chronograph sheets and cable tapes at both stations, with their partial reduction, the arrangement of which will now be explained. Two complete comparisons were made every night, each such comparison consisting of four sets of (generally) sixteen signals in each direction—the signals being sent alternately from each station—which sets are known as A, B, C and D 'exchanges', the nature of the current being altered for each exchange, as explained in Chapter I. A preliminary column of *Table V* contains the date, the number of comparison—No. 1, or No. 2 of the day—the distinguishing letter of the exchange, the nature of current, and the value of pen equation at each station. The cable employed is also noted for the comparisons between Suez and Aden. The numbers at the heads of the following thirteen columns will now be used for reference.

* In the heading of *Table IV* the word "Error" was used by an oversight instead of "Correction."

Column 1, contains the local time recorded on the chronograph at east station, for the signals sent through the cable to west station. The mean time of these signals is taken out at the foot of the column and called t_E.

„ 2, contains a similar record for west station, the signal recorded in this column being always made after, and as the response to, that entered in the same line of column 1.

Columns 3 and 4, contain the time intervals between the signals successively recorded in columns 1 and 2, respectively.

„ 5 and 7, contain the transcriptions from the cable tapes, showing the position of each signal received through the cable between two locally recorded signals, in decimal parts of the interval between the latter. Thus the quantities in these columns are fractions of the intervals entered in seconds of time in columns 3 and 4, respectively.

„ 6 and 8, contain the equivalents in seconds of the quantities in columns 5 and 7, obtained by multiplying each quantity in column 5, or 7, by that in the same line of column 3, or 4, respectively.

„ 9 and 10, contain the time by east, or west clock of each signal received through the cable from west, or east station respectively, being the sum of columns 1 and 6, or 2 and 8. The absence of a quantity on the first line of column 10 is due to the fact, that the first signal sent from east, being the first of the whole series, did not fall between two local signals on the tape at the west station, and therefore could not be interpolated. For a similar reason there is one quantity wanting at the foot of column 9, because the last signal sent from west was the last of the whole series.

„ 11 and 12, contain the difference between the two clocks, subtracting west from east time, for each signal timed by both, being the difference between columns 9 and 2, 1 and 10, respectively. The mean is taken out at the foot of each of these columns. These mean clock differences still require correction for the pen equations, which is carried out in one operation in the last column of the table, where the means of columns 11 and 12 are entered after correction for the combined effect of the two equations. This correction can easily be followed if it is borne in mind that the pen equations are properly applicable, with the signs given, to the quantities in columns 1 and 2. Lastly, the mean of the means of columns 11 and 12, after correction of the latter for the pen equations, is taken out, and this quantity, called d, is the difference between the two clocks at an instant which is represented in terms of the east clock by t_E, the mean of column 1. The values of pen equation here used were obtained by direct measurement, as explained in Section 11, Chapter IV, Part I.

Column 13, contains the differences between the corresponding quantities in columns 11 and 12, and each such difference represents double the amount of the retardation of a signal through the cable, or rather the sum of the two retardations in opposite directions which must be considered equal to each other. The accordance of the quantities in this column *inter se* affords some measure of the accuracy of the method, on the supposition that the retardation of successive signals may be considered constant.

The whole process carried out in *Table V* will be rendered clearer by reference to the diagrams on next page, figures 4 and 5, which represent two corresponding portions of the cable tapes at east, and west stations, respectively. The arrow shows the direction of the tape's motion.

Fig. 4.

Clock Comparison Signals on Cable Record Tape at East Station.

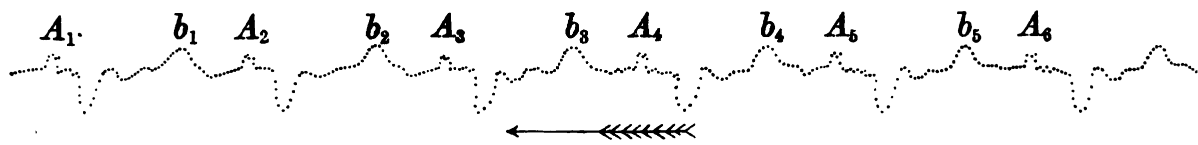
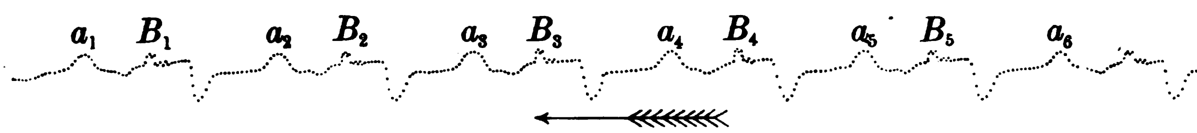


Fig. 5.

Clock Comparison Signals on Cable Record Tape at West Station.



$A_1, A_2, A_3, \ldots$ are the signals recorded locally on. the tape at east station, while $a_1, a_2, a_3, \ldots$ are corresponding signals produced on the cable tape at the west station by the same action of the key, therefore the latter are absolutely later than the former by the retardation of a signal passing through the cable from east to west. Similarly $B_1, B_2, B_3, \ldots$ are the signals locally recorded at west, and $b_1, b_2, b_3, \ldots$ their corresponding effects at east station.

Each signal A, or B, (generally) is also recorded on the local chronograph at east, or west station, whence its time by the local clock is obtained, and these times are entered in columns 1 and 2, and the time intervals A_2-A_1, A_3-A_2, &c., and B_2-B_1, B_3-B_2, &c., are taken out in columns 3 and 4, respectively. In columns 5 and 7 respectively, the fractions $\frac{A_1\,b_1}{A_1\,A_2}$, $\frac{A_2\,b_2}{A_2\,A_3}$, &c., and $\frac{B_1\,a_2}{B_1\,B_2}$, $\frac{B_2\,a_3}{B_2\,B_3}$, &c., are entered as decimal quantities, with their equivalents in seconds in columns 6 and 8. It is evident then that the quantities in column 9 give the times by east clock of the signals b_1, b_2, &c., while those in column 10 give the west clock times of a_2, a_3, &c.

7.

Table VI.—"Reduction of Comparisons of Clocks."

The reductions begun in *Table V* are completed in *Table VI*, the first nine columns of which contain merely an abstract of the former table, and the means of the quantities in columns 7, 8 and 9 are taken out. In the tenth column, the relative hourly clock-rate correction is computed by using the means of the quantities t_E, and d given in columns 7, and 8; the result is called R, and its sign is such that if applied to the rate of the west clock, it would cause it to keep time with the east clock. By using R in combination with the means of the quantities d, clock differences, D, are computed for certain epochs, T_E, at which they will be required in the future course of the reductions, and entered in the last column of the table.

8.

Personal Equations.

While Captains Campbell and Heaviside were together in Bombay, before commencing the operations by sub-marine cable, they took observations on four nights—*viz.*, 4th, 5th, 7th and 9th April—for the determination of their relative personal equations for stars of north, and south aspect; and the results were adopted for use in the reduction of the longitude observations between Bombay, Aden and Suez, because there was no opportunity for obtaining another determination after the completion of the work. The determination was made by means of observing divided transits at the same telescope, as described in Section 2, Chapter V, Part I, and the results are embodied in *Tables IX* and *X* of Part I, because they were required for the foregoing land measurements in India, as well as for the work now under notice.

Table VII.—" Abstract of Observed Values of the Absolute (N—S) Equations of Captains Campbell and Heaviside."—corresponds exactly to *Table XI*, Part I, and requires no further explanation beyond what is given for that table in Section 20, Chapter VI, Part I. At the foot of the table, the adopted values of the relative personal equation used in the subsequent reductions are entered in a note.

9.

System followed in the Observation of Stars for Difference of Longitude.

The method of observing the same stars at both stations—which were termed 'longitude stars'—and combining the differences of their corrected times of transit with the absolute clock-differences obtained by the clock comparisons, which was partly used for the first measurement contained in Part I, was also adopted for the work between Bombay, Aden and Suez; but owing to the different circumstances of the latter measurements, as compared with those executed in India, it was found advisable to supplement this system, as will now be described. The large difference of longitude between Bombay and Aden, of nearly two hours, made it inconvenient to use only the same stars at both stations, for in that case the observer at Aden would have had nearly two hours of idleness at the beginning of the night's work, after taking the first clock comparison; while at Bombay there would have been a similar interval of inactivity after the observation of transits, before the second clock comparison; because it was considered advisable to include all star observations in the interval between the two clock comparisons of each night.

It was therefore decided that each observer should occupy his available leisure in observing a group of well-known stars—hereafter spoken of as 'clock stars'—for the determination of the error of his own clock, the two errors thus found being used in combination with the results of the clock comparisons to afford the difference of longitude.

In the case of the measurement Aden–Suez the same method was followed, for although the difference of longitude was much less than that between Bombay and Aden, the great difference of latitude—about 17°—was held to be an objection to depending only on the observations of longitude stars.

The observations between Bombay and Aden comprised generally, two groups of longitude stars by both observers, and one group of clock stars by each observer, on each night, but the completeness of the series was unfortunately considerably marred by the prevalence of clouds at Aden. The Aden-Suez observations consisted nightly of one small group of longitude stars observed at both stations, and two groups of clock stars by each observer.

10.

Table VIII.—" Observations of Transits with Local Clocks, and Deduction of the Corrected Difference of the Observed Times, M_N."

Table VIII contains an abstract of the observations of 'longitude stars', and the reduction of the results as far as the determination of M_N. This table corresponds in all respects with *Table XII*, Part I, and requires no explanation beyond that afforded for the latter table in Sections 21, 23 and 24, Chapter VI, Part I, except as regards the two last columns.

In the table now under notice the method was adopted of applying the absolute, N—S, personal equations, which was followed in *Tables XV* and *XVI*, Part I, (see Section 25, Chapter VI, Part I) and the result of the reduction effected is called M_N, instead of M as in *Table XII*, Part I. M_N is a supposititious mean difference between the times of observation of a group of stars by the two clocks, arrived at by correcting the times of all the stars observed under a south aspect by the N—S equation of the observer, so as to afford results such as would have been obtained had these south stars been all observed under north aspect. The correction of M_N for the observers' relative personal equation remains to be done in *Table XI*.

11.

Table IX.—" Transits of Clock Stars, and Deduction of the Clock-Correction."

Table IX contains an abstract of the observations taken to 'clock stars' for the determination of the error of each clock. The arrangement of the table is so similar to those already explained, that only the last two columns appear to call for any remark; at the head of these columns, the observer's N—S equation, abstracted from *Table VII*, is entered, and used to compute a correction—contained in the last column but one—which, when applied to the mean apparent clock-correction obtained from a group of stars, affords the supposititious clock-correction which would have resulted if all the stars had been observed under north aspect. The latter quantity is entered in the last column under the head of "Clock-Correction by North Aspect", and it is considered to belong to the mean time of transits of all the stars from which it is deduced, which is entered in column 7 as t_E*.

12.

Right Ascensions of Clock Stars.

The apparent right ascensions for the clock stars used were arrived at in the following manner. The mean right ascensions on 1st January 1877 were obtained from four catalogues, *viz.*
"Greenwich Seven-Year Catalogue of 1860"
" ,, ,, ,, 1864"
" ,, Nine-Year ,, 1872" and the "Catalogue of Stars Observed at the United States Naval Observatory, during the years 1845 to 1877."

In the last catalogue the mean right ascensions are given for 1860·0, and the mean year of the observations on which each place depends is entered, but no proper motions were employed in the

* This mean time is by a misprint called t_E in those parts of *Table IX* which contain the observations made at Aden, in connection with Bombay, and at Suez, whereas it should have been printed t_W.

reduction from the mean year of observation to the epoch 1860·0. All right ascensions taken from the Washington Catalogue were therefore first corrected for the intervals between these two dates, by means of the proper motions of the Greenwich Catalogues; and the Greenwich constants for precession, secular variation, and proper motion were employed to complete the reduction to the required epoch, *viz.*, 1st January 1877.

A value of the mean right ascension on 1st January 1877 of each star observed having been obtained from each of the four catalogues—or from as many of them as contained the star in question—these were combined with weights in direct proportion to the number of observations on which the place in each catalogue depended, and the final mean was adopted for use. The apparent right ascensions for each day were deduced by "Airy's Day Numbers" in combination with the constants of the Greenwich Catalogues. The results obtained from each catalogue will be found collated in the Appendix.

13.

Proper Motions of Clock Stars.

The proper motions used for the clock stars were always those given in the three Greenwich Catalogues referred to above, which agree in this particular as concerns all the stars employed for the longitude observations except two.

(1). 14 Draconis. The proper motion given for this star in the Greenwich Catalogues of 1860 (star No. 1334) and 1864 (star No. 1868) is $+ 0^s{\cdot}023$, which is apparently taken from the British Association Catalogue; but in the Catalogue of 1872 (star No. 1491) it is entered as $+0^s{\cdot}005$, with a reference to Mädler's Bradley. The latter value was accepted, but it does not appear to be a satisfactory determination, as the results obtained by it from the different catalogues show much greater discrepancies than is generally the case with other stars, although the place depends on a larger number of observations than usual in each catalogue. It is, however, better in this respect than the older value of $+ 0^s{\cdot}023$.

(2). 60 Herculis. The proper motion is given in the Catalogue of 1864, as $+ 0^s{\cdot}005$ (star No. 1922); and in that of 1860, as $+ 0^s{\cdot}007$ (star No. 1382); while the star does not occur in the Catalogue of 1872. No reason is assigned in the later catalogue for the change, nor is the point referred to in the list of errata of either catalogue. The value $+ 0^s{\cdot}007$ was adopted, as it afforded a slightly better agreement in the places deduced from the three catalogues employed, *viz.*, those of Greenwich for 1860 and 1864, and the Washington Catalogue.

14.

Table X.—"Deduction of Clock Rate Corrections."

The rate-corrections for both clocks are deduced in *Table X* in two ways, as follows. (1). The clock-corrections found for each night in *Table IX* are abstracted in *Table X*, each with the date and epoch (under the head "Time") to which it belongs, and from these quantities hourly rate-corrections for each night are interpolated. In the lower portion of the table, which refers to the observations between Aden and Suez, each of the clock-corrections, and corresponding value of time, is the mean of two obtained on the same day. (2). By comparing the times of transit of longitude stars on successive nights—as given in *Table VIII*—a second series of hourly rate-corrections is found by interpolation for each clock, and entered in *Table X* under the head of "Hourly Rate Correction by Longitude Stars."

The two rate-corrections thus found are considered of equal weight, and their arithmetic mean is accepted as the rate-correction obtained from all star observations, and entered in *Table X* as r_e, or r_w, according as it belongs to the clock at east, or west, station.

These last values of rate-correction are now combined by means of the relative clock rate-correction deduced from the clock comparisons in *Table VI*, exactly as was done in *Table XVIII*, Part I (see Sec. 26, Chapter VI, Part I), and the final values r_E and r_W are obtained. The last column of the table contains the corrections for clock-rate which are used in *Table VIII*.

The general agreement shown in *Table X* between the two values of the same correction—*viz.*, r_e and r_E, r_w and r_W—is very satisfactory, except on one or two nights of the observations between Aden and Suez. The maximum difference in any case is $0^s{\cdot}018$, equivalent to a discrepancy of $0^s{\cdot}432$ in twenty-four hours. This cannot be considered very large when it is remembered that the relative clock-rate correction, R, was obtained from the rates during two hours only in the middle of the night, while the values r_e and r_w depend on the behaviour of the clocks during twenty-four hours from night to night. It should also be remarked that the conditions were very unfavourable, as the clocks were most inadequately protected at both stations, and at Suez in particular the range of temperature in the clock hut between day and night was very great.

15.

Table XI.—"Deduction of the Difference of Longitude, ΔL, from Observations of Transits with Local Clocks, combined by Clock Comparisons."

Table XI corresponds closely with *Table XIX* of Part I, (see Section 27, Chapter VI, Part I) the chief difference being that the sum of M_N, abstracted from *Table VIII*; and D, taken from *Table VI*, gives δL_N, from which δL_S is deduced by applying the difference of the two observers' N − S equations, with the proper sign. From δL_N and δL_S, ΔL_N and ΔL_S are obtained by applying the relative personal equations $H_N - C_N$, and $H_S - C_S$, respectively; and lastly the final value (so far as this table is concerned) of difference of longitude, ΔL, is the arithmetic mean of ΔL_N, and ΔL_S. During the observations between Bombay and Aden, it unfortunately happened, that, owing to a misunderstanding between the two observers, the instruments were reversed on different dates, and therefore the results cannot be treated in two separate groups.

It was not necessary to show the division of the observations between Aden and Suez into two groups, according to the positions of the instruments, because the quantities in each group are equal in number.

16.

Table XII.—"Deduction of the Difference of Longitude, ΔL, from the Determination of Local Clock Corrections combined by Clock Camparisons."

In *Table XII* the clock-corrections deduced in *Table IX* for both clocks are combined with the clock-difference, D, found in *Table VI*, to obtain the apparent difference of longitude ΔL_N. The correction for each clock is abstracted from *Table IX* with the time to which it belongs, which in the case of the west clock is first converted into east clock time by applying the known clock-difference. The final clock rate-corrections r_E and r_W obtained in *Table X* are also entered for each clock, and by means of these, the clock-corrections in columns 4 and 8 are reduced to an epoch T_E—given in column

2—which is the mean of the two times entered in columns 5 and 9. The deduced clock-corrections are entered in columns 11 and 12 under the heads of ΔT_E and ΔT_W, respectively; in column 13 the clock-difference, D—found in *Table VI* for the epoch T_E—is entered, and in the last column the apparent difference of longitude δL_N is found by the formula, $\delta L_N = D + \Delta T_E - \Delta T_W$.

From ΔL_N, the two values ΔL_N, ΔL_S are deduced as in *Table XI*, and the mean of these gives the value of difference of longitude ΔL, as afforded by the process carried out in this table.

Lastly at the foot of the table the value of ΔL obtained in *Table XI* is entered, and the arithmetic mean of the two values of ΔL is adopted as the final difference of longitude.

The "transcribing equation" applied in *Tables XI* and *XII* to the results obtained between Aden and Suez was determined as explained in Section 8, Chapter V, Part I.

17.

The Method of Applying the N — S Equations.

The method of using supposititious quantities, arrived at by reducing the observations of stars taken under a south aspect, as if they had been observed as north stars, and *vice versâ*, has been remarked upon in Section 31, Chapter VI, Part I.

If such a system had not been followed in reducing the observations between Aden and Suez, the use of longitude stars for that measurement would have been almost wholly precluded, owing to the great difference of latitude between the two stations. Again, in reducing the observations of clock stars for the determination of clock-corrections, carried out in *Table IX*, the existence of the observers' N — S equations could not be neglected.

ELECTRO-TELEGRAPHIC LONGITUDES

PART II.

BOMBAY-ADEN-SUEZ

BY

SUB-MARINE CABLES

ABSTRACT OF THE OBSERVATIONS

AND

REDUCTION OF THE RESULTS

1877.

 TABLE I. ABSTRACT OF DETERMINATIONS OF COLLIMATION AND LEVEL CORRECTION-CONSTANTS.

Astronl. Date	Station	Instrumental Position	Collimation C_0	Collimation C_s	Collimation c_1	Collimation c	Level M	Level b	Remarks	Station	Instrumental Position	Collimation C_0	Collimation C_s	Collimation c_1	Collimation c	Level M	Level b	Remarks
1877			d	d	d	d	d	d				d	d	d	d	d	d	
Apr. 25	BOMBAY (Telescope No. 1)	*I.P.E.*	85·8							ADEN (Telescope No. 2)	*I.P.E.*	68·2						
„ 26		„	86·3								„	70·5						
„ 27		...	...	...	...	...	...	...			„	68·9						
„ 28		„	84·2								„	70·4						
„ 29		„	82·3	85·0	−0·4	−1·3	81·9	+2·7										
„ 30		„	84·4	85·0	−0·4	−1·3	81·6	+3·0	Mean C_0 = 84·6 d		„	68·8	70·0	−1·0	−1·9	65·4	+ 3·6	
May 1		*I.P.W.*	84·0	85·0	+1·9	+1·0	83·5	+0·4			*I.P.W.*	70·7	70·0	−0·1	−1·0	67·3	− 2·8	
„ 2		„	83·7	85·0	+1·9	+1·0	82·9 83·3	−0·2 +0·2			„	69·9	70·0	−0·1	−1·0	69·9	− 0·2	
„ 3		„	81·7	85·0	+1·9	+1·0	83·3 83·8	+0·2 +0·7			„	70·7	70·0	−0·1	−1·0	70·1	0·0	Mean C_0 d *I.P.E.* = 69·0 *I.P.W.* = 70·1
„ 4		„	82·9	85·0	+1·9	+1·0	84·5 84·2	+1·4 +1·1	„ = 83·1		„	69·5	70·0	−0·1	−1·0	70·6	+ 0·5	
„ 5		*I.P.E.*	83·7	85·0	−0·2	−1·1	84·9	−0·1			„		70·0	−0·1	−1·0	72·6	+ 2·5	
„ 6		...	...	...	...	...	...	...			„	69·6	70·0	−0·1	−1·0	73·2	+ 3·1	
„ 7		„	85·9	85·0	−0·2	−1·1	85·3 85·4	−0·5 −0·6	„ = 84·8		*I.P.E.*	68·6	70·0	−1·0	−1·9	62·3	+ 6·7	
„ 8		*I.P.W.*	86·4	85·0	−0·5	−1·4	88·1 88·0	+2·6 +2·5			„	68·8	70·0	−1·0	−1·9	70·2	− 1·2	
„ 9		„	84·5	85·0	−0·5	−1·4	85·4 86·0	−0·1 +0·5	„ = 85·5		„	68·0	70·0	−1·0	−1·9	69·0	0·0	
May 23	ADEN (Telescope No. 1)	...	...	...	...	...	...	...		SUEZ (Telescope No. 2)	*I.P.E.*	74·5						
„ 25		*I.P.E.*	41·1	40·0	+1·6	+0·7	34·3 34·0	+7·3 +7·6			„	75·2	75·0	−0·7	−1·5	101·7	−27·4	
„ 26		„	41·5	40·0	+1·6	+0·7	44·0 43·0	−2·4 −1·4			„	73·3	75·0	−0·7	−1·5	77·6	− 3·3	
„ 27		„	42·1	40·0	+1·6	+0·7	42·1 42·0	−0·5 −0·4	Mean C_0 d *I.P.E.* = 41·6 *I.P.W.* = 41·4		„	74·2	75·0	−0·7	−1·5	75·9	− 1·6	Mean C_0 d *I.P.E.* = 74·3 *I.P.W.* = 79·5
„ 28		*I.P.W.*	42·5	40·0	−1·4	−2·3	41·0 42·2	−0·4 +0·8			*I.P.W.*	78·7	75·0	−4·5	−5·3	74·2	− 5·3	
„ 29		„	40·6	40·0	−1·4	−2·3	39·4 39·2	−2·0 −2·2			„	79·3	75·0	−4·5	−5·3	75·9	− 3·6	
„ 30		„	41·1	40·0	−1·4	−2·3	39·8 39·8	−1·6 −1·6			„	80·0 80·0	75·0 75·0	−4·5 −4·5	−5·3 −5·3	74·0	− 5·5	

NOTE.—For an explanation of the symbols used in this table, see Part I, page 2.

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Level	Pen Equation Q	Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
BOMBAY (E) AND ADEN (W)	BOMBAY (LATITUDE 18° 54')	1877							h m s	s	s	s	s	s	h m s	m s	d	
		April 30	*I.P.E.*	E	R.P.L.* 33	L	6	+0·226	15 3 43·68	+0·30	−0·16	+1·90		45·72	15 3 17·42	− 0 28·30	−43·9	15
					R.P.L. 115	U	5	−0·246	15 46 48·92	−0·35	+0·32	−1·90	−0·02	46·97	15 46 39·37	− 7·60		
		„ „	„	„	R.P.L. 84	L	5	+0·331	15 26 39·16	+0·45	−0·27	−1·90		37·44	15 26 5·46	− 31·98	−43·6	20
					ζ Ursæ Minoris	U	8	−0·094	15 48 47·86	−0·14	+0·17	+1·90	−0·01	49·78	15 48 36·31	− 13·47		
		„ „	„	„	ε Ursæ Minoris	U	8	−0·148	16 58 58·23	−0·22	+0·18	−1·90		56·29	16 58 44·50	− 11·79	−39·7	5
					θ Ophiuchi	U	15	+0·017	17 14 50·30	−0·03	+0·04	−1·90	−0·01	48·40	17 14 30·06	− 18·34		
																30th, Mean	−43·2	
		May 1	*I.P.W.*	„	R.P.L. 33	L	6	+0·226	15 3 38·83	−0·23	−0·02	+1·90		40·48	15 3 17·46	− 23·02	−19·7	17
					R.P.L. 115	U	7	−0·246	15 46 54·70	+0·27	+0·04	−1·90	−0·02	53·09	15 46 39·39	− 13·70		
		„ „	„	„	R.P.L. 84	L	2	+0·331	15 26 32·27	−0·34	−0·04	−1·90		29·99	15 26 5·48	− 24·51	−18·7	13
					R.P.L. 115	U	7	−0·246	15 46 54·70	+0·27	+0·04	−1·90	−0·01	53·10	15 46 39·39	− 13·71		
		„ „	„	„	ε Ursæ Minoris	U	10	−0·148	16 59 18·68	−16·43	+0·06	−1·90		0·41	16 58 44·58	− 15·83	−16·3	7
					θ Ophiuchi	U	15	+0·017	17 14 52·98	− 2·48	+0·01	−1·90	−0·01	48·60	17 14 30·08	− 18·52		
																1st, Mean	−18·7	
		„ 2	„	„	R.P.L. 33	L	8	+0·226	15 3 44·42	−0·23	+0·01	−1·90		42·30	15 3 17·50	− 24·80	−23·3	23
					R.P.L. 115	U	8	−0·246	15 46 51·09	+0·27	−0·02	+1·90	−0·02	53·22	15 46 39·41	− 13·81		
		„ „	„	„	R.P.L. 84	L	3	+0·331	15 26 31·00	−0·34	+0·02	+1·90		32·58	15 26 5·50	− 27·08	−23·0	18
					R.P.L. 115	U	8	−0·246	15 46 51·09	+0·27	−0·02	+1·90	−0·01	53·23	15 46 39·41	− 13·82		
		„ „	„	„	ε Ursæ Minoris	U	3	−0·148	16 58 58·74	+0·17	+0·01	+1·90		60·82	16 58 44·65	− 16·17	−18·5	2
					θ Ophiuchi	U	15	+0·017	17 14 47·42	+0·03	0·00	+1·90	−0·01	49·34	17 14 30·11	− 19·23		
																2nd, Mean	−23·0	
		„ 3	„	„	R.P.L. 33	L	8	+0·226	15 3 42·14	−0·23	−0·01	+1·89		43·79	15 3 17·54	− 26·25	−26·1	23
					R.P.L. 115	U	8	−0·246	15 46 54·97	+0·27	+0·02	−1·89	−0·02	53·35	15 46 39·43	− 13·92		
		„ „	„	„	R.P.L. 84	L	4	+0·331	15 26 37·62	−0·34	−0·02	−1·89		35·37	15 26 5·53	− 29·84	−27·6	23
					R.P.L. 115	U	8	−0·246	15 46 54·97	+0·27	+0·02	−1·89	−0·01	53·36	15 46 39·43	− 13·93		
		„ „	„	„	ε Ursæ Minoris	U	8	−0·148	16 58 62·34	+0·17	+0·05	−1·89		60·67	16 58 44·71	− 15·96	−25·7	5
					θ Ophiuchi	U	15	+0·017	17 14 52·20	+0·03	+0·01	−1·89	−0·01	50·34	17 14 30·14	− 20·20		
																3rd, Mean	−26·7	
		„ 4	„	„	R.P.L. 33	L	7	+0·226	15 3 46·35	−0·23	−0·08	−1·89		44·15	15 3 17·58	− 26·57	−27·1	19
					R.P.L. 115	U	7	−0·246	15 46 50·94	+0·27	+0·15	+1·89	−0·02	53·23	15 46 39·45	− 13·78		
		„ „	„	„	R.P.L. 84	L	4	+0·331	15 26 34·28	−0·34	−0·13	+1·89		35·70	15 26 5·55	− 30·15	−28·1	16
					ε Ursæ Minoris	U	9	−0·148	16 58 59·38	+0·17	+0·08	+1·89	−0·05	61·47	16 58 44·77	− 16·70		
																4th, Mean	−27·6	

* The letters R.P.L. indicate "Radcliffe Polar List."

TABLE II. DEDUCTION OF DEVIATION ERROR FROM STAR OBSERVATIONS.

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
									h m s	s	s	s	s	s	h m s	m s	d	
BOMBAY (E) AND ADEN (W)	BOMBAY (Latitude 18° 54′)	1877 May 5	*I.P.E.*	E	R.P.L. 33	L	5	+0·226	15 3 43·99	+0·26	+0·01	+1·89		46·15	15 3 17·62	− 0 28·53	−32·2	13
					R.P.L. 115	U	4	−0·246	15 46 55·02	−0·30	−0·01	−1·89	−0·02	52·80	15 46 39·48	− 13·32		
		" "	"	"	R.P.L. 84	L	5	+0·331	15 26 39·78	+0·38	+0·01	−1·89		38·28	15 26 5·57	− 32·71	−33·6	19
					R.P.L. 115	U	4	−0·246	15 46 55·02	−0·30	−0·01	−1·89	−0·01	52·81	15 46 39·48	− 13·33		
		" "	"	"	ε Ursæ Minoris	U	11	−0·148	16 58 63·64	−0·18	−0·01	−1·89		61·56	16 58 44·83	− 16·73	−29·9	8
					θ Ophiuchi	U	15	+0·017	17 14 53·78	−0·03	0·00	−1·89	−0·01	51·85	17 14 30·19	− 21·66		
																5th, Mean	−32·4	
		" 7	"	"	R.P.L. 33	L	9	+0·226	15 3 53·11	+0·26	+0·03	−1·90		51·50	15 3 17·69	− 33·81	−47·9	25
					R.P.L. 115	U	9	−0·246	15 46 49·21	−0·30	−0·05	+1·90	−0·02	50·74	15 46 39·52	− 11·22		
		" "	"	"	R.P.L. 84	L	5	+0·331	15 26 41·84	+0·38	+0·05	+1·90		44·17	15 26 5·61	− 38·56	−48·8	21
					ζ Ursæ Minoris	U	10	−0·094	15 48 52·51	−0·12	−0·03	+1·90	−0·01	54·25	15 48 36·43	− 17·82		
		" "	"	"	ε Ursæ Minoris	U	10	−0·148	16 58 59·11	−0·18	−0·04	+1·90		60·79	16 58 44·95	− 15·84	−45·5	7
					θ Ophiuchi	U	6	+0·017	17 14 51·74	−0·03	−0·01	+1·90	−0·01	53·59	17 14 30·24	− 23·35		
																7th, Mean	−47·9	
		" 8	*I.P.W.*	"	β Centauri	U	6	+0·044	13 55 35·24	−0·06	+0·02	+1·89		37·09	13 55 12·89	− 24·20	−24·7	18
					ζ Ursæ Minoris	U	13	−0·094	15 48 59·18	−0·15	+0·15	−1·89	−0·05	57·24	15 48 36·45	− 20·79		
		" "	"	"	ε Ursæ Minoris	U	5	−0·148	16 59 7·10	−0·23	+0·19	−1·89		5·17	16 58 45·01	− 20·16	−20·7	3
					θ Ophiuchi	U	15	+0·017	17 14 55·72	−0·04	+0·05	−1·89	−0·01	53·83	17 14 30·26	− 23·57		
																8th, Mean	−24·1	
		" 9	"	"	R.P.L. 33	L	8	+0·226	15 3 50·77	+0·33	+0·01	−1·90		49·21	15 3 17·77	− 31·44	−32·0	25
					R.P.L. 115	U	8	−0·246	15 46 54·43	−0·38	−0·01	+1·90	−0·02	55·92	15 46 39·56	− 16·36		
		" "	"	"	R.P.L. 84	L	4	+0·331	15 26 38·66	+0·48	+0·01	+1·90		41·05	15 26 5·66	− 35·39	−34·8	17
					ζ Ursæ Minoris	U	7	−0·094	15 48 55·31	−0·15	−0·01	+1·90	−0·01	57·04	15 48 36·46	− 20·58		
		" "	"	"	ε Ursæ Minoris	U	8	−0·148	16 59 2·80	−0·23	+0·04	+1·90		4·51	16 58 45·07	− 19·44	−28·3	5
					θ Ophiuchi	U	15	+0·017	17 14 52·54	−0·04	+0·01	+1·90	−0·01	54·40	17 14 30·29	− 24·11		
																9th, Mean	−32·6	
	ADEN (Latitude 12° 46′)	1877 Apr. 30	*I.P.E.*	W	R.P.L. 99	U	5	−0·207	12 48 17·79	−0·41	+0·25	+1·46		19·09	12 48 30·86	+ 11·77	+ 3·1	
					Polaris	L	3	+0·940	13 12 18·88	+1·82	−0·68	+1·46	+0·02	21·50	13 12 36·87	+ 15·37		
		May 2	"	"	148*	U	7	−0·083	16 21 55·31	−0·09	−0·01	+1·43		56·64	16 21 12·59	+ 15·95	− 7·3	6
					α Scorpii	U	10	+0·016	16 21 38·27	−0·03	0·00	+1·43	0·00	39·67	16 21 54·90	+ 15·23		
		" "	*I.P.W*	"	α Trianguli Aust.	U	9	+0·062	16 35 28·69	−0·06	0·00	+1·43		30·06	16 35 45·08	+ 15·02	− 5·4	4
					ζ Herculis	U	10	−0·008	16 36 24·76	−0·03	−0·01	+1·43	0·00	26·15	16 36 41·55	+ 15·40		
																2nd, Mean	− 6·5	.

* Mittlere Positionen von 160 Sternen für das Jahr 1875 abgeleitet aus ältern und neuern Beobachtungen. F. W. A. Argelander. In "Astronomische Beobachtungen auf der Sternwarte zu Bonn," Vol. VII, Bonn, 1869.

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
									h m s	s	s	s	s	s	h m s	m s	d	
BOMBAY (E) AND ADEN (W)	ADEN (Latitude 12° 46′)	1877 May 3	*I.P.W.*	W	η Bootis	U	15	−0·0025	13 48 37·43	−0·02	0·00	−1·46		35·95	13 48 52·45	+ 0 16·50	− 8·4	
					β Centauri	U	15	+0·043	13 54 58·27	−0·05	0·00	−1·46	0·00	56·76	13 55 12·88	+ 16·12		
		" 4	"	"	R.P.L. 99	U	9	−0·207	12 48 10·36	−0·22	+0·04	+1·45		11·63	12 48 30·39	+ 18·76	− 3·2	
					Polaris	L	4	+0·940	13 12 21·24	+0·96	−0·10	+1·45	+0·02	23·57	13 12 38·68	+ 15·11		
		" 5	"	"	R.P.L. 99	U	7	−0·207	12 48 8·80	−0·22	+0·18	+1·45		10·21	12 48 30·27	+ 20·06	− 2·5	
					Polaris	L	3	+0·940	13 12 19·98	+0·96	−0·48	+1·45	+0·02	21·93	13 12 39·10	+ 17·17		
		" 6	"	"	R.P.L. 99	U	12	−0·207	12 48 6·94	−0·22	+0·22	+1·44		8·38	12 48 30·15	+ 21·77	− 5·2	
					Polaris	L	5	+0·940	13 12 21·88	+0·96	−0·59	+1·44	+0·02	23·71	13 12 39·52	+ 15·81		
		" 8	*I.P.E.*	"	R.P.L. 99	U	9	−0·207	12 48 5·40	−0·41	−0·08	+1·43		6·34	12 48 29·92	+ 23·58	+ 1·8	4
					Polaris	L	3	+0·940	13 12 11·34	+1·82	+0·23	+1·43	+0·02	14·84	13 12 40·44	+ 25·60		
		" "	"	"	A. 117	U	10	−0·043	13 47 30·58	−0·10	−0·04	+1·43		31·87	13 47 55·30	+ 23·43	− 2·4	2
					β Centauri	U	5	+0·043	13 54 48·35	−0·09	−0·02	+1·43	0·00	49·67	13 55 12·89	+ 23·22		
																8th, Mean	+ 0·4	
		" 9	"	"	R.P.L. 99	U	6	−0·207	12 48 5·00	−0·41	0·00	+1·44		6·03	12 48 29·80	+ 23·77	+ 2·5	
					Polaris	L	3	+0·940	13 12 10·99	+1·82	0·00	+1·44	+0·02	14·27	13 12 40·90	+ 26·63		
ADEN (E) AND SUEZ (W)	ADEN (Latitude 12° 46′)	1877 May 25	*I.P.E.*	E	α Scorpii	U	5	+0·016	16 21 57·59	+0·02	+0·14	+1·74		59·49	16 21 55·31	− 0 4·18	+16·3	3
					η² Draconis	U	6	−0·036	16 22 26·63	+0·03	+0·23	+1·74	0·00	28·63	16 22 23·60	− 5·03		
		" "	"	"	ε Ursæ Minoris	U	4	−0·155	16 58 51·50	+0·12	+0·42	+1·74		53·78	16 58 45·54	− 8·24	+23·5	3
					θ Ophiuchi	U	15	+0·015	17 14 36·46	+0·02	+0·15	−1·74	−0·01	34·88	17 14 30·64	− 4·24		
		" "	"	"	β Draconis	U	12	−0·023	17 27 48·64	+0·03	+0·20	−1·74		47·13	17 27 42·19	− 4·94	+18·1	4
					μ Sagittarii	U	15	+0·013	18 6 33·41	+0·02	+0·15	−1·74	−0·04	31·80	18 6 27·51	− 4·29		
		" "	"	"	δ Ursæ Minoris	U	3	−0·363	18 12 22·79	+0·26	+0·81	−1·74		22·12	18 12 10·88	− 11·24	+20·7	31
					51 Cephei	L	4	+0·457	18 42 4·08	−0·32	−0·62	+1·74	−0·03	4·85	18 42 10·55	+ 5·70		
																25th, Mean	+20·3	
		" 26	"	"	α Scorpii	U	8	+0·016	16 21 58·82	+0·02	−0·05	+1·70		60·49	16 21 55·33	− 5·16	+17·5	5
					η² Draconis	U	8	−0·036	16 22 28·02	+0·03	−0·07	+1·70	0·00	29·68	16 22 23·61	− 6·07		
		" "	"	"	ε Ursæ Minoris	U	3	−0·155	16 58 52·33	+0·12	−0·14	+1·70		54·01	16 58 45·54	− 8·47	+18·9	2
					θ Ophiuchi	U	14	+0·015	17 14 37·66	+0·02	−0·05	−1·70	−0·01	35·92	17 14 30·66	− 5·26		
		" "	"	"	β Draconis	U	10	−0·023	17 27 50·00	+0·03	−0·07	−1·70		48·26	17 27 42·20	− 6·06	+19·4	3
					μ Sagittarii	U	15	+0·013	18 6 34·65	+0·02	−0·03	−1·70	−0·04	32·90	18 6 27·54	− 5·36		
		" "	"	"	δ Ursæ Minoris	U	5	−0·363	18 12 23·65	+0·26	−0·15	−1·70		22·06	18 12 10·97	− 11·09	+18·2	38
					51 Cephei	L	4	+0·457	18 42 5·08	−0·32	+0·11	+1·70	−0·03	6·54	18 42 10·39	+ 3·85		
																26th, Mean	+18·2	

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation d_1	Weight of d_1
									h m s	s	s	s	s	s	h m s	m s	d	
BOMBAY (E) AND ADEN (W)	BOMBAY (Latitude 18° 54′)	1877 May 5	*I.P.E.*	E	R.P.L. 33	L	5	+0·226	15 3 43·99	+0·26	+0·01	+1·89		46·15	15 3 17·62	− 0 28·53	−32·2	13
					R.P.L. 115	U	4	−0·246	15 46 55·02	−0·30	−0·01	−1·89	−0·02	52·80	15 46 39·48	− 13·32		
		" "	"	"	R.P.L. 34	L	5	+0·331	15 26 39·78	+0·38	+0·01	−1·89		38·28	15 26 5·57	− 32·71	−33·6	19
					R.P.L. 115	U	4	−0·246	15 46 55·02	−0·30	−0·01	−1·89	−0·01	52·81	15 46 39·48	− 13·33		
		" "	"	"	ε Ursæ Minoris	U	11	−0·148	16 58 63·64	−0·18	−0·01	−1·89		61·56	16 58 44·83	− 16·73	−29·9	8
					θ Ophiuchi	U	15	+0·017	17 14 53·78	−0·03	0·00	−1·89	−0·01	51·85	17 14 30·19	− 21·66		
																5th, Mean	−32·4	
		" 7	"	"	R.P.L. 33	L	9	+0·226	15 3 53·11	+0·26	+0·03	−1·90		51·50	15 3 17·69	− 33·81	−47·9	25
					R.P.L. 115	U	9	−0·246	15 46 49·21	−0·30	−0·05	+1·90	−0·02	50·74	15 46 39·52	− 11·22		
		" "	"	"	R.P.L. 34	L	5	+0·331	15 26 41·84	+0·38	+0·05	+1·90		44·17	15 26 5·61	− 38·56	−48·8	21
					ζ Ursæ Minoris	U	10	−0·094	15 48 52·51	−0·12	−0·03	+1·90	−0·01	54·25	15 48 36·43	− 17·82		
		" "	"	"	ε Ursæ Minoris	U	10	−0·148	16 58 59·11	−0·18	−0·04	+1·90		60·79	16 58 44·95	− 15·84	−45·5	7
					θ Ophiuchi	U	6	+0·017	17 14 51·74	−0·03	−0·01	+1·90	−0·01	53·59	17 14 30·24	− 23·35		
																7th, Mean	−47·9	
		" 8	*I.P.W.*	"	β Centauri	U	6	+0·044	13 55 35·24	−0·06	+0·02	+1·89		37·09	13 55 12·89	− 24·20	−24·7	18
					ζ Ursæ Minoris	U	13	−0·094	15 48 59·18	−0·15	+0·15	−1·89	−0·05	57·24	15 48 36·45	− 20·79		
		" "	"	"	ε Ursæ Minoris	U	5	−0·148	16 59 7·10	−0·23	+0·19	−1·89		5·17	16 58 45·01	− 20·16	−20·7	3
					θ Ophiuchi	U	15	+0·017	17 14 55·72	−0·04	+0·05	−1·89	−0·01	53·83	17 14 30·26	− 23·57		
																8th, Mean	−24·1	
		" 9	"	"	R.P.L. 33	L	8	+0·226	15 3 50·77	+0·33	+0·01	−1·90		49·21	15 3 17·77	− 31·44	−32·0	25
					R.P.L. 115	U	8	−0·246	15 46 54·43	−0·38	−0·01	+1·90	−0·02	55·92	15 46 39·56	− 16·36		
		" "	"	"	R.P.L. 34	L	4	+0·331	15 26 38·66	+0·48	+0·01	+1·90		41·05	15 26 5·66	− 35·39	−34·8	17
					ζ Ursæ Minoris	U	7	−0·094	15 48 55·31	−0·15	−0·01	+1·90	−0·01	57·04	15 48 36·46	− 20·58		
		" "	"	"	ε Ursæ Minoris	U	8	−0·148	16 59 2·80	−0·23	+0·04	+1·90		4·51	16 58 45·07	− 19·44	−28·3	5
					θ Ophiuchi	U	15	+0·017	17 14 52·54	−0·04	+0·01	+1·90	−0·01	54·40	17 14 30·29	− 24·11		
																9th, Mean	−32·6	
	ADEN (Latitude 12° 46′)	1877 Apr. 30	*I.P.E.*	W	R.P.L. 99	U	5	−0·207	12 48 17·79	−0·41	+0·25	+1·46		19·09	12 48 30·86	+ 11·77	+ 3·1	
					Polaris	L	3	+0·940	13 12 18·88	+1·82	−0·68	+1·46	+0·02	21·50	13 12 36·87	+ 15·37		
		May 2	"	"	148*	U	7	−0·083	16 21 55·31	−0·09	−0·01	+1·43		56·64	16 21 12·59	+ 15·95	− 7·3	6
					α Scorpii	U	10	+0·016	16 21 38·27	−0·03	0·00	+1·43	0·00	39·67	16 21 54·90	+ 15·23		
		" "	*I.P.W*	"	α Trianguli Aust.	U	9	+0·062	16 35 28·69	−0·06	0·00	+1·43		30·06	16 35 45·08	+ 15·02	− 5·4	4
					ζ Herculis	U	10	−0·008	16 36 24·76	−0·03	−0·01	+1·43	0·00	26·15	16 36 41·55	+ 15·40		
																2nd, Mean	− 6·5	.

* Mittlere Positionen von 160 Sternen für das Jahr 1875 abgeleitet aus ältern und neuern Beobachtungen. F. W. A. Argelander. In "Astronomische Beobachtungen auf der Sternwarte zu Bonn," Vol. VII, Bonn, 1869.

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
									h m s	s	s	s	s	s	h m s	m s	d	
BOMBAY (E) AND ADEN (W)	ADEN (Latitude 12° 46′)	1877 May 3	*I.P.W.*	W	η Bootis	U	15	−0·0025	13 48 37·43	−0·02	0·00	−1·46		35·95	13 48 52·45	+ 0 16·50	− 8·4	
					β Centauri	U	15	+0·043	13 54 58·27	−0·05	0·00	−1·46	0·00	56·76	13 55 12·88	+ 16·12		
		" 4	"	"	R.P.L. 99	U	9	−0·207	12 48 10·36	−0·22	+0·04	+1·45		11·63	12 48 30·39	+ 18·76	− 3·2	
					Polaris	L	4	+0·940	13 12 21·24	+0·96	−0·10	+1·45	+0·02	23·57	13 12 38·68	+ 15·11		
		" 5	"	"	R.P.L. 99	U	7	−0·207	12 48 8·80	−0·22	+0·18	+1·45		10·21	12 48 30·27	+ 20·06	− 2·5	
					Polaris	L	3	+0·940	13 12 19·98	+0·96	−0·48	+1·45	+0·02	21·93	13 12 39·10	+ 17·17		
		" 6	"	"	R.P.L. 99	U	12	−0·207	12 48 6·94	−0·22	+0·22	+1·44		8·38	12 48 30·15	+ 21·77	− 5·2	
					Polaris	L	5	+0·940	13 12 21·88	+0·96	−0·59	+1·44	+0·02	23·71	13 12 39·52	+ 15·81		
		" 8	*I.P.E.*	"	R.P.L. 99	U	9	−0·207	12 48 5·40	−0·41	−0·08	+1·43		6·34	12 48 29·92	+ 23·58	+ 1·8	4
					Polaris	L	3	+0·940	13 12 11·34	+1·82	+0·23	+1·43	+0·02	14·84	13 12 40·44	+ 25·60		
		" "	"	"	A. 117	U	10	−0·043	13 47 30·58	−0·10	−0·04	+1·43		31·87	13 47 55·30	+ 23·43	− 2·4	2
					β Centauri	U	5	+0·043	13 54 48·35	−0·09	−0·02	+1·43	0·00	49·67	13 55 12·89	+ 23·22		
																8th, Mean	+ 0·4	
		" 9	"	"	R.P.L. 99	U	6	−0·207	12 48 5·00	−0·41	0·00	+1·44		6·03	12 48 29·80	+ 23·77	+ 2·5	
					Polaris	L	3	+0·940	13 12 10·99	+1·82	0·00	+1·44	+0·02	14·27	13 12 40·90	+ 26·63		
ADEN (E) AND SUEZ (W)	ADEN (Latitude 12° 46′)	1877 May 25	*I.P.E.*	E	α Scorpii	U	5	+0·016	16 21 57·59	+0·02	+0·14	+1·74		59·49	16 21 55·31	− 0 4·18	+16·3	3
					η² Draconis	U	6	−0·036	16 22 26·63	+0·03	+0·23	+1·74	0·00	28·63	16 22 23·60	− 5·03		
		" "	"	"	ε Ursæ Minoris	U	4	−0·155	16 58 51·50	+0·12	+0·42	+1·74		53·78	16 58 45·54	− 8·24	+23·5	3
					θ Ophiuchi	U	15	+0·015	17 14 36·46	+0·02	+0·15	−1·74	−0·01	34·88	17 14 30·64	− 4·24		
		" "	"	"	β Draconis	U	12	−0·023	17 27 48·64	+0·03	+0·20	−1·74		47·13	17 27 42·19	− 4·94	+18·1	4
					μ Sagittarii	U	15	+0·013	18 6 33·41	+0·02	+0·15	−1·74	−0·04	31·80	18 6 27·51	− 4·29		
		" "	"	"	δ Ursæ Minoris	U	3	−0·363	18 12 22·79	+0·26	+0·81	−1·74		22·12	18 12 10·88	− 11·24	+20·7	31
					51 Cephei	L	4	+0·457	18 42 4·08	−0·32	−0·62	+1·74	−0·03	4·85	18 42 10·55	+ 5·70		
																25th, Mean	+20·3	
		" 26	"	"	α Scorpii	U	8	+0·016	16 21 58·82	+0·02	−0·05	+1·70		60·49	16 21 55·33	− 5·16	+17·5	5
					η² Draconis	U	8	−0·036	16 22 28·02	+0·03	−0·07	+1·70	0·00	29·68	16 22 23·61	− 6·07		
		" "	"	"	ε Ursæ Minoris	U	3	−0·155	16 58 52·33	+0·12	−0·14	+1·70		54·01	16 58 45·54	− 8·47	+18·9	2
					θ Ophiuchi	U	14	+0·015	17 14 37·66	+0·02	−0·05	−1·70	−0·01	35·92	17 14 30·66	− 5·26		
		" "	"	"	β Draconis	U	10	−0·023	17 27 50·00	+0·03	−0·07	−1·70		48·26	17 27 42·20	− 6·06	+19·4	3
					μ Sagittarii	U	15	+0·013	18 6 34·65	+0·02	−0·03	−1·70	−0·04	32·90	18 6 27·54	− 5·36		
		" "	"	"	δ Ursæ Minoris	U	5	−0·363	18 12 23·65	+0·26	−0·15	−1·70		22·06	18 12 10·97	− 11·09	+18·2	38
					51 Cephei	L	4	+0·457	18 42 5·08	−0·32	+0·11	+1·70	−0·03	6·54	18 42 10·39	+ 3·85		
																26th, Mean	+18·2	

 TABLE II. DEDUCTION OF DEVIATION ERROR FROM STAR OBSERVATIONS.

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation a_1	Weight of a_1
									h m s	s	s	s	s	s	h m s	m s	d	
ADEN (E) AND SUEZ (W)	ADEN (Latitude 12° 46′)	1877 May 27	*I.P.E.*	E	α Scorpii	U	10	+0·016	16 21 59·97	+0·02	−0·01	+1·70		61·68	16 21 55·34	− 0 6·34	+13·1	6
					η² Draconis	U	10	−0·036	16 22 28·92	+0·03	−0·02	+1·70	0·00	30·63	16 22 23·61	− 7·02		
		" "	"	"	ε Ursæ Minoris	U	5	−0·155	16 58 53·27	+0·12	−0·03	+1·70		55·06	16 58 45·54	− 9·52	+18·6	4
					θ Ophiuchi	U	15	+0·015	17 14 38·74	+0·02	−0·01	−1·70	−0·01	37·04	17 14 30·68	− 6·36		
		" "	"	"	β Draconis	U	10	−0·023	17 28 50·91	+0·03	−0·01	−1·70		49·23	17 28 42·22	− 7·01	+16·1	3
					μ Sagittarii	U	12	+0·013	18 6 35·72	+0·02	−0·01	−1·70	−0·04	33·99	18 6 27·56	− 6·43		
		" "	"	"	δ Ursæ Minoris	U	3	−0·363	18 12 24·97	+0·26	−0·04	−1·70		23·49	18 12 11·05	− 12·44	+17·7	31
					51 Cephei	L	4	+0·457	18 42 6·84	−0·32	+0·03	+1·70	−0·03	8·22	18 42 10·28	+ 2·06		
																27th, Mean	+17·0	
		" 28	*I.P.W.*	"	α Scorpii	U	7	+0·016	16 22 1·75	−0·06	−0·01	+1·70		3·38	16 21 55·36	− 8·02	−16·3	5
					η² Draconis	U	8	−0·036	16 22 29·20	−0·11	−0·01	+1·70	0·00	30·78	16 22 23·61	− 7·17		
		" "	"	"	ε Ursæ Minoris	U	5	−0·155	16 58 50·53	−0·38	−0·02	+1·70		51·83	16 58 45·55	− 6·28	−10·1	4
					θ Ophiuchi	U	10	+0·015	17 14 40·48	−0·06	−0·01	−1·70	−0·01	38·70	17 14 30·70	− 8·00		
		" "	"	"	β Draconis	U	10	−0·023	17 27 51·51	−0·09	−0·01	−1·70		49·71	17 27 42·23	− 7·48	−14·7	3
					μ Sagittarii	U	15	+0·013	18 6 37·38	−0·06	+0·02	−1·70	−0·04	35·60	18 6 27·59	− 8·01		
		" "	"	"	δ Ursæ Minoris	U	4	−0·363	18 12 15·06	−0·87	+0·08	−1·70		12·57	18 12 11·12	− 1·45	−14·0	31
					51 Cephei	L	3	+0·457	18 42 20·38	+1·07	−0·06	+1·70	−0·03	23·06	18 42 10·18	− 12·88		
																28th, Mean	−14·0	
		" 29	"	"	α Scorpii	U	13	+0·016	16 22 6·38	−0·06	−0·04	−1·71		4·57	16 21 55·37	− 9·20	−12·5	5
					η² Draconis	U	7	−0·036	16 22 34·04	−0·11	−0·06	−1·71	0·00	32·16	16 22 23·61	− 8·55		
		" "	"	"	ε Ursæ Minoris	U	5	−0·155	16 58 55·82	−0·38	−0·12	−1·71		53·61	16 58 45·55	− 8·06	− 7·4	4
					θ Ophiuchi	U	15	+0·015	17 14 38·44	−0·06	−0·04	+1·71	−0·01	40·04	17 14 30·72	− 9·32		
		" "	"	"	β Draconis	U	10	−0·023	17 27 49·64	−0·09	−0·06	+1·71		51·20	17 27 42·25	− 8·95	−11·1	3
					μ Sagittarii	U	15	+0·013	18 6 35·39	−0·06	−0·04	+1·71	−0·04	36·96	18 6 27·61	− 9·35		
		" "	"	"	δ Ursæ Minoris	U	4	−0·363	18 12 15·21	−0·87	−0·23	+1·71		15·82	18 12 11·17	− 4·65	−12·0	34
					51 Cephei	L	4	+0·457	18 42 25·11	+1·07	+0·18	−1·71	−0·03	24·62	18 42 10·10	− 14·52		
																29th, Mean	−11·6	
		" 30	"	"	α Scorpii	U	11	+0·016	16 22 4·61	−0·06	−0·03	+1·71		6·23	16 21 55·38	− 10·85	−14·2	6
					η² Draconis	U	10	−0·036	16 22 32·18	−0·11	−0·05	+1·71	0·00	33·73	16 22 23·62	− 10·11		
		" "	"	"	ε Ursæ Minoris	U	5	−0·155	16 58 54·01	−0·38	−0·09	+1·71		55·25	16 58 45·56	− 9·69	− 7·3	4
					θ Ophiuchi	U	15	+0·015	17 14 43·47	−0·06	−0·03	−1·71	−0·01	41·66	17 14 30·74	− 10·92		
		" "	"	"	β Draconis	U	11	−0·023	17 27 54·63	−0·09	−0·04	−1·71		52·79	17 27 42·26	− 10·53	− 12·0	3
					μ Sagittarii	U	15	+0·013	18 6 40·43	−0·06	−0·03	−1·71	−0·04	38·59	18 6 27·63	− 10·96		

Arc	Station	Astronomical Date	Instrumental Position	Clock in use	Star	Culmination	No. of Wires Observed	Deviation Constant A	Observed Time of Transit	Corrections for Collimation	Corrections for Level	Corrections for Pen Equation Q	Corrections for Clock Rate	Seconds of Corrected Time of Transit	Right Ascension (increased by 12h. for lower Culmination)	Apparent Clock Corrections	Deduced Value of Deviation d_1	Weight of d_1
									h m s	s	s	s	s	s	h m s	m s	d	
	ADEN (Latitude 12° 46′)	1877 May 30	*I.P.W.*	E	δ Ursæ Minoris	U	4	−0.363	18 12 20.37	−0.87	−0.17	−1.71		17.62	18 12 11.23	− 0 6.39	−11.5	38
					51 Cephei	L	5	+0.457	18 42 22.97	+1.07	+0.13	+1.71	−0.03	25.85	18 42 10.02	− 15.83		
																30th, Mean	−11.5	
ADEN (E) AND SUEZ (W)	SUEZ (Latitude 29° 58′)	1877 May 25	*I.P.E.*	W	R.P.L. 33	L	6	+0.212	15 3 28.28	+0.35	+2.63	+1.32		32.58	15 3 19.17	− 0 13.41	−20.8	
					R.P.L. 111	U	5	−0.189	15 4 35.93	−0.35	−3.70	+1.32	0.00	33.20	15 4 28.14	− 5.06		
		„ „	„	„	R.P.L. 43	L	4	+0.356	17 57 47.83	+0.60	+4.90	+1.32		54.65	17 57 39.57	− 15.08	−16.3	
					δ Ursæ Minoris	U	10	−0.317	18 12 19.99	−0.57	−5.73	+1.32	−0.02	14.99	18 12 10.88	− 4.11		
																25th, Mean	−18.6	
		„ 26	„	„	R.P.L. 33	L	4	+0.212	15 3 41.46	+0.35	+0.32	+1.31		43.44	15 3 19.31	− 24.13	−60.5	
					R.P.L. 111	U	5	−0.189	15 4 27.39	−0.35	−0.45	+1.31	0.00	27.90	15 4 28.03	+ 0.13		
		„ „	„	„	R.P.L. 43	L	5	+0.356	17 58 11.88	+0.60	+0.59	+1.31		14.38	17 57 39.53	− 34.85	−65.9	
					δ Ursæ Minoris	U	5	−0.317	18 12 1.45	−0.57	−0.69	+1.31	−0.02	1.48	18 12 10.97	+ 9.49		
																26th, Mean	−63.2	
		„ 27	„	„	R.P.L. 33	L	5	+0.212	15 3 46.99	+0.35	+0.15	+1.30		48.79	15 3 19.44	− 29.35	−75.6	
					R.P.L. 111	U	5	−0.189	15 4 26.21	−0.35	−0.22	+1.30	0.00	26.94	15 4 27.91	+ 0.97		
		„ „	„	„	R.P.L. 43	L	5	+0.356	17 58 15.70	+0.60	+0.29	+1.30		17.89	17 57 39.49	− 38.40	−72.0	
					δ Ursæ Minoris	U	5	−0.317	18 12 0.63	−0.57	−0.33	+1.30	−0.02	1.01	18 12 11.05	+ 10.04		
																27th, Mean	−73.8	
		„ 28	*I.P.W.*	„	R.P.L. 33	L	5	+0.212	15 3 33.93	+1.23	+0.51	+1.32		36.99	15 3 19.58	− 17.41	−13.4	
					R.P.L. 111	U	5	−0.189	15 4 40.45	−1.23	−0.72	+1.32	0.00	39.82	15 4 27.80	− 12.02		
		„ „	„	„	R.P.L. 43	L	5	+0.356	17 57 51.64	+2.11	+0.95	+1.32		56.02	17 57 39.45	− 16.57	− 6.2	
					δ Ursæ Minoris	U	6	−0.317	18 12 25.34	−2.01	−1.11	+1.32	−0.02	23.52	18 12 11.12	− 12.40		
																28th, Mean	− 9.8	
		„ 29	„	„	R.P.L. 33	L	5	+0.212	15 3 34.86	+1.23	+0.35	+1.31		37.75	15 3 19.71	− 18.04	− 9.0	
					R.P.L. 111	U	5	−0.189	15 4 42.54	−1.23	−0.49	+1.31	0.00	42.13	15 4 27.69	− 14.44		
		„ „	„	„	R.P.L. 43	L	1	+0.356	17 57 51.55	+2.11	+0.64	+1.31		55.61	17 57 39.41	− 16.20	+ 0.4	
					δ Ursæ Minoris	U	5	−0.317	18 12 29.14	−2.01	−0.75	+1.31	−0.02	27.67	18 12 11.17	− 16.50		
																29th, Mean	− 4.3	
		„ 30	„	„	R.P.L. 43	L	5	+0.356	17 57 54.25	+2.11	+0.98	+1.31		58.65	17 57 39.37	− 19.28	− 3.9	
					δ Ursæ Minoris	U	16	−0.317	18 12 29.77	−2.01	−1.15	+1.31	−0.02	27.90	18 12 11.23	− 16.67		

TABLE III. DEDUCTION OF DEVIATION ERROR AT ADEN.

On 1st, 3rd and 7th May from Readings of Collimators.

Astronomical Date	Instrumental Position	Value of Deviation a_1 from *Table II*	North N	South S	Differences from Means		Mean $\frac{\delta N + \delta S}{2}$	Deduced Deviation Error
					δN	δS		
1877		d	d	d	d	d	d	d
May 1	*I.P.W.*	......	60·4*	81·0*	− 5·5	− 7·6	− 6·6	−11·0
„ 2	„	− 6·5	62·6	77·1	− 3·3	− 3·7	− 3·5	− 7·9
„ 3	„	......	63·8*	77·6*	− 2·1	− 4·2	− 3·2	− 7·6
„ 4	„	− 3·2	66·5	72·4	+ 0·6	+ 1·0	+ 0·8	− 3·6
„ 5	„	− 2·5	66·8	72·2	+ 0·9	+ 1·2	+ 1·1	− 3·3
„ 6	„	− 5·2	67·5	71·7	+ 1·6	+ 1·7	+ 1·7	− 2·7
	Means	− 4·4	65·9	73·4				
May 7	*I.P.E.*	......	65·0*	72·2*	− 1·9	− 1·6	− 1·8	− 0·3
„ 8	„	+ 0·4	64·1	73·5	− 1·0	− 0·3	− 0·7	+ 0·8
„ 9	„	+ 2·5	62·0	74·0	+ 1·1	+ 0·2	+ 0·7	+ 2·2
	Means	+ 1·5	63·1	73·8				

The values of deviation error deduced above for 1st and 7th May are adopted for use on those days. The value deduced for 3rd May is combined with that derived from star observations *Table II*, and their arithmetical mean is adopted.

* Not included in taking out mean.

TABLE IV. VALUES OF DEVIATION ERROR, *a*, FINALLY ADOPTED.

Astronomical Date	At Bombay	At Aden	Astronomical Date	At Aden	At Suez
1877	d	d	1877	d	d
April 30	− 43·2	+ 3·1	May 25	+ 20·3	− 18·6
May 1	− 18·7	− 11·0	„ 26	+ 18·2	− 63·2
„ 2	− 23·0	− 6·5	„ 27	+ 17·0	− 73·8
„ 3	− 26·7	− 8·0	„ 28	− 14·0	− 9·8
„ 4	− 27·6	− 3·2	„ 29	− 11·6	− 4·3
„ 5	− 32·4	− 2·5	„ 30	− 11·5	− 3·9
„ 6	......	− 5·2			
„ 7	− 47·9	− 0·3			
„ 8	− 24·1	+ 0·4			
„ 9	− 32·6	+ 2·5			

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_B
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 April 30	14 18 38·19	12 26 50·85	4·23	3·87	·52	2·20	·68	2·63	14 18 40·39	...	1 51 49·54	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 51m 49s·976; " 12 " = 1 51 49·396; General Mean = d = 1 51 49·686
	42·42	54·72	3·97	3·83	·46	1·83	·71	2·72	44·25	12 26 53·48	·53	1 51 48·94	0·60	
	46·39	58·55	3·66	3·98	·46	1·68	·64	2·55	48·07	57·44	·52	·95	·58	
Comparison No. 1	50·05	27 2·53	3·63	3·45	·57	2·07	·63	2·17	52·12	27 1·10	·59	·95	·57	
	53·68	5·98	3·83	3·69	·51	1·80	·63	2·32	55·48	4·70	·50	·98	·61	
Exchange A	57·21	9·67	3·92	3·80	·50	1·96	·66	2·51	59·17	8·30	·50	·91	·59	
	19 1·13	13·47	3·57	3·53	·51	1·82	·65	2·29	19 2·95	12·18	·48	·95	·55	
Current used	4·70	17·00	3·61	3·60	·50	1·81	·65	2·34	6·51	15·76	·51	·94	·54	
at East, Positive	8·31	20·60	3·51	3·58	·54	1·90	·64	2·29	10·21	19·34	·61	·97	·54	
at West, "	11·82	24·18	3·57	3·62	·52	1·86	·63	2·28	13·68	22·89	·50	·93	·68	
	15·39	27·80	3·51	3·54	·56	1·97	·60	2·12	17·36	26·46	·56	·93	·57	
Pen Equation	18·90	31·34	3·52	3·56	·56	1·97	·60	2·14	20·87	29·92	·53	·98	·58	
	22·42	34·90	3·67	3·57	·54	1·98	·63	2·25	24·40	33·48	·50	·94	·59	
at East + 1s·901	26·09	38·47	3·48	3·52	·55	1·91	·61	2·15	28·00	37·15	·53	·94	·56	
at West + 1·456	29·57	41·99	3·60	3·64	·55	1·98	·60	2·18	31·55	40·62	·56	·95	·58	
	33·17	45·63							...	44·17	...	49·00	·56	
Mean	14 19 6 = t_B										1 51 49·531	1 51 48·951	·580	
1877 April 30	14 23 47·80	12 31 59·80	4·50	3·74	·52	2·34	·70	2·62	14 23 50·14	...	1 51 50·34	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 51m 49s·964; " 12 " = 1 51 49·412; General Mean = d = 1 51 49·688
	52·30	32 3·54	3·60	3·77	·46	1·66	·65	2·45	53·96	12 32 2·42	·42	1 51 49·88	0·46	
	55·90	7·31	3·90	3·74	·49	1·91	·70	2·62	57 81	5·99	·50	·91	·51	
Comparison No. 1	59·80	11·05	3·34	3·35	·50	1·67	·67	2·24	24 1·47	9·93	·42	·87	·63	
	24 3·14	14·40	3·34	3·33	·50	1·67	·66	2·20	4·81	13·29	·41	·85	·57	
	6·48	17·73	3·36	3·45	·50	1·68	·66	2·28	8·16	16·60	·43	·88	·53	
Exchange B	9·84	21·18	3·39	3·47	·50	1·70	·65	2·26	11·54	20·01	·36	·83	·60	
	13·23	24·65	3·47	3·65	·51	1·77	·60	2·19	15·00	23·44	·35	·79	·57	
Current used	16·70	28·30	3·59	3·32	·56	2·01	·64	2·12	18·71	26·84	·41	·86	·49	
	20·29	31·62	3·36	3·58	·52	1·75	·60	2·15	22·04	30·42	·42	·87	·54	
at East, Negative	23·65	35·20	3·54	3·41	·56	1·98	·62	2·11	25·63	33·77	·43	·88	·54	
at West, "	27·19	38·61	3·48	3·57	·50	1·74	·63	2·25	28·93	37·31	·32	·88	·55	
	30·67	42·18	3·46	3·43	·56	1·94	·60	2·06	32·61	40·86	·43	·81	·51	
Pen Equation	34·13	45·61	3·49	3·29	·55	1·92	·66	2·17	36·05	44·24	·44	·89	·54	
at East − 1s·901	37·62	48·90	3·46	3·70	·50	1·73	·64	2·37	39·35	47·78	·45	·84	·60	
at West − 1·456	41·08	52·60							...	51·27	...	·81	·64	
Mean	14 24 14 = t_B										1 51 50·409	1 51 49·857	·552	

TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East (1)	Times of Local Signals recorded on Chronograph at: West (2)	Intervals between successive Local Signals as recorded at: East (3)	Intervals between successive Local Signals as recorded at: West (4)	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape, Decimal (5)	Signals from West on East Tape, Seconds (6)	Signals from East on West Tape, Decimal (7)	Signals from East on West Tape, Seconds (8)	Times of Signals in Terms of Distant Clock: West Signals by East Clock 9 (= 1 + 6)	East Signals by West Clock 10 (= 2 + 8)	Observed Differences of Clocks at: East 11 (= 9 − 2)	West 12 (= 1 − 10)	Resulting Values of double Retardation 13 (= 11 − 12)	Deduction of d, the Final Difference between the Clocks at Epoch t_x
1877	h m s 14 25 0·17	h m s 12 33 12·60	s 4·05	s 3·80	·50	s 2·03	·69	s 2·62	h m s 14 25 2·20	h m s ...	h m s 1 51 49·60	h m s ...	s ...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 49·984 s „ „ 12 „ = 1 51 49·410 General Mean = d = 1 51 49·697
April 30	4·22	16·40	3·61	3·62	·48	1·73	·69	2·50	5·95	12 33 15·22	·55	1 51 49·00	0·60	
	7·83	20·02	3·32	3·35	·54	1·79	·64	2·14	9·62	18·90	·60	48·93	·62	
Comparison No. 1	11·15	23·37	3·45	3·40	·50	1·73	·66	2·24	12·88	22·16	·51	·99	·61	
	14·60	26·77	3·34	3·48	·50	1·67	·64	2·23	16·27	25·61	·50	·99	·52	
Exchange C	17·94	30·25	3·56	3·50	·50	1·78	·65	2·28	19·72	29·00	·47	·94	·56	
	21·50	33·75	3·41	3·54	·53	1·81	·63	2·23	23·31	32·53	·56	·97	·50	
	24·91	37·29	3·68	3·49	·50	1·84	·67	2·34	26·75	35·98	·46	·93	·63	
Current used	28·59	40·78	3·56	3·59	·49	1·74	·67	2·41	30·33	39·63	·55	·96	·50	
at East, Positive	32·15	44·37	3·45	3·23	·50	1·73	·70	2·26	33·88	43·19	·51	·96	·59	
at West, „	35·60	47·60	3·32	3·48	·46	1·53	·68	2·37	37·13	46·63	·53	·97	·54	
	38·92	51·08	3·49	3·34	·49	1·71	·70	2·34	40·63	49·97	·55	·95	·58	
	42·41	54·42	3·27	3·28	·49	1·60	·70	2·30	44·01	53·42	·59	·99	·56	
Pen Equation	45·68	57·70	3·31	3·62	·48	1·59	·64	2·32	47·27	56·72	·57	·96	·63	
at East + 1·901 s	48·99	34 1·32	3·52	3·36	·53	1·87	·66	2·22	50·86	34 0·02	·54	·97	·60	
at West + 1·456	52·51	4·68							...	3·54	...	·97	·57	
Mean	14 25 26 = t_x										1 51 49·539	1 51 48·965	·574	
1877	14 26 17·40	12 34 32·60	3·58	3·71	·51	1·83	·61	2·26	14 26 19·23	...	1 51 46·63	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 49·968 s „ „ 12 „ = 1 51 49·426 General Mean = d = 1 51 49·697
April 30	20·98	36·31	3·65	3·49	·54	1·97	·65	2·27	22·95	12 34 34·86	·64	1 51 46·12	0·51	
	24·63	39·80	3·49	3·55	·50	1·75	·64	2·27	26·38	38·58	·58	·05	·59	
Comparison No. 1	28·12	43·35	3·49	3·37	·53	1·85	·66	2·22	29·97	42·07	·62	·05	·53	
	31·61	46·72	3·38	3·19	·51	1·72	·68	2·17	33·33	45·57	·61	·04	·58	
	34·99	49·91	3·38	3·59	·47	1·59	·65	2·33	36·58	48·89	·67	·10	·51	
Exchange D	38·37	53·50	3·43	3·48	·50	1·72	·65	2·26	40·09	52·24	·59	·13	·54	
	41·80	56·98	3·54	3·50	·50	1·77	·66	2·31	43·57	55·76	·59	·04	·55	
	45·34	35 0·48	3·55	3·45	·50	1·78	·68	2·35	47·12	59·29	·64	·05	·54	
Current used	48·89	3·93	3·88	3·91	·43	1·67	·70	2·74	50·56	35 2·83	·63	·06	·58	
at East, Negative	52·77	7·84	3·55	3·53	·49	1·74	·67	2·37	54·51	6·67	·67	·10	·53	
at West, „	56·32	11·37	3·59	3·92	·47	1·69	·64	2·51	58·01	10·21	·64	·11	·56	
	59·91	15·29	3·83	3·42	·50	1·92	·70	2·39	27 1·83	13·88	·54	·03	·61	
Pen Equation	27 3·74	18·71	3·68	3·68	·40	1·47	·73	2·69	5·21	17·68	·50	·06	·48	
s	7·42	22·39							...	21·40	...	·02	·48	
at East + 1·901														
at West − 1·456														
Mean	14 26 42 = t_x										1 51 46·611	1 51 46·069	·542	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 April 30	17 46 49·77	15 55 1·97	3·83	3·47	·55	2·11	·67	2·32	17 46 51·88	...	1 51 49·91	...	...	
	53·60	5·44	3·50	3·55	·48	1·68	·64	2·27	55·28	15 55 4·29	·84	1 51 49·31	0·60	
	57·10	8·99	3·53	3·43	·50	1·77	·68	2·33	58·87	7·71	·88	·39	·45	
Comparison No. 2	47 0·63	12·42	3·37	3·38	·50	1·69	·66	2·23	47 2·32	11·32	·90	·31	·57	
	4·00	15·80	3·40	3·21	·50	1·70	·70	2·25	5·70	14·65	·90	·35	·55	
Exchange A	7·40	19·01	4·21	4·39	·36	1·52	·75	3·29	8·92	18·05	·91	·35	·55	
	11·61	23·40	3·31	3·34	·50	1·66	·66	2·20	13·27	22·30	·87	·31	·60	
	14·92	26·74	3·46	3·66	·47	1·63	·63	2·31	16·55	25·60	·81	·32	·55	
Current used	18·38	30·40	3·52	3·30	·53	1·87	·66	2·18	20·25	29·05	·85	·33	·48	
at East, Positive	21·90	33·70	3·27	3·47	·50	1·64	62	2·15	23·54	32·58	·84	·32	·53	
at West, „	25·17	37·17	3·43	3·31	·56	1·92	·64	2·12	27·09	35·85	·92	·32	·52	
	28·60	40·48	3·30	3·35	·53	1·75	·62	2·08	30·35	39·29	·87	·31	·61	
Pen Equation	31·90	43·83	3·44	3·51	·52	1·79	·64	2·25	33·69	42·56	·86	·34	·53	
	35·34	47·34	3·39	3·05	·54	1·83	·70	2·14	37·17	46·08	·83	·26	·60	
s at East + 1·900	38·73	50·39	3·17	3·36	·47	1·49	·66	2·22	40·22	49·48	·83	·25	·58	
at West + 1·456	41·90	53·75							...	52·61	...	·29	·54	
Mean	17 47 16 = t_E										1 51 49·868	1 51 49·317	·551	Mean of col. 11 after Correction for Pen Equations = h m s 1 51 50·312; „ „ 12 „ „ = 1 51 49·761; General Mean = d = 1 51 50·037
1877 April 30	17 48 1·84	15 56 16·81	3·62	3·29	·53	1·92	·68	2·24	17 48 3·76	...	1 51 46·95	...	...	
	5·46	20·10	3·24	3·30	·49	1·59	·66	2·18	7·05	15 56 19·05	·95	1 51 46·41	0·54	
	8·70	23·40	3·30	3·26	·50	1·65	·67	2·18	10·35	22·28	·95	·42	·53	
Comparison No. 2	12·00	26·66	3·23	3·33	·50	1·62	·67	2·23	13·62	25·58	·96	·42	·53	
	15·23	29·99	3·27	3·21	·50	1·64	·66	2·12	16·87	28·89	·88	·34	·62	
	18·50	33·20	3·19	3·20	·53	1·69	·64	2·05	20·19	32·11	·99	·39	·49	
Exchange B	21·69	36·40	3·23	3·11	·49	1·58	·70	2·18	23·27	35·25	87	·44	·55	
	24·92	39·51	3·22	3·29	·46	1·48	·66	2·17	26·40	38·58	·89	·34	·53	
Current used	28·14	42·80	3·27	3·10	·50	1·64	·70	2·17	29·78	41·68	·98	·46	·43	
	31·41	45·90	3·11	3·39	·47	1·46	·65	2·20	32·87	44·97	·97	·44	·54	
at East, Negative	34·52	49·29	3·30	3·31	·52	1·72	·65	2·15	36·24	48·10	·95	·42	·55	
at West, „	37·82	52·60	3·38	3·28	·50	1·69	·64	2·10	39·51	51·44	·91	·38	·57	
	41·20	55·88	3·62	3·63	·44	1·59	·70	2·54	42·79	54·70	·91	·50	·41	
Pen Equation	44·82	59·51	3·37	3·29	·47	1·58	·69	2·27	46·40	58·42	·89	·40	·51	
s at East + 1·900	48·19	57 2·80	3·29	3·27	·46	1·51	·71	2·32	49·70	57 1·78	·90	·41	·48	
at West − 1·456	51·48	6·07				..			...	5·12	...	·36	·54	
Mean	17 48 27 = t_E										1 51 46·930	1 51 46·409	·521	Mean of col. 11 after Correction for Pen Equations = h m s 1 51 50·286; „ „ 12 „ „ = 1 51 49·765; General Mean = d = 1 51 50·026

TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 April 30	17 49 21·55	15 57 30·60	4·51	3·39	·59	2·66	·69	2·34	17 49 24·21	...	1 51 53·61	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 50·285 s; „ 12 „ = 1 51 49·742; General Mean = d = 1 51 50·014
	26·06	33·99	3·24	3·08	·50	1·62	·71	2·19	27·68	15 57 32·94	·69	1 51 53·12	0·49	
	29·30	37·07	3·04	3·13	·45	1·37	·70	2·19	30·67	36·18	·60	·12	·57	
Comparison No. 2	32·34	40·20	3·15	3·25	·49	1·54	·67	2·18	33·88	39·26	·68	·08	·52	
	35·49	43·45	3·21	3·15	·50	1·61	·69	2·17	37·10	42·38	·65	·11	·57	
Exchange C	38·70	46·60	3·29	3·28	·46	1·51	·69	2·26	40·21	45·62	·61	·08	·57	
	41·99	49·88	3·24	3·35	·46	1·49	·68	2·28	43·48	48·86	·60	·13	·48	
	45·23	53·23	3·25	3·17	·50	1·63	·68	2·16	46·86	52·16	·63	·07	·53	
Current used	48·48	56·40	3·28	3·29	·50	1·64	·69	2·27	50·12	55·39	·72	·09	·54	
at East, Positive	51·76	59·69	3·24	3·16	·49	1·59	·70	2·21	53·35	58·67	·66	·09	·63	
at West, „	55·00	58 2·85	3·15	3·24	·48	1·51	·69	2·24	56·51	58 1·90	·66	·10	·56	
	58·15	6·09	3·16	3·21	·50	1·58	·66	2·12	59·73	5·09	·64	·06	·60	
Pen Equation	50 1·31	9·30	3·31	3·38	·49	1·62	·66	2·23	50 2·93	8·21	·63	·10	·54	
s	4·62	12·68	3·40	3·29	·50	1·70	·67	2·20	6·32	11·53	·64	·09	·54	
at East − 1·900	8·02	15·97	3·61	3·57	·43	1·55	·72	2·57	9·57	14·88	·60	·14	·50	
at West + 1·456	11·63	19·54							...	18·54	...	·09	·51	
Mean	17 49 47 = t_E										1 51 53·641	1 51 53·098	·543	
1877 April 30	17 50 34·59	15 58 45·66	3·53	3·41	·50	1·77	·66	2·25	17 50 36·36	...	1 51 50·70	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 50·262 s; „ 12 „ = 1 51 49·763; General Mean = d = 1 51 50·013
	38·12	49·07	3·48	3·40	·46	1·60	·67	2·28	39·72	15 58 47·91	·65	1 51 50·21	0·49	
	41·60	52·47	3·27	3·32	·50	1·64	·67	2·22	43·24	51·35	·77	·25	·40	
	44·87	55·79	3·33	3·36	·47	1·57	·66	2·22	46·44	54·69	·65	·18	·59	
Comparison No. 2	48·20	59·15	3·31	3·15	·50	1·66	·69	2·17	49·86	58·01	·71	·19	·46	
	51·51	59 2·30	3·19	3·28	·49	1·56	·68	2·23	53·07	59 1·32	·77	·19	·52	
Exchange D	54·70	5·58	3·25	3·22	·48	1·56	·66	2·13	56·26	4·53	·68	·17	·60	
	57·95	8·80	3·24	3·20	·47	1·52	·66	2·11	59·47	7·71	·67	·24	·44	
Current used	51 1·19	12·00	3·24	3·33	·47	1·52	·67	2·23	51 2·71	10·91	·71	·28	·39	
	4·43	15·33	3·32	3·37	·46	1·53	·66	2·22	5·96	14·23	·63	·20	·51	
at East, Negative	7·75	18·70	3·44	3·47	·48	1·65	·65	2·26	9·40	17·55	·70	·20	·43	
at West, „	11·19	22·17	3·31	3·43	·51	1·69	·64	2·20	12·88	20·96	·71	·23	·47	
	14·50	25·60	3·43	3·01	·53	1·82	·70	2·11	16·32	24·37	·72	·13	·58	
Pen Equation	17·93	28·61	3·09	3·39	·46	1·42	·65	2·20	19·35	27·71	·74	·22	·50	
s	21·02	32·00	3·45	3·28	·51	1·76	·69	2·26	22·78	30·81	·78	·21	·53	
at East − 1·900	24·47	35·28							...	34·26	...	·21	·57	
at West − 1·456														
Mean	17 51 0 = t_E										1 51 50·706	1 51 50·207	·499	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at East	Times of Local Signals recorded on Chronograph at West	Intervals between successive Local Signals as recorded at East	Intervals between successive Local Signals as recorded at West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape, Decimal	Signals from West on East Tape, Seconds	Signals from East on West Tape, Decimal	Signals from East on West Tape, Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at East	Observed Differences of Clocks at West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 1	14 16 50·93	12 25 1·17	4·57	4·24	·41	1·87	·76	3·22	14 16 52·80	...	1 51 51·63	...	...	Mean of col. 11 after Correction for Pen Equations = 1 51 52·081 (h m s); " 12 " " = 1 51 51·540; General Mean = d = 1 51 51·811
	55·50	5·41	3·48	3·49	·45	1·57	·70	2·44	57·07	12 25 4·39	·66	1 51 51·11	0·52	
	58·98	8·90	3·42	3·60	·44	1·50	·66	2·38	17 0·48	7·85	·58	·13	·53	
Comparison No. 1	17 2·40	12·50	3·73	3·60	·47	1·75	·70	2·52	4·15	11·28	·65	·12	·46	
	6·13	16·10	3·37	3·48	·47	1·58	·66	2·30	7·71	15·02	·61	·11	·54	
Exchange A	9·50	19·58	3·55	3·44	·48	1·70	·70	2·41	11·20	18·40	·62	·10	·51	
	13·05	23·02	3·29	3·49	·48	1·58	·65	2·27	14·63	21·99	·61	·06	·56	
	16·34	26·51	3·46	3·39	·50	1·73	·65	2·20	18·07	25·29	·56	·05	·56	
Current used	19·80	29·90	3·41	3·42	·50	1·71	·65	2·22	21·51	28·71	·61	·09	·47	
at East, Positive	23·21	33·32	3·49	3·28	·50	1·75	·70	2·30	24·96	32·12	·64	·09	·52	
at West, "	26·70	36·60	3·30	3·38	·47	1·55	·69	2·33	28·25	35·62	·65	·08	·56	
	30·00	39·98	3·40	3·49	·47	1·60	·67	2·34	31·60	38·93	·62	·07	·58	
	33·40	43·47	3·37	3·43	·50	1·69	·65	2·23	35·09	42·32	·62	·08	·54	
Pen Equation	36·77	46·90	3·55	3·46	·50	1·78	·68	2·35	38·55	45·70	·65	·07	·55	
at East + 1·903 s	40·32	50·36	3·47	3·48	·50	1·74	·68	2·37	42·06	49·25	·70	·07	·58	
at West + 1·449	43·79	53·84							...	52·73	...	·06	·64	
Mean	14 17 17 = t_E										1 51 51·627	1 51 51·086	·541	
1877 May 1	14 18 12·13	12 26 21·31	3·87	3·77	·44	1·70	·70	2·64	14 18 13·83	...	1 51 52·52	...	...	Mean of col. 11 after Correction for Pen Equations = 1 51 52·097 (h m s); " 12 " " = 1 51 51·562; General Mean = d = 1 51 51·830
	16·00	25·08	3·40	3·32	·48	1·63	·70	2·32	17·63	12 26 23·95	·55	1 51 52·05	0·47	
	19·40	28·40	3·20	3·30	·48	1·54	·65	2·15	20 94	27·40	·54	·00	·55	
Comparison No. 1	22·60	31·70	3·35	3·40	·50	1·68	·66	2·24	24·28	30·55	·58	·05	·49	
	25·95	35·10	3·39	3·43	·50	1·70	·65	2·23	27·65	33·94	·55	·01	·57	
	29·34	38·53	3·38	3·36	·50	1·69	·66	2·22	31·03	37·33	·50	·01	·54	
Exchange B	32·72	41·89	3·38	3·05	·50	1·69	·72	2·20	34·41	40·75	·52	51·97	·53	
	36·10	44·94	3·06	3·36	·47	1·44	·66	2·22	37·54	44·09	·60	52·01	·51	
Current used	39·16	48·30	3·34	3·41	·50	1·67	·63	2·15	40·83	47·16	·53	·00	·60	
	42·50	51·71	3·41	3·21	·53	1·81	·69	2·21	44·31	50·45	·60	·05	·48	
at East, Negative	45·91	54·92	3·22	3·27	·49	1·58	·67	2·19	47·49	53·92	·57	51·99	·61	
at West, "	49·13	58·19	3·22	3·29	·50	1·61	·65	2·14	50·74	57·11	·55	52·02	·55	
	52·35	27 1·48	3·37	3·32	·50	1·69	·67	2·22	54·04	27 0·33	·56	·02	·53	
Pen Equation	55·72	4·80	3·31	3·40	·50	1·66	·66	2·24	57·38	3·70	·58	·02	·54	
at East − 1·903 s	59·03	8·20	3·37	3·36	·50	1·69	·64	2·15	60·72	7·04	·52	51·99	·59	
at West − 1·449	62·40	11·56							...	10·35	...	52·05	·47	
Mean	14 18 37 = t_E										1 51 52·551	1 51 52·016	·535	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	West	Intervals between successive Local Signals as recorded at: East	West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Seconds	Signals from East on West Tape: Decimal	Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at: East	West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s 14 19 21·55	h m s 12 27 32·11	s 4·34	s 3·86	·52	s 2·26	·70	s 2·70	h m s 14 19 23·81	h m s ...	h m s 1 51 51·70	h m s ...	s ...	Mean of col. 11 after Correction for Pen Equations = 1h 51m 52s·089; „ 12 „ = 1 51 51·515; General Mean = d = 1 51 51·802
May 1	25·89	35·97	3·50	3·44	·51	1·79	·66	2·27	27·68	12 27 34·81	·71	1 51 51·08	0·62	
	29·39	39·41	3·36	3·31	·51	1·71	·69	2·28	31·10	38·24	·69	·15	·56	
Comparison No. 1	32·75	42·72	3·30	3·38	·50	1·65	·67	2·26	34·40	41·69	·68	·06	·63	
	36 05	46·10	3·34	3·33	·50	1·67	·66	2·20	37·72	44·98	·62	·07	·61	
Exchange C	39·39	49·43	3·33	3·28	·50	1·67	·67	2·20	41·06	48·30	·63	·09	·53	
	42·72	52·71	3·31	3·31	·47	1·56	·68	2·25	44·28	51·63	·57	·09	·54	
	46·03	56·02	3·29	3·28	·50	1·65	·68	2·23	47·68	54·96	·66	·07	·50	
Current used	49·32	59·30	3·39	3·50	·50	1·70	·68	2·38	51·02	58·25	·72	·07	·59	
at East, Positive	52·71	28 2·80	3·31	3·36	·52	1·72	·64	2·15	54·43	28 1·68	·63	·03	·69	
at West, „	56·02	6·16	3·35	3·43	·50	1·68	·64	2·20	57·70	4·95	·54	·07	·56	
	59·37	9·59	3·35	3·21	·55	1·84	·65	2·09	20 1·21	8·36	·62	·01	·53	
Pen Equation	20 2·72	12·80	3·36	3·49	·50	1·68	·65	2·27	4·40	11·68	·60	·04	·58	
s	6·08	16·29	3·59	3·40	·50	1·80	·69	2·35	7·88	15·07	·59	·01	·59	
at East + 1·903	9·67	19·69	3·24	3·35	·49	1·59	·65	2·18	11·26	18·64	·57	·03	·56	
at West + 1·449	12·91	23·04							...	21·87	...	·04	·53	
Mean	14 19 47 = t_E										1 51 51·635	1 51 51·061	·575	
1877	14 20 40·99	12 28 50·10	3·36	3·19	·50	1·68	·70	2·23	14 20 42·67	...	1 51 52·57	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 51m 52s·098; „ 12 „ = 1 51 51·562; General Mean = d = 1 51 51·830
May 1	44·35	53·29	3·25	3·30	·45	1·46	·70	2·31	45·81	12 28 52·33	·52	1 51 52·02	0·55	
	47·60	56·59	3·19	3·11	·50	1·60	·70	2·18	49·20	55·60	·61	·00	·52	
Comparison No. 1	50·79	59·70	3·11	3·26	·45	1·40	·67	2·18	52·19	58·77	·49	·02	·59	
	53·90	29 2·96	3·22	3·05	·50	1·61	·70	2·14	55·51	29 1·88	·55	·02	·47	
	57·12	6·01	3·07	3·24	·48	1·47	·67	2·17	58·59	5·10	·58	·02	·53	
Exchange D	21 0·19	9·25	3·49	3·35	·45	1·57	·72	2·41	21 1·76	8·18	·51	·01	·57	
	3·68	12·60	3·10	3·06	·50	1·55	·71	2·17	5·23	11·66	·63	·02	·49	
Current used	6·78	15·66	3·02	3·04	·48	1·45	·70	2·13	8·23	14·77	·57	·01	·62	
	9·80	18·70	3·22	3·29	·45	1·45	·70	2·30	11·25	17·79	·55	·01	·56	
at East, Negative	13·02	21·99	3·19	3·21	·46	1·47	·68	2·18	14·49	21·00	·50	·02	·53	
at West, „	16·21	25·20	3·19	3·16	·49	1·56	·69	2·18	17·77	24·17	·57	·04	·46	
	19·40	28·36	3·15	3·14	·47	1·48	·70	2·20	20·88	27·38	·52	·02	·55	
Pen Equation	22 55	31·50	3·21	3·30	·47	1·51	·68	2·24	24·06	30·56	·56	51·99	·53	
s	25·76	34·80	3·24	3·11	·49	1·59	·70	2·18	27·35	33·74	·55	52·02	·54	
at East − 1·903	29·00	37·91							...	36·98	...	·02	·53	
at West − 1·449														
Mean	14 21 5 = t_E										1 51 52·552	1 51 52·016	·536	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
					Signals from West on East Tape		Signals from East on West Tape							
	East	West	East	West	Decimal	Seconds	Decimal	Seconds	West Signals by East Clock	East Signals by West Clock	East	West		
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
May 1	17 30 47·69	15 38 57·50	3·54	3·35	·49	1·73	·70	2·35	17 30 49·42	...	1 51 51·92	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 51m 52s·345; " " 12 " = 1 51 51·833; General Mean = d = 1 51 52·089
	51·23	39 0·85	3·59	3·53	·41	1·47	·74	2·61	52·70	15 38 59·85	·85	1 51 51·38	0·54	
	54·82	4·38	3·19	3·06	·43	1·37	·73	2·23	56·19	39 3·46	·81	·36	·49	
Comparison No. 2	58·01	7·44	3·17	3·26	·45	1·43	·71	2·31	59·44	6·61	52·00	·40	·41	
	31 1·18	10·70	3·15	3·24	·45	1·42	·69	2·24	31 2·60	9·75	51·90	·43	·57	
Exchange A	4·33	13·94	3·31	3·36	·46	1·52	·70	2·35	5·85	12·94	·91	·39	·51	
	7·64	17·30	3·27	3·23	·47	1·54	·70	2·26	9·18	16·29	·88	·35	·56	
	10·91	20·53	3·61	4·02	·41	1·48	·64	2·57	12·39	19·56	·86	·35	·53	
Current used	14·52	24·55	3·80	3·67	·50	1·90	·64	2·35	16·42	23·10	·87	·42	·44	
at East, Positive	18·32	28·22	3·66	3·69	·50	1·83	63	2·32	20·15	26·90	·93	·42	·45	
at West, "	21·98	31·91	3·55	3·31	·52	1·85	·68	2·25	23·83	30·54	·92	·44	·49	
	25·53	35·22	3·41	3·28	·49	1·67	·71	2·33	27·20	34·16	·98	·37	·55	
	28·94	38·50	3·26	3·35	·44	1·43	·70	2·35	30·37	37·55	·87	·39	·59	
Pen Equation	32·20	41·85	3·61	3·84	·41	1·48	·69	2·65	33·68	40·85	·83	·35	·52	
s at East + 1·899	35·81	45·69	3·48	3·31	·51	1·77	·67	2·22	37·58	44·50	·89	·31	·52	
at West + 1·449	39·29	49·00							...	47·91	...	·38	·51	
Mean	17 31 13 = t_E										1 51 51·895	1 51 51·383	·512	
1877	17 32 15·99	15 40 25·42	4·15	3·46	·55	2·28	·70	2·42	17 32 18·27	...	1 51 52·85	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 51m 52s·393; " " 12 " = 1 51 51·855; General Mean = d = 1 51 52·124
May 1	20·14	28·88	3·46	3·90	·46	1·59	·64	2·50	21·73	15 40 27·84	·85	1 51 52·30	0·55	
	23·60	32·78	3·72	3·32	·53	1·97	·68	2·26	25·57	31·38	·79	·22	·63	
	27·32	36·10	3·39	3·39	·46	1·56	·69	2·34	28·88	35·04	·78	·28	·51	
Comparison No. 2	30·71	39·49	3·29	3·30	·49	1·61	·67	2·21	32·32	38·44	·83	·27	·51	
	34·00	42·79	3·26	3·30	·48	1·56	·65	2·15	35·56	41·70	·77	·30	·53	
Exchange B	37·26	46·09	3·37	3·31	·49	1·65	·66	2·18	38·91	44·94	82	·32	·45	
	40·63	49·40	3·35	3·44	·50	1·68	·66	2·27	42·31	48·27	·91	·36	·46	
	43·98	52·84	3·52	3·37	·49	1·72	·70	2·36	45·70	51·67	·86	·31	·60	
Current used	47·50	56·21	3·30	3·40	·48	1·58	·67	2·28	49·08	55·20	·87	·30	·56	
at East, Negative	50·80	59·61	3·39	3·39	·50	1·70	·66	2·24	52·50	58·49	·89	·31	·56	
at West, "	54·19	41 3·00	3·38	3·58	·50	1·69	·63	2·26	55·88	41 1·85	·88	·34	·55	
	57·57	6·58	3·59	3·40	·52	1·87	·66	2·24	59·44	5·26	·86	·31	·57	
Pen Equation	33 1·16	9·98	3·38	3·41	·50	1·69	·67	2·28	33 2·85	8·82	·87	·34	·52	
s	4·54	13·39	3·48	3·43	·48	1·67	·67	2·30	6·21	12·26	·82	·28	·59	
at East − 1·899	8·02	16·82							...	15·69	...	·33	·49	
at West − 1·449														
Mean	17 32 42 = t_E										1 51 52·843	1 51 52·305	·539	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
May 1	17 33 26·43	15 41 39·96	4·60	3·52	·55	2·53	·74	2·60	17 33 28·96	...	1 51 49·00	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 52·380 s; Mean of col. 12 after Correction for Pen Equations = 1 51 51·850; General Mean = d = 1 51 52·115
	31·03	43·48	3·75	3·83	·40	1·50	·72	2·76	32·53	15 41 42·56	·05	1 51 48·47	0·53	
	34·78	47·31	3·52	3·39	·47	1·65	·72	2·44	36·43	46·24	·12	·54	·51	
Comparison No. 2	38·30	50·70	3·30	3·31	·44	1·45	·71	2·35	39·75	49·75	·05	·55	·57	
	41·60	54·01	3·22	3·39	·46	1·48	·70	2·37	43·08	53·05	·07	·55	·50	
Exchange C	44·82	57·40	3·32	3·20	·47	1·56	·70	2·24	46·38	56·38	48·98	·44	·63	
	48·14	42 0·60	3·26	3·42	·46	1·50	·66	2·26	49·64	59·64	49·04	·50	·48	
	51·40	4·02	3·48	3·68	·50	1·74	·64	2·36	53·14	42 2·86	·12	·54	·50	
Current used	54·88	7·70	3·72	3·48	·47	1·75	·70	2·44	56·63	6·38	48·93	·50	·62	
at East, Positive	58·60	11·18	3·33	3·16	·47	1·57	·70	2·21	34 0·17	10·14	·99	·46	·47	
at West, Negative	34 1·93	14·34	3·17	3·26	·46	1·46	·69	2·25	3·39	13·39	49·05	·54	·45	
	5·10	17·60	3·24	3·30	·47	1·52	·69	2·28	6·62	16·59	·02	·51	·54	
	8·34	20·90	3·39	3·40	·47	1·59	·69	2·35	9·93	19·88	·03	·46	·56	
Pen Equation	11·73	24·30	3·37	3·48	·47	1·58	·66	2·30	13·31	23·25	·01	·48	·55	
at East + 1·899 s	15·10	27·78	3·61	3·49	·47	1·70	·70	2·44	16·80	26·60	·02	·50	·51	
at West − 1·449	18·71	31·27							...	30·22	...	·49	·53	
Mean	17 33 53 = t_E										1 51 49·032	1 51 48·502	·530	
1877	17 34 46·43	15 42 55·93	4·07	3·37	·57	2·32	·68	2·29	17 34 48·75	...	1 51 52·82	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 52·376 s; Mean of col. 12 after Correction for Pen Equations = 1 51 51·846; General Mean = d = 1 51 52·111
May 1	50·50	59·30	3·44	3·40	·47	1·62	·69	2·35	52·12	15 42 58·22	·82	1 51 52·28	0·54	
	53·94	43 2·70	3·25	3·20	·50	1·63	·67	2·14	55·57	43 1·65	·87	·29	·53	
	57·19	5·90	3·26	3·37	·48	1·56	·68	2·29	58·75	4·84	·85	·35	·52	
Comparison No. 2	35 0·45	9·27	3·25	3·23	·49	1·59	·67	2·16	35 2·04	8·19	·77	·26	·59	
	3·70	12·50	3·33	3·35	·49	1·63	·66	2·21	5·33	11·43	·83	·27	·50	
Exchange D	7·03	15·85	3·32	3·35	·50	1·66	·67	2·24	8·69	14·71	·84	·32	·51	
	10·35	19·20	3·46	3·40	·48	1·66	·67	2·28	12·01	18·09	·81	·26	·58	
Current used	13·81	22·60	3·29	3·24	·50	1·65	·68	2·20	15·46	21·48	·86	·33	·48	
	17·10	25·84	3·14	3·12	·50	1·57	·66	2·06	18·67	24·80	·83	·30	·56	
at East, Negative	20·24	28·96	3·19	3·32	·49	1·56	·66	2·19	21·80	27·90	·84	·34	·49	
at West, "	23·43	32·28	3·35	3·31	·50	1·68	·68	2·25	25·11	31·15	·83	·28	·56	
	26·78	35·59	3·17	3·19	·50	1·59	·65	2·07	28·37	34·53	·78	·25	·58	
Pen Equation	29·95	38·78	3·19	3·12	·51	1·63	·66	2·06	31·58	37·66	·80	·29	·49	
at East − 1·899 s	33·14	41·90	3·19	3·20	·50	1·60	·66	2·11	34·74	40·84	·84	·30	·50	
at West − 1·449	36·33	45·10							...	44·01	...	·32	·52	
Mean	17 35 11 = t_E										1 51 52·826	1 51 52·296	·530	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at East	Times of Local Signals recorded on Chronograph at West	Intervals between successive Local Signals as recorded at East	Intervals between successive Local Signals as recorded at West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape, Decimal	Signals from West on East Tape, Seconds	Signals from East on West Tape, Decimal	Signals from East on West Tape, Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at East	Observed Differences of Clocks at West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
May 2	17 33 41·70	15 41 53·37	4·60	3·71	·61	2·81	·63	2·34	17 33 44·51	...	1 51 51·14	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 54·441 s; ,, ,, 12 ,, = 1 51 53·905; General Mean = d = 1 51 54·173
	46·30	57·08	3·56	3·58	·50	1·78	·63	2·26	48·08	15 41 55·71	·00	1 51 50·59	0·55	
	49·86	42 0·66	3·57	3·37	·54	1·93	·65	2·19	51·79	59·34	·13	·52	·48	
Comparison No. 2	53·43	4·03	3·42	3·27	·51	1·74	·68	2·22	55·17	42 2·85	·14	·58	·55	
	56·85	7·30	3·15	3·46	·49	1·54	·61	2·11	58·39	6·25	·09	·60	·54	
Exchange A	34 0·00	10·76	3·41	3·14	·53	1·81	·67	2·10	34 1·81	9·41	·05	·59	·50	
	3·41	13·90	3·39	3·56	·48	1·63	·64	2·28	5·04	12·86	·14	·55	·50	
	6·80	17·46	3·53	3·52	·50	1·77	·66	2·32	8·57	16·18	·11	·62	·52	
Current used	10·33	20·98	3·29	3·12	·53	1·74	·65	2·03	12·07	19·78	·09	·55	·56	
at East, Positive	13·62	24·10	3·28	3·50	·48	1·57	·64	2·24	15·19	23·01	·09	·61	·48	
at West, ,,	16·90	27·60	3·60	3·70	·50	1·80	·63	2·33	18·70	26·34	·10	·56	·53	
	20·50	31·30	3·69	3·40	·53	1·96	·69	2·35	22·46	29·93	·16	·57	·53	
	24·19	34·70	3·41	3·41	·49	1·67	·68	2·32	25·86	33·65	·16	·54	·62	
Pen Equation	27·60	38·11	3·40	3·48	·50	1·70	·66	2·30	29·30	37·02	·19	·58	·58	
at East + 1·901 s	31·00	41·59	3·38	3·41	·50	1·69	·64	2·18	32·69	40·41	·10	·59	·60	
at West − 1·427	34·38	45·00							...	43·77	...	·61	·49	
Mean	17 34 8 = t_E										1 51 51·113	1 51 50·577	·535	
1877	17 35 0·45	15 43 4·67	3·63	3·51	·55	2·00	·62	2·18	17 35 2·45	...	1 51 57·78	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 54·417 s; ,, ,, 12 ,, = 1 51 53·888; General Mean = d = 1 51 54·153
May 2	4·08	8·18	3·34	3·12	·56	1·87	·65	2·03	5·95	15 43 6·85	·77	1 51 57·23	0·55	
	7·42	11·30	3·18	3·20	·50	1·59	·65	2·08	9·01	10·21	·71	·21	·56	
Comparison No. 2	10·60	14·50	3·05	2·97	·54	1·65	·65	1·93	12·25	13·38	·75	·22	·49	
	13·65	17·47	3·09	3·33	·50	1·55	·63	2·10	15·20	16·43	·73	·22	·53	
	16·74	20·80	3·33	3·05	·54	1·80	·68	2·07	18·54	19·57	·74	·17	·56	
Exchange B	20·07	23·85	3·05	3·22	·50	1·52	·63	2·03	21·59	22·87	·74	·20	·54	
	23·12	27·07	3·21	3·13	·50	1·61	·66	2·07	24·73	25·88	·66	·24	·50	
Current used	26·33	30·20	3·11	3·12	·52	1·62	·65	2·03	27·95	29·14	·75	·19	·47	
	29·44	33·32	3·21	3·28	·50	1·60	·64	2·10	31·04	32·23	·72	·21	·54	
at East, Negative	32·65	36·60	3·21	3·01	·53	1·70	·66	1·99	34·35	35·42	·75	·23	·49	
at West, ,,	35·86	39·61	3·13	3·09	·49	1·53	·69	2·13	37·39	38·59	·78	·27	·48	
	38·99	42·70	3·05	3·09	·49	1·49	·70	2·16	40·48	41·74	·78	·25	·53	
Pen Equation	42·04	45·79	3·07	3·49	·50	1·54	·61	2·13	43·58	44·86	·79	·18	·60	
at East − 1·901 s	45·11	49·28	3·64	3·34	·52	1·89	·67	2·24	47·00	47·92	·72	·19	·60	
at West + 1·427	48·75	52·62							...	51·52	...	·23	·49	
Mean	17 35 25 = t_E										1 51 57·745	1 51 57·216	·529	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 2	17 36 7·30	15 44 18·38	3·94	3·42	·56	2·21	·67	2·29	17 36 9·51	...	1 51 51·13	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 54·453 s; „ 12 „ = 1 51 53·905; General Mean = d = 1 51 54·179
	11·24	21·80	3·26	3·25	·51	1·66	·66	2·15	12·90	15 44 20·67	·10	1 51 50·57	0·56	
	14·50	25·05	3·25	3·65	·51	1·66	·57	2·08	16·16	23·95	·11	·55	·55	
Comparison No. 2	17·75	28·70	3·65	3·49	·57	2·08	·60	2·09	19·83	27·13	·13	·62	·49	
	21·40	32·19	3·45	3·18	·55	1·90	·67	2·13	23·30	30·79	·11	·61	·52	
Exchange C	24·85	35·37	3·18	3·23	·50	1·59	·63	2·03	26·44	34·32	·07	·53	·58	
	28·03	38·60	3·22	3·02	·52	1·67	·70	2·11	29·70	37·40	·10	·63	·44	
	31·25	41·62	3·13	3·19	·48	1·50	·68	2·17	32·75	40·71	·13	·54	·56	
Current used	34·38	44·81	3·19	3·32	·50	1·60	·66	2·19	35·98	43·79	·17	·59	·54	
at East, Positive	37·57	48·13	3·36	3·29	·50	1·68	·68	2·24	39·25	47·00	·12	·57	·60	
at West, „	40·93	51·42	3·26	3·38	·50	1·63	·64	2·16	42·56	50·37	·14	·56	·56	
	44·19	54·80	3·29	3·41	·51	1·68	·60	2·05	45·87	53·58	·07	·61	·53	
Pen Equation	47·48	58·21	3·51	3·39	·56	1·97	·67	2·27	49·45	56·85	·24	·63	·44	
s	50·99	45 1·60	3·31	3·20	·53	1·75	·67	2·14	52·74	45 0·48	·14	·51	·73	
at East + 1·901	54·30	4·80	3·22	3·21	·50	1·61	·67	2·15	55·91	3·74	·11	·56	·58	
at West − 1·427	57·52	8·01							...	6·95	...	·57	·54	
Mean	17 36 32 = t_E										1 51 51·125	1 51 50·577	·548	
1877 May 2	17 37 22·00	15 45 25·94	3·23	3·26	·53	1·71	·64	2·09	17 37 23·71	...	1 51 57·77	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 54·416 s; „ 12 „ = 1 51 53·879; General Mean = d = 1 51 54·148
	25·23	29·20	3·56	3·37	·48	1·71	·70	2·36	26·94	15 45 28·03	·74	1 51 57·20	0·57	
	28·79	32·57	3·00	3·02	·50	1·50	·67	2·02	30·29	31·56	·72	·23	·51	
Comparison No. 2	31·79	35·59	3·00	3·22	·51	1·53	·62	2·00	33·32	34·59	·73	·20	·52	
	34·79	38·81	3·31	3·08	·54	1·79	·68	2·09	36·58	37·59	·77	·20	·53	
	38·10	41·89	3·10	3·01	·50	1·55	·70	2·11	39·65	40·90	·76	·20	·57	
Exchange D	41·20	44·90	2·99	3·07	·48	1·44	·70	2·15	42·64	44·00	·74	·20	·56	
	44·19	47·97	3·09	3·07	·50	1·55	·67	2·06	45·74	47·05	·77	·14	·60	
Current used	47·28	51·04	3·10	3·16	·50	1·55	·67	2·12	48·83	50·03	·79	·25	·52	
	50·38	54·20	3·12	3·20	·51	1·59	·63	2·02	51·97	53·16	·77	·22	·57	
at East, Negative	53·50	57·40	3·28	3·10	·50	1·64	·70	2·17	55·14	56·22	·74	·28	·49	
at West, „	56·78	46 0·50	3·07	3·22	·45	1·38	·68	2·19	58·16	59·57	·66	·21	·53	
	59·85	3·72	3·21	3·33	·50	1·60	·64	2·13	38 1·45	46 2·69	·73	·16	·50	
Pen Equation	38 3·06	7·05	3·28	3·22	·53	1·74	·65	2·09	4·80	5·85	·75	·21	·52	
s at East − 1·901	6·34	10·27	3·29	3·28	·50	1·65	·66	2·16	7·99	9·14	·72	·20	·55	
at West + 1·427	9·63	13·55							...	12·43	...	·20	·52	
Mean	17 37 46 = t_E										1 51 57·744	1 51 57·207	·537	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
May 3	14 16 26·43	12 24 32·30	3·39	3·25	·50	1·70	·70	2·28	14 16 28·13	...	1 51 55·83	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 51m 56s·224 Mean of col. 12 after Correction for Pen Equations = 1 51 55·637 General Mean = d = 1 51 55·931
	29·82	35·55	3·23	3·15	·48	1·55	·72	2·27	31·37	12 24 34·58	·82	1 51 55·24	0·59	
	33·05	38·70	3·14	3·15	·47	1·48	·72	2·27	34·53	37·82	·83	·23	·59	
Comparison No. 1	36·19	41·85	3·03	3·15	·48	1·45	·70	2·21	37·64	40·97	·79	·22	·61	
	39·22	45·00	3·18	3·30	·48	1·53	·66	2·18	40·75	44·06	·75	·16	·63	
Exchange A	42·40	48·30	3·40	3·17	·50	1·70	·71	2·25	44·10	47·18	·80	·22	·53	
	45·80	51·47	3·12	3·33	·44	1·37	·68	2·26	47·17	50·55	·70	·25	·55	
	48·92	54·80	3·30	3·18	·50	1·65	·69	2·19	50·57	53·73	·77	·19	·51	
Current used	52·22	57·98	3·27	3·20	·48	1·57	·71	2·27	53·79	56·99	·81	·23	·54	
at East, Positive	55·49	25 1·18	3·03	3·34	·50	1·52	·64	2·14	57·01	25 0·25	·83	·24	·57	
at West, ,,	58·52	4·52	3·44	3·23	·52	1·79	·69	2·23	17 0·31	3·32	·79	·20	·63	
	17 1·96	7·75	3·20	3·24	·49	1·57	·69	2·24	3·53	6·75	·78	·21	·58	
	5·16	10·99	3·18	3·19	·50	1·59	·69	2·20	6·75	9·99	·76	·17	·61	
Pen Equation	8·34	14·18	3·16	3·12	·53	1·67	·68	2·12	10·01	13·19	·83	·15	·61	
at East + 1s·892	11·50	17·30	3·15	3·19	·50	1·58	·69	2·20	13·08	16·30	·78	·20	·63	
at West + 1·459	14·65	20·49							...	19·50	...	·15	·63	
Mean	14 16 51 = t_E										1 51 55·791	1 51 55·204	·587	
1877	14 17 41·05	12 25 46·20	3·40	3·05	·53	1·80	·70	2·14	14 17 42·85	...	1 51 56·65	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 51m 56s·207 Mean of col. 12 after Correction for Pen Equations = 1 51 55·653 General Mean = d = 1 51 55·930
May 3	44·45	49·25	3·05	2·95	·46	1·40	·73	2·15	45·85	12 25 48·34	·60	1 51 56·11	0·54	
	47·50	52·20	2·88	2·75	·46	1·32	·76	2·09	48·82	51·40	·62	·10	·50	
Comparison No. 1	50·38	54·95	2·82	2·89	·44	1·24	·74	2·14	51·62	54·29	·67	·09	·53	
	53·20	57·84	2·79	2·75	·45	1·26	·76	2·09	54·46	57·09	·62	·11	·56	
	55·99	26 0·59	2·72	2·74	·46	1·25	·75	2·06	57·24	59·93	·65	·06	·56	
Exchange B	58·71	3·33	2·84	2·89	·45	1·28	·74	2·14	59·99	26 2·65	·66	·06	·59	
	18 1·55	6·22	2·75	2·78	·49	1·35	·73	2·03	18 2·90	5·47	·68	·08	·58	
Current used	4·30	9·00	2·83	2·80	·49	1·39	·72	2·02	5·69	8·25	·69	·05	·63	
	7·13	11·80	2·81	2·90	·47	1·32	·70	2·03	8·45	11·02	·65	·11	·58	
at East, Negative	9·94	14·70	2·94	2·86	·46	1·35	·73	2·09	11·29	13·83	·59	·11	·54	
at West, ,,	12·88	17·56	2·79	2·97	·47	1·31	·68	2·02	14·19	16·79	·63	·09	·50	
	15·67	20·53	2·93	2·78	·50	1·47	·73	2·03	17·14	19·58	·61	·09	·54	
Pen Equation	18·60	23·31	2·84	2·90	·47	1·33	·70	2·03	19·93	22·56	·62	·04	·57	
	21·44	26·21	2·91	2·81	·49	1·43	·73	2·05	22·87	25·34	·66	·10	·52	
at East − 1s·892	24·35	29·02							...	28·26	...	·09	·57	
at West − 1·459														
Mean	14 18 2 = t_E										1 51 56·640	1 51 56·086	·554	

Bombay (E) and *Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	East	West	East	West	Signals from West on East Tape		Signals from East on West Tape		West Signals by East Clock	East Signals by West Clock	East	West		
					Decimal	Seconds	Decimal	Seconds						
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877 May 3	h m s 14 18 39·78	h m s 12 26 45·79	s 3·29	s 2·97	·55	s 1·81	·70	s 2·08	h m s 14 18 41·59	h m s ...	h m s 1 51 55·80	h m s ...	s ...	Mean of col. 11 after Correction for Pen Equations = h m s 1 51 56·223; „ 12 „ = 1 51 55·642; General Mean = d = 1 51 55·933
	43·07	48·76	3·10	3·11	·48	1·49	·70	2·18	44·56	12 26 47·87	·80	1 51 55·20	0·60	
	46·17	51·87	3·01	2·93	·51	1·54	·71	2·08	47·71	50·94	·84	·23	·57	
Comparison No. 1	49·18	54·80	2·92	2·91	·50	1·46	·70	2·04	50·64	53·95	·84	·23	·61	
	52·10	57·71	2·78	2·83	·50	1·39	·69	1·95	53·49	56·84	·78	·26	·58	
Exchange C	54·88	27 0·54	2·80	2·77	·50	1·40	·70	1·94	56·28	59·66	·74	·22	·56	
	57·68	3·31	2·82	2·85	·50	1·41	·70	2·00	59·09	27 2·48	·78	·20	·54	
	19 0·50	6·16	2·90	2·84	·49	1·42	·72	2·04	19 1·92	5·31	·76	·19	·59	
Current used	3·40	9·00	2·82	2·86	·49	1·38	·70	2·00	4·78	8·20	·78	·20	·56	
at East, Positive	6·22	11·86	2·88	2·89	·50	1·44	·70	2·02	7·66	11·00	·80	·22	·56	
at West, „	9·10	14·75	2·84	2·85	·50	1·42	·70	2·00	10·52	13·88	·77	·22	·58	
	11·94	17·60	2·86	2·80	·50	1·43	·72	2·02	13·37	16·75	·77	·19	·58	
Pen Equation	14·80	20·40	2·82	2·91	·48	1·35	·70	2·04	16·15	19·62	·75	·18	·59	
	17·62	23·31	2·97	2·79	·50	1·49	·74	2·06	19·11	22·44	·80	·18	·57	
at East + s 1·892	20·59	26·10	2·81	3·05	·48	1·35	·69	2·10	21·94	25·37	·84	·22	·58	
at West + 1·459	23·40	29·15							...	28·20	...	·20	·64	
Mean	14 19 2 = t_E										1 51 55·790	1 51 55·209	·581	
1877 May 3	14 19 45·75	12 27 50·60	3·03	2·85	·50	1·52	·73	2·08	14 19 47·27	...	1 51 56·67	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 1 51 56·224; „ 12 „ = 1 51 55·656; General Mean = d = 1 51 55·940
	48·78	53·45	2·87	2·85	·46	1·32	·73	2·08	50·10	12 27 52·68	·65	1 51 56·10	0·57	
	51·65	56·30	2·85	2·90	·49	1·40	·72	2·09	53·05	55·53	·75	·12	·53	
Comparison No. 1	54·50	59·20	2·90	2·83	·46	1·33	·73	2·07	55·83	58·39	·63	·11	·64	
	57·40	28 2·03	2·68	2·72	·50	1·34	·73	1·99	58·74	28 1·27	·71	·13	·50	
	20 0·08	4·75	2·82	2·85	·49	1·38	·73	2·08	20 1·46	4·02	·71	·06	·65	
Exchange D	2·90	7·60	2·82	2·88	·49	1·38	·72	2·07	4·28	6·83	·68	·07	·64	
	5·72	10·48	2·88	2·99	·48	1·38	·69	2·06	7·10	9·67	·62	·05	·63	
Current used	8·60	13·47	3·00	2·81	·50	1·50	·73	2·05	10·10	12·54	·63	·06	·56	
	11·60	16·28	2·79	2·72	·48	1·34	·74	2·01	12·94	15·52	·66	·08	·55	
at East, Negative	14·39	19·00	2·87	3·10	·42	1·21	·70	2·17	15·60	18·29	·60	·10	·56	
at West, „	17·26	22·10	2·87	2·79	·50	1·44	·69	1·93	18·70	21·17	·60	·09	·51	
	20·13	24·89	2·77	2·67	·50	1·39	·73	1·95	21·52	24·03	·63	·10	·50	
Pen Equation	22·90	27·56	2·80	2·84	·47	1·32	·71	2·02	24·22	26·84	·66	·06	·57	
	25·70	30·40	2·90	2·94	·47	1·36	·72	2·12	27·06	29·58	·66	·12	·54	
at East − s 1·892	28·60	33·34							...	32·52	...	·08	·58	
at West − 1·459														
Mean	14 20 7 = t_E										1 51 56·657	1 51 56·089	·569	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	East	West	East	West	Signals from West on East Tape		Signals from East on West Tape		West Signals by East Clock	East Signals by West Clock	East	West		
					Decimal	Seconds	Decimal	Seconds						
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877	17 30 22·73	15 38 29·08	4·09	3·09	·59	2·41	·73	2·26	17 30 25·14	...	1 51 56·06	...	...	Mean of col. 11 after Correction for Pen Equations = 1 51 56·526 (h m s); " 12 " = 1 51 55·932; General Mean = d = 1 51 56·229
May 8	26·82	32·17	3·29	3·26	·42	1·38	·75	2·45	28·20	15 38 31·34	·03	1 51 55·48	0·58	
	30·11	35·43	2·94	2·92	·50	1·47	·73	2·13	31·58	34·62	·15	·49	·54	
Comparison No. 2	33·05	38·35	2·85	2·85	·50	1·43	·72	2·05	34·48	37·56	·13	·49	·66	
	35·90	41·20	2·90	2·98	47	1·36	·70	2·09	37·26	40·40	·06	·50	·63	
Exchange A	38·80	44·18	2·89	2·81	·50	1·45	·70	1·97	40·25	43·29	·07	·51	·55	
	41·69	46·99	2·98	2·80	·49	1·46	·74	2·07	43·15	46·15	·16	·54	·53	
	44·67	49·79	2·75	2·97	·45	1·24	·72	2·14	45·91	49·06	·12	·61	·55	
Current used	47·42	52·76	2·98	3·14	·49	1·46	·68	2·14	48·88	51·93	·12	·49	·63	
at East, Positive	50·40	55·90	3·02	2·87	·53	1·60	70	2·01	52·00	54·90	·10	·50	·62	
at West, "	53·42	58·77	2·90	3·07	·50	1·45	·67	2·06	54·87	57·91	·10	·51	·59	
	56·32	39 1·84	3·08	2·99	·53	1·63	·69	2·06	57·95	39 0·83	·11	·49	·61	
Pen Equation	59·40	4·83	3·10	3·07	·48	1·49	·70	2·15	31 0·89	3·90	·06	·50	·61	
s	31 2·50	7·90	3·05	3·09	·50	1·53	·69	2·13	4·03	6·98	·13	·52	·54	
at East + 1·882	5·55	10·99	3·15	3·31	·50	1·58	·67	2·22	7·13	10·03	·14	·52	·61	
at West + 1·459	8·70	14·30							...	13·21	...	·49	·65	
Mean	17 30 46 = t_E										1 51 56·103	1 51 55·509	·593	
1877	17 31 29·82	15 39 34·68	3·22	2·91	·55	1·77	·70	2·04	17 31 31·59	...	1 51 56·91	...	...	Mean of col. 11 after Correction for Pen Equations = 1 51 56·495 (h m s); " 12 " = 1 51 55·930; General Mean = d = 1 51 56·213
May 8	33·04	37·59	2·98	2·90	·46	1·37	·72	2·09	34·41	15 39 36·72	·82	1 51 56·32	0·59	
	36·02	40·49	2·93	2·90	·46	1·35	·74	2·15	37·37	39·68	·88	·34	·48	
Comparison No. 2	38·95	43·39	2·92	2·88	·47	1·37	·74	2·13	40·32	42·64	·93	·31	·57	
	41·87	46·27	2·77	2·83	·47	1·30	·72	2·04	43·17	45·52	·90	·35	·58	
	44·64	49·10	2·86	2·80	·47	1·34	·72	2·02	45·98	48·31	·88	·33	·57	
Exchange B	47·50	51·90	3·95	4·07	·34	1·34	·78	3·17	48·84	51·12	94	·38	·50	
	51·45	55·97	2·90	3·02	·51	1·48	·67	2·02	52·93	55·07	·96	·38	·56	
	54·35	58·99	2·93	2·71	·54	1·58	·70	1·90	55·93	57·99	·94	·36	·60	
Current used	57·28	40 1·70	2·77	2·80	·50	1·39	·70	1·96	58·67	40 0·89	·97	·39	·55	
at East, Negative	32 0·05	4·50	2·85	2·80	·47	1·34	·74	2·07	32 1·39	3·66	·89	·39	·58	
at West, "	2·90	7·30	2·75	2·80	·48	1·32	·72	2·02	4·22	6·57	·92	·33	·56	
	5·65	10·10	2·77	2·90	·48	1·33	·68	1·97	6·98	9·32	·88	·33	·59	
Pen Equation	8·42	13·00	2·98	2·92	·52	1·55	·70	2·04	9·97	12·07	·97	·35	·53	
s	11·40	15·92	2·99	3·05	·50	1·50	·69	2·10	12·90	15·04	·98	·36	·61	
at East − 1·882	14·39	18·97							...	18·02	...	·37	·61	
at West − 1·459														
Mean	17 31 52 = t_E										1 51 56·918	1 51 56·353	·565	

TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = 1h 51m 56s·515
May 3	17 32 26·69	15 40 32·60	3·50	3·09	·59	2·07	·66	2·04	17 32 28·76	...	1 51 56·16	...	...	Mean of col. 12 after Correction for Pen Equations = 1 51 55·930
	30·19	35·69	3·11	2·99	·51	1·59	·70	2·09	31·78	15 40 34·64	·09	1 51 55·55	0·61	General Mean = d = 1 51 56·223
	33·30	38·68	3·03	3·22	·49	1·48	·67	2·16	34·78	37·78	·10	·52	·57	
Comparison No. 2	36·33	41·90	3·17	3·08	·50	1·59	·68	2·09	37·92	40·84	·02	·49	·61	
	39·50	44·98	3·02	3·01	·50	1·51	·68	2·05	41·01	43·99	·03	·51	·51	
Exchange C	42·52	47·99	3·01	3·03	·52	1·57	·68	2·06	44·09	47·03	·10	·49	·54	
	45·53	51·02	3·15	3·10	·50	1·58	·69	2·14	47·11	50·05	·09	·48	·62	
	48·68	54·12	3·07	3·10	·50	1·54	·69	2·14	50·22	53·16	·10	·52	·57	
Current used	51·75	57·22	3·15	3·08	·48	1·51	·71	2·19	53·26	56·26	·04	·49	·61	
at East, Positive	54·90	41 0·30	3·00	3·10	·50	1·50	·66	2·05	56·40	59·41	·10	·49	·55	
at West, Negative	57·90	3·40	3·11	3·10	·52	1·62	·67	2·08	59·52	41 2·35	·12	·55	·55	
	33 1·01	6·50	3·14	3·10	·53	1·66	·70	2·17	33 2·67	5·48	·17	·53	·59	
Pen Equation	4·15	9·60	3·15	3·10	·49	1·54	·70	2·17	5·69	8·67	·09	·48	·69	
	7·30	12·70	3·00	3·05	·50	1·50	·70	2·14	8·80	11·77	·10	·53	·56	
at East + 1s·882	10·30	15·75	3·10	3·20	·49	1·52	·67	2·14	11·82	14·84	·07	·46	·64	
at West + 1·459	13·40	18·95							...	17·89	...	·51	·56	
Mean	17 32 50 = t_E										1 51 56·092	1 51 55·507	·585	
1877	17 33 59·10	15 42 3·72	3·18	2·98	·48	1·53	·73	2·18	17 34 0·63	...	1 51 56·91	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 51m 56s·500
May 3	34 2·28	6·70	2·93	3·00	·46	1·35	·73	2·19	3·63	15 42 5·90	·93	1 51 56·38	0·53	Mean of col. 12 after Correction for Pen Equations = 1 51 55·928
	5·21	9·70	3·04	3·18	·48	1·46	·69	2·19	6·67	8·89	·97	·32	·61	General Mean = d = 1 51 56·214
	8·25	12·88	3·11	3·10	·48	1·49	·69	2·14	9·74	11·89	·86	·36	·61	
Comparison No. 2	11·36	15·98	3·02	2·98	·50	1·51	·67	2·00	12·87	15·02	·89	·34	·52	
	14·38	18·96	4·82	5·24	...	...	·74	3·88	...	17·98	...	·40	·49	
Exchange D	19·20	24·20	3·62	3·19	·53	1·92	·71	2·26	21·12	22·84	·92	·36	...	
	22·82	27·39	3·12	3·11	·48	1·50	·70	2·18	24·32	26·46	·93	·36	·56	
Current used	25·94	30·50	3·16	3·14	·47	1·49	·72	2·26	27·43	29·57	·93	·37	·56	
	29·10	33·64	3·12	3·16	·48	1·50	·70	2·21	30·60	32·76	·96	·34	·59	
at East, Negative	32·22	36·80	3·12	3·24	·50	1·56	·67	2·17	33·78	35·85	·98	·37	·59	
at West, Positive	35·34	40·04	3·16	3·05	·50	1·58	·70	2·14	36·92	38·97	·88	·37	·61	
	38·50	43·09	3·12	3·19	·49	1·53	·69	2·20	40·03	42·18	·94	·32	·56	
Pen Equation	41·62	46·28	3·18	3·14	·50	1·59	·70	2·20	43·21	45·29	·93	·33	·61	
	44·80	49·42	3·18	3·42	·48	1·53	·64	2·19	46·33	48·48	·91	·32	·61	
at East − 1s·882	47·98	52·84	3·34	3·46	·53	1·77	·63	2·18	49·75	51·61	·91	·37	·54	
at West − 1·459	51·32	56·30							...	55·02	...	·30	·61	
Mean	17 34 25 = t_E										1 51 56·923	1 51 56·351	·573	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	East	West	East	West	Signals from West on East Tape		Signals from East on West Tape		West Signals by East Clock	East Signals by West Clock	East	West		
					Decimal	Seconds	Decimal	Seconds						
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
May 4	14 18 58·50	12 27 3·09	4·28	3·31	·57	2·44	·72	2·38	14 19 0·94	...	1 51 57·85	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 58·360 s; „ 12 „ = 1 51 57·769; General Mean = d = 1 51 58·065
	19 2·78	6·40	3·12	2·91	·49	1·53	·75	2·18	4·31	12 27 5·47	·91	1 51 57·31	0·54	
	5·90	9·31	2·90	3·09	·50	1·45	·70	2·16	7·35	8·58	58·04	·32	·59	
Comparison No. 1	8·80	12·40	3·00	2·91	·50	1·50	·72	2·10	10·30	11·47	57·90	·33	·71	
	11·80	15·31	2·92	3·00	·52	1·52	·69	2·07	13·32	14·50	58·01	·30	·60	
Exchange A	14·72	18·31	2·98	3·06	·50	1·49	·68	2·08	16·21	17·38	57·90	·34	·67	
	17·70	21·37	3·23	3·43	·50	1·62	·65	2·23	19·32	20·39	·95	·31	·59	
	20·93	24·80	3·30	3·09	·54	1·78	·68	2·10	22·71	23·60	·91	·33	·62	
Current used	24·23	27·89	3·09	3·10	·50	1·55	·68	2·11	25·78	26·90	·89	·33	·58	
at East, Positive	27·32	30·99	3·18	3·21	·50	1·59	·69	2·21	28·91	30·00	·92	·32	·57	
at West, „	30·50	34·20	3·21	3·40	·50	1·61	·66	2·24	32·11	33·20	·91	·30	·62	
	33·71	37·60	3·41	3·10	·50	1·71	·70	2·17	35·42	36·44	·82	·27	·64	
Pen Equation	37·12	40·70	3·11	3·26	·46	1·43	·66	2·15	38·55	39·77	·85	·35	·47	
s	40·23	43·96	3·25	3·20	·51	1·66	·69	2·21	41·89	42·85	·93	·38	·47	
at East + 1·900	43·48	47·16	3·20	3·12	·50	1·60	·70	2·18	45·08	46·17	·92	·31	·62	
at West + 1·454	46·68	50·28							...	49·34	...	·34	·58	
Mean	14 19 23 = t_E										1 51 57·914	1 51 57·323	·591	
1877	14 20 12·30	12 28 14·95	2·86	2·96	·49	1·40	...	...	14 20 13·70	...	1 51 58·75	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 58·341 s; „ 12 „ = 1 51 57·796; General Mean = d = 1 51 58·069
May 4	15·16	17·91	3·33	3·25	·44	1·47	·70	2·28	16·63	...	·72	...	...	
	18·49	21·16	2·92	2·82	·50	1·46	·71	2·00	19·95	12 28 20·19	·79	1 51 58·30	0·42	
	21·41	23·98	2·88	2·82	·46	1·32	·74	2·09	22·73	23·16	·75	·25	·54	
Comparison No. 1	24·29	26·80	2·80	2·90	·48	1·34	·70	2·03	25·63	26·07	·83	·22	·53	
	27·09	29·70	2·86	2·90	·50	1·43	·70	2·03	28·52	28·83	·82	·26	·57	
Exchange B	29·95	32·60	2·89	2·80	·49	1·42	·70	1·96	31·37	31·73	·77	·22	·60	
	32·84	35·40	2·80	2·71	·45	1·26	·73	1·98	34·10	34·56	·70	·28	·49	
Current used	35·64	38·11	2·84	2·97	·46	1·31	·73	2·17	36·95	37·38	·84	·26	·44	
at East, Negative	38·48	41·08	2·86	2·83	·48	1·37	·72	2·04	39·85	40·28	·77	·20	·64	
at West, „	41·34	43·91	2·93	3·01	·48	1·41	·71	2·14	42·75	43·12	·84	·22	·55	
	44·27	46·92	2·91	2·96	·50	1·46	·68	2·01	45·73	46·05	·81	·22	·62	
	47·18	49·88	3·01	3·02	·50	1·51	·70	2·11	48·69	48·93	·81	·25	·56	
Pen Equation	50·19	52·90	3·09	2·97	·50	1·55	·72	2·14	51·74	51·99	·84	·20	·61	
s	53·28	55·87	3·02	3·27	·45	1·36	·66	2·16	54·64	55·04	·77	·24	·60	
at East − 1·900	56 30	59·14							...	58·03	...	·27	·50	
at West − 1·454														
Mean	14 20 34 = t_E										1 51 58·787	1 51 58·242	·548	

 TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
May 4	14 21 12·79	12 29 16·40	3·10	3·03	·50	1·55	·70	2·12	14 21 14·34	...	1 51 57·94	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 58·367 s; " " 12 " " = 1 51 57·792; General Mean = d = 1 51 58·080
	15·89	19·43	3·00	2·97	·50	1·50	·71	2·11	17·39	12 29 18·52	·96	1 51 57·37	0·57	
	18·89	22·40	3·01	2·98	·50	1·51	·72	2·15	20·40	21·54	58·00	·35	·61	
Comparison No. 1	21·90	25·38	3·04	3·12	·47	1·43	·72	2·25	23·33	24·55	57·95	·35	·65	
	24 94	28·50	2·96	2·99	·50	1·48	·70	2·09	26·42	27·63	·92	·31	·64	
Exchange C	27·90	31·49	3·05	2·97	·50	1·53	·70	2·08	29·43	30·59	·94	·31	·61	
	30·95	34·46	2·95	2·88	·49	1·45	·71	2·04	32·40	33·57	·94	·38	·56	
	33·90	37·34	2·82	2·98	·47	1·33	·70	2·09	35·23	36·50	·89	·40	·54	
Current used	36·72	40·32	3·10	3·08	·50	1·55	·70	2·16	38·27	39·43	·95	·29	·60	
at East, Positive	39·82	43·40	2·98	3·03	·49	1·46	·67	2·03	41·28	42·48	·88	·34	·61	
at West, Negative	42·80	46·43	3·05	3·00	·50	1·53	·68	2·04	44·33	45·43	·90	·37	·51	
	45·85	49·43	2·98	3·25	·50	1·49	·65	2·11	47·34	48·47	·91	·38	·52	
Pen Equation	48·83	52·68	3·24	3·21	·52	1·68	·64	2·05	50·51	51·54	·83	·29	·62	
s	52·07	55·89	3·14	3·30	·55	1·73	·60	1·98	53·80	54·73	·91	·34	·49	
at East + 1·900	55·21	59·19	3·35	3·13	·56	1·88	·64	2·00	57·09	57·87	·90	·34	·57	
at West + 1·454	58·56	62·32							...	30 1·19	...	·37	·53	
Mean	14 21 36 = t_E										1 51 57·921	1 51 57·346	·575	
1877	14 22 30·31	12 30 30·18	2·89	2·83	·52	1·50	·70	1·98	14 22 31·81	...	1 52 1·63	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 58·335 s; " " 12 " " = 1 51 57·741; General Mean = d = 1 51 58·038
May 4	33·20	33·01	2·90	2·97	·51	1·48	·68	2·02	34·68	12 30 32·16	·67	1 52 1·04	0·59	
	36·10	35·98	3·00	2·92	·51	1·53	·68	1·99	37·63	35·03	·65	·07	·60	
Comparison No. 1	39·10	38·90	2·90	2·86	·52	1·51	·68	1·94	40·61	37·97	·71	·13	·52	
	42·00	41·76	2·97	3·03	·51	1·51	·70	2·12	43·51	40·84	·75	·16	·55	
	44·97	44·79	2·96	2·97	·50	1·48	·70	2·08	46·45	43·88	·66	·09	·66	
Exchange D	47·93	47·76	2·98	2·92	·50	1·49	·71	2·07	49·42	46·87	·66	·c6	·60	
	50·91	50·68	3·03	3·14	·50	1·52	·68	2·14	52·43	49·83	·75	·08	·58	
Current used	53·94	53·82	3·01	3·10	·53	1·60	·66	2·05	55·54	52·82	·72	·12	·63	
	56·95	56·92	3·15	3·07	·54	1·70	·70	2·15	58·65	55·87	·73	·08	·64	
at East, Negative	23 0·10	59·99	3·10	3·11	·51	1·58	·66	2·05	23 1·68	59·07	·69	·03	·70	
at West, Positive	3·20	31 3·10	3·10	3·20	·50	1·55	·65	2·08	4·75	31 2·04	·65	·16	·53	
	6·30	6·30							...	5·18	...	·12	·53	
Pen Equation														
s														
at East − 1·900														
at West + 1·454														
Mean	14 22 48 = t_E										1 52 1·689	1 52 1·095	·594	

Bombay (E) *and* *Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
					Signals from West on East Tape		Signals from East on West Tape							
	East	West	East	West	Decimal	Seconds	Decimal	Seconds	West Signals by East Clock	East Signals by West Clock	East	West		
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
May 4	17 32 10·92	15 40 14·56	3·37	3·04	·54	1·82	·69	2·10	17 32 12·74	...	1 51 58·18	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 58·611 s; „ 12 „ = 1 51 58·046; General Mean = d = 1 51 58·329
	14·29	17·60	3·05	3·08	·48	1·46	·70	2·16	15·75	15 40 16·66	·15	1 51 57·63	0·55	
	17·34	20·68	3·04	3·02	·49	1·49	·70	2·11	18·83	19·76	·15	·58	·57	
Comparison No. 2	20·38	23·70	3·02	3·00	·50	1·51	·70	2·10	21·89	22·79	·19	·59	·56	
	23·40	26·70	2·90	2·90	·49	1·42	·68	1·97	24·82	25·80	·12	·60	·59	
Exchange A	26·30	29·60	2·98	2·90	·50	1·49	·70	2·03	27·79	28·67	·19	·63	·49	
	29·28	32·50	2·81	2·88	·50	1·41	·70	2·02	30·69	31·63	·19	·65	·54	
	32·09	35·38	2·91	2·94	·49	1·43	·70	2·06	33·52	34·52	·14	·57	·62	
Current used	35·00	38·32	2·97	3·08	·50	1·49	·67	2·06	36·49	37·44	·17	·56	·58	
at East, Positive	37·97	41·40	3·04	3·02	·54	1·64	·64	1·93	39·61	40·38	·21	·59	·58	
at West, „	41·01	44·42	3·06	3·16	·53	1·62	·64	2·02	42·63	43·33	·21	·68	·53	
	44·07	47·58	3·16	3·32	·54	1·71	·60	1·99	45·78	46·44	·20	·63	·58	
Pen Equation	47·23	50·90	3·27	3·10	·55	1·80	·66	2·05	49·03	49·57	·13	·66	·54	
s	50·50	54·00	3·30	3·10	·50	1·65	·71	2·20	52·15	52·95	·15	·55	·58	
at East + 1·893	53·80	57·10	3·00	3·10	·50	1·50	·68	2·11	55·30	56·20	·20	·60	·55	
at West + 1·454	56·80	60·20							...	59·21	...	·59	·61	
Mean	17 32 34 = t_E										1 51 58·172	1 51 57·607	·565	
1877														
	17 33 23·04	15 41 25·60	3·01	3·00	·54	1·63	·66	1·98	17 33 24·67	...	1 51 59·07	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 58·612 s; „ 12 „ = 1 51 58·058; General Mean = d = 1 51 58·335
May 4	26·05	28·60	3·05	3·10	·53	1·62	·64	1·98	27·67	15 41 27·58	·07	1 51 58·47	0·60	
	29·10	31·70	3·05	3·08	·55	1·68	·63	1·94	30·78	30·58	·08	·52	·55	
Comparison No. 2	32·15	34·78	3·04	2·92	·56	1·70	·67	1·96	33·85	33·64	·07	·51	·57	
	35·19	37·70	3·00	2·71	·53	1·59	·71	1·92	36·78	36·74	·08	·45	·62	
	38·19	40·41	2·73	2·89	·47	1·28	·70	2·02	39·47	39·62	·06	·57	·51	
Exchange B	40·92	43·30	2·83	2·95	·50	1·42	·67	1·98	42·34	42·43	·04	·49	·57	
	43·75	46·25	2·94	3·16	·52	1·53	·60	1·90	45·28	45·28	·03	·47	·57	
Current used	46·69	49·41	3·14	2·86	·55	1·73	·69	1·97	48·42	48·15	·01	·54	·49	
	49·83	52·27	2·87	2·86	·50	1·44	·68	1·94	51·27	51·38	·00	·45	·56	
at East, Negative	52·70	55·13	2·84	2·91	·54	1·53	·66	1·92	54·23	54·21	·10	·49	·51	
at West, „	55·54	58·04	2·96	2·87	·53	1·57	·68	1·95	57·11	57·05	·07	·49	·61	
	58·50	42 0·91	2·88	3·69	·50	1·44	·54	1·99	59·94	59·99	·03	·51	·56	
Pen Equation	34 1·38	4·60	3·72	2·86	·61	2·27	·70	2·00	34 3·65	42 2·90	·05	·48	·55	
s	5·10	7·46	2·80	2·74	·49	1·37	·70	1·92	6·47	6·60	·01	·50	·55	
at East − 1·893	7·90	10·20							...	9·38	...	·52	·49	
at West − 1·454														
Mean	17 33 45 = t_E										1 51 59·051	1 51 58·497	·554	

 TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	West	Intervals between successive Local Signals as recorded at: East	West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Seconds	Signals from East on West Tape: Decimal	Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at: East	West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	- 1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = 1 51 58·619 h m s; „ 12 „ „ = 1 51 58·052; General Mean = d = 1 51 58·335
May 4	17 34 25·67	15 42 29·80	3·77	2·90	·60	2·26	·70	2·03	17 34 27·93	...	1 51 58·13	...	...	
	29·44	32·70	2·99	2·90	·48	1·44	·71	2·06	30·88	15 42 31·83	·18	1 51 57·61	0·52	
	32·43	35·60	4·19	4·40	...	...	·77	3·39	...	34·76	...	·67	·51	
Comparison No. 2	36·62	40·00	3·17	3·15	·48	1·52	·69	2·17	38·14	38·99	·14	·63	...	
	39·79	43·15	3·03	2·96	·49	1·48	·71	2·10	41·27	42·17	·12	·62	·52	
Exchange C	42·82	46·11	3·02	2·99	·49	1·48	·70	2·09	44·30	45·25	·19	·57	·55	
	45·84	49·10	2·96	3·12	·50	1·48	·67	2·09	47·32	48·20	·22	·64	·55	
	48·80	52·22	3·02	3·08	·52	1·57	·65	2·00	50·37	51·19	·15	·61	·61	
Current used	51·82	55·30	3·09	2·90	·53	1·64	·69	2·00	53·46	54·22	·16	·60	·55	
at East, Positive	54·91	58·20	2·97	2·90	·50	1·49	·71	2·06	56·40	57·30	·20	·61	·55	
at West, Negative	57·88	43 1·10	2·94	3·02	·49	1·44	·69	2·08	59·32	43 0·26	·22	·62	·58	
	35 0·82	4·12	3·08	3·07	·50	1·54	·70	2·15	35 2·36	3·18	·24	·64	·58	
	3·90	7·19	3·01	3·10	·50	1·51	·69	2·14	5·41	6·27	·22	·63	·61	
Pen Equation	6·91	10·29	3·07	3·12	·50	1·54	·67	2·09	8·45	9·33	·16	·58	·64	
at East + 1·893 s	9·98	13·41	3·22	3·10	·50	1·61	·70	2·17	11·59	12·38	·18	·60	·56	
at West + 1·454	13·20	16·51	3·00	3·05	·50	1·50	·70	2·14	14·70	15·58	·19	·62	·56	
	16·20	19·56							...	18·65	...	·55	·64	
Mean	17 34 51 = t_E										1 51 58·180	1 51 57·613	·569	
1877	17 35 39·60	15 43 42·09	2·90	2·81	·54	1·57	·65	1·83	17 35 41·17	...	1 51 59·08	...	...	Mean of col. 11 after Correction for Pen Equations = 1 51 58·623 h m s; „ 12 „ „ = 1 51 58·047; General Mean = d = 1 51 58·335
May 4	42·50	44·90	6·71	7·00	...	...	·84	5·88	...	15 43 43·92	...	1 51 58·58	0·50	
	49·21	51·90	3·16	2·81	·55	1·74	·70	1·97	50·95	50·78	·05	·43	...	
Comparison No. 2	52·37	54·71	2·87	2·86	·49	1·41	·72	2·06	53·78	53·87	·07	·50	·55	
	55·24	57·57	2·91	2·91	·48	1·40	·71	2·07	56·64	56·77	·07	·47	·60	
	58·15	44 0·48	2·75	2·78	·51	1·40	·70	1·95	59·55	59·64	·07	·51	·56	
Exchange D	36 0·90	3·26	2·90	2·94	·48	1·39	·70	2·06	36 2·29	44 2·43	·03	·47	·60	
	3·80	6·20	2·86	2·90	·52	1·49	·69	2·00	5·29	5·32	·09	·48	·55	
Current used	6·66	9·10	3·00	2·94	·50	1·50	·70	2·06	8·16	8·20	·06	·46	·63	
	9·66	12·04	2·88	2·76	·50	1·44	·74	2·04	11·10	11·16	·06	·50	·56	
at East, Negative	12·54	14·80	2·71	2·86	·50	1·36	·70	2·00	13·90	14·08	·10	·46	·60	
at West, Positive	15·25	17·66	2·99	3·04	·48	1·44	·69	2·10	16·69	16·80	·03	·45	·65	
	18·24	20·70	2·92	2·90	·54	1·58	·66	1·91	19·82	19·76	·12	·48	·55	
Pen Equation	21·16	23 60	2·89	2·97	·52	1·50	·66	1·96	22·66	22·61	·06	·55	·57	
at East − 1·893 s	24·05	26·57	3·00	3·02	·50	1·50	·67	2·02	25·55	25·56	58·98	·49	·57	
at West − 1·454	27·05	29·59							...	28·59	...	·46	·52	
Mean	17 36 3 = t_E										1 51 59·062	1 51 58·486	·572	

Bombay (E) and *Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
					Signals from West on East Tape		Signals from East on West Tape							
	East	West	East	West	Decimal	Seconds	Decimal	Seconds	West Signals by East Clock	East Signals by West Clock	East	West		
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 5	14 15 5·65	12 23 8·32	4·27	2·91	·60	2·56	·75	2·18	14 15 8·21	...	1 51 59·89	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 1 51 60·410; „ „ 12 „ = 1 51 59·851; General Mean = d = 1 51 60·131
	9·92	11·23	2·80	2·97	·45	1·26	·70	2·08	11·18	12 23 10·50	·95	1 51 59·42	0·47	
	12·72	14·20	2·89	2·89	·49	1·42	·70	2·02	14·14	13·31	·94	·41	·54	
Comparison No. 1	15·61	17·09	2·99	2·99	·49	1·47	·70	2·09	17·08	16·22	·99	·39	·55	
	18·60	20·08	3·00	3·12	·49	1·47	·69	2·15	20 07	19·18	·99	·42	·57	
Exchange A	21·60	23·20	2·94	2·93	·54	1·59	·67	1·96	23·19	22·23	·99	·37	·62	
	24·54	26·13	3·08	3·04	·50	1·54	·70	2·13	26·08	25·16	·95	·38	·61	
	27·62	29·17	3·08	3·17	·48	1·48	·67	2·12	29·10	28·26	·93	·36	·59	
Current used	30·70	32·34	3·21	3·18	·50	1·61	·67	2·13	32·31	31·29	·97	·41	·52	
at East, Positive	33·91	35·52	3·23	3·17	·48	1·55	·69	2·19	35·46	34·47	·94	·44	·53	
at West, „	37·14	38·69	3·14	3·27	·46	1·44	·66	2·16	38·58	37·71	·89	·43	·51	
	40·28	41·96	3·30	3·26	·53	1·75	·67	2·18	42·03	40·85	60·07	·43	·46	
Pen Equation	43·58	45·22	3·24	3·28	·50	1·62	·66	2·16	45·20	44·14	59·98	·44	·63	
s	46·82	48·50	3·27	3·16	·52	1·70	·68	2·15	48·52	47·38	60·02	·44	·54	
at East + 1·886	50·09	51·66	3·22	3·23	·50	1·61	·69	2·23	51·70	50·65	·04	·44	·58	
at West + 1·449	53·31	54·89	3·19	3·63	·50	1·60	·60	2·18	54·91	53·89	·02	·42	·62	
	56·50	58·52							...	57·07	...	·43	·59	
Mean	14 15 31 = t_E										1 51 59·973	1 51 59·414	·558	
1877	14 16 21·91	12 24 22·78	3·18	2·91	·53	1·69	·70	2·04	14 16 23·60	...	1 51 60·82	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 1 51 60·400; „ „ 12 „ = 1 51 59·859; General Mean = d = 1 51 60·130
May 5	25·09	25·69	2·91	2·88	·49	1·43	·70	2·02	26·52	12 24 24·82	·83	1 51 60·27	0·55	
	28·00	28·57	2·83	3·01	·47	1·33	·68	2·05	29·33	27·71	·76	·29	·54	
Comparison No. 1	30·83	31·58	2·91	3·01	·53	1·54	·64	1·93	32·37	30·62	·79	·21	·55	
	33·74	34·59	3·04	3·08	·55	1·67	·62	1·91	35·41	33·51	·82	·23	·56	
	36·78	37·67	3·24	3·13	·53	1·72	·61	1·91	38·50	36·50	·83	·28	·54	
Exchange B	40·02	40·80	3·12	3·12	·53	1·65	·66	2·06	41·67	39·58	·87	·44	·39	
	43·14	43·92	3·12	3·07	·52	1·62	·68	2·09	44·76	42·86	·84	·28	·59	
Current used	46·26	46·99	3·03	2·92	·54	1·64	·66	1·93	47·90	46·01	·91	·25	·59	
	49·29	49·91	3·03	3·00	·50	1·52	·70	2·10	50·81	48·92	·90	·37	·54	
at East, Negative	52·32	52·91	2·90	2·89	·49	1·42	·70	2·02	53·74	52·01	·83	·31	·59	
at West, „	55·22	55·80	3·28	3·30	·43	1·41	·73	2·41	56·63	54·93	·83	·29	·54	
	58·50	59·10	2·87	2·99	·49	1·41	·67	2·00	59·91	58·21	·81	·29	·54	
Pen Equation	17 1·37	25 2·09	3·03	2·95	·53	1·61	·66	1·95	17 2·98	25 1·10	·89	·27	·54	
s	4·40	5·04	3·01	3·18	·49	1·47	·65	2·07	5·8;	4·04	·83	·36	·53	
at East − 1·886	7·41	8·22							...	7·11	...	·30	·53	
at West − 1·449														
Mean	14 16 45 = t_E										1 51 60·837	1 51 60·296	·541	

TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at East	Times of Local Signals recorded on Chronograph at West	Intervals between successive Local Signals as recorded at East	Intervals between successive Local Signals as recorded at West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape, Decimal	Signals from West on East Tape, Seconds	Signals from East on West Tape, Decimal	Signals from East on West Tape, Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at East	Observed Differences of Clocks at West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_x
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877 May 5	h m s 14 17 26·79	h m s 12 25 28·75	s 3·51	s 3·08	·55	s 1·93	·67	s 2·06	h m s 14 17 28·72	h m s ...	h m s 1 51 59·97	h m s ...	s ...	Mean of col. 11 after Correction for Pen Equations = h m s 1 51 60·413; ″ ″ 12 ″ = 1 51 59·852; General Mean = d = 1 51 60·133
	30·30	31·83	3·12	3·18	·50	1·56	·67	2·13	31·86	12 25 30·81	60·03	1 51 59·49	0·48	
	33·42	35·01	3·28	3·26	·47	1·54	·70	2·28	34·96	33·96	59·95	·46	·57	
Comparison No. 1	36·70	38·27	3·02	2·93	·50	1·51	·70	2·05	38·21	37·29	·94	·41	·54	
	39·72	41·20	2·95	3·07	·50	1·48	·68	2·09	41·20	40·32	60·00	·40	·54	
Exchange C	42·67	44·27	3·04	2·94	·52	1·58	·69	2·03	44·25	43·29	59·98	·38	·62	
	45·71	47·21	3·01	3·02	·50	1·51	·70	2·11	47·22	46·30	60·01	·41	·57	
Current used	48·72	50·23	2·98	3·07	·50	1·49	·67	2·06	50·21	49·32	59·98	·40	·61	
	51·70	53·30	3·03	3·13	·53	1·61	·65	2·03	53·31	52·29	60·01	·41	·57	
at East, Positive	54·73	56·43	3·17	3·12	·54	1·71	·66	2·06	56·44	55·33	·01	·40	·61	
at West, Negative	57·90	59·55	3·20	3·15	·49	1·57	·68	2·14	59·47	58·49	59·92	·41	·60	
	18 1·10	26 2·70	3·11	3·09	·50	1·56	·68	2·10	18 2·66	26 1·69	·96	·41	·51	
Pen Equation	4·21	5·79	3·21	3·29	·49	1·57	·67	2·20	5·78	4·80	·99	·41	·55	
	7·42	9·08	3·27	3·22	·49	1·60	·68	2·19	9·02	7·99	·94	·43	·56	
at East + s 1·886	10·69	12·30	3·11	3·10	·50	1·56	·68	2·11	12·25	11·27	·95	·42	·52	
at West + 1·449	13·80	15·40							...	14·41	...	·39	·56	
Mean	14 17 50 = t_x										1 51 59·976	1 51 59·415	·561	
1877 May 5	14 18 40·02	12 26 40·80	3·11	3·00	·52	1·62	·67	2·01	14 18 41·64	...	1 51 60·84	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 1 51 60·435; ″ ″ 12 ″ = 1 51 59·870; General Mean = d = 1 51 60·153
	43·13	43·80	3·07	3·01	·49	1·50	·70	2·11	44·63	12 26 42·81	·83	1 51 60·32	0·52	
	46·20	46·81	3·02	2·99	·50	1·51	·70	2·09	47·71	45·91	·90	·29	·54	
Comparison No. 1	49·22	49·80	2·96	2·91	·50	1·48	·70	2·04	50·70	48·90	·90	·32	·58	
	52·18	52·71	3·02	3·05	·46	1·39	·74	2·26	53·57	51·84	·86	·34	·56	
	55·20	55·76	3·04	3·04	·46	1·40	·70	2·13	56·60	54·97	·84	·23	·63	
Exchange D	58·24	58·80	3·01	3·03	·48	1·44	·71	2·15	59·68	57·89	·88	·35	·49	
	19 1·25	27 1·83	2·95	2·89	·48	1·42	·70	2·02	19 2·67	27 0·95	·84	·30	·58	
Current used	4·20	4·72	2·96	3·03	·48	1·42	·70	2·12	5·62	3·85	·90	·35	·49	
	7·16	7·75	3·09	3·22	·50	1·55	·68	2·19	8·71	6·84	·96	·32	·58	
at East, Negative	10·25	10·97	3·12	2·99	·50	1·56	·71	2·12	11·81	9·94	·84	·31	·65	
at West, Positive	13·37	13·96	2·93	2·96	·50	1·47	·69	2·04	14·84	13·09	·88	·28	·56	
	16·30	16·92	3·04	3·05	·48	1·46	·68	2·07	17·76	16·00	·84	·30	·58	
Pen Equation	19·34	19·97	3·05	3·02	·50	1·53	·71	2·14	20·87	18·99	·90	·35	·49	
at East − s 1·886	22·39	22·99	2·94	2·96	·50	1·47	·70	2·07	23·86	22·11	·87	·28	·62	
at West − 1·449	25·33	25·95							...	25·06	...	·27	·60	
Mean	14 19 3 = t_x										1 51 60·872	1 51 60·307	·565	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	West	Intervals between successive Local Signals as recorded at: East	West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Seconds	Signals from East on West Tape: Decimal	Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at: East	West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = 1h 51m 60·752s
May 5	17 30 32·50	15 38 33·74	3·81	3·69	...	...	·77	2·84	...	...	...	...	...	„ 12 „ = 1 51 60·188
	36·31	37·43	2·99	2·98	·48	1·44	·71	2·12	17 30 37·75	15 38 36·58	1 51 60·32	1 51 59·73	...	General Mean = d = 1 51 60·470
	39·30	40·41	3·20	3·27	·44	1·41	·72	2·35	40·71	39·55	·30	·75	0·57	
Comparison No. 2	42·50	43·68	2·99	2·86	·50	1·50	·70	2·00	44·00	42·76	·32	·74	·56	
	45·49	46·54	2·90	2·92	·47	1·36	·70	2·04	46·85	45·68	·31	·81	·51	
Exchange A	48·39	49·46	2·80	2·80	·48	1·34	·70	1·96	49·73	48·58	·27	·81	·50	
	51·19	52·26	2·84	2·84	·50	1·42	·72	2·04	52·61	51·42	·35	·77	·50	
	54·03	55·10	2·80	2·89	·51	1·43	·69	1·99	55·46	54·30	·36	·73	·62	
Current used	56·83	57·99	2·94	2·90	·50	1·47	·70	2·03	58·30	57·09	·31	·74	·62	
at East, Positive	59·77	39 0·89	2·86	2·81	·51	1·46	72	2·02	31 1·23	39 0·02	·34	·75	·56	
at West, „	31 2·63	3·70	2·87	2·92	·48	1·38	·70	2·04	4·01	2·91	·31	·72	·62	
	5·50	6·62	2·88	2·93	·50	1·44	·69	2·02	6·94	5·74	·32	·76	·55	
	8·38	9·55	2·87	2·75	·52	1·49	·72	1·98	9·87	8·64	·32	·74	·58	
Pen Equation	11·25	12·30	2·75	2·82	·48	1·32	·69	1·95	12·57	11·53	·27	·72	·60	
at East + 1·885s	14·00	15·12	2·90	2·89	·50	1·45	·70	2·02	15·45	14·25	·33	·75	·52	
at West + 1·449	16·90	18·01							...	17·14	...	·76	·57	
Mean	17 30 55 = t_E										1 51 60·316	1 51 59·752	·563	
1877	17 31 42·67	15 39 43·06	2·93	2·75	·52	1·52	·68	1·87	17 31 44·19	...	1 51 61·13	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 51m 60·733s
May 5	45·60	45·81	2·71	2·69	·52	1·41	·70	1·88	47·01	15 39 44·93	·20	1 51 60·67	0·46	„ 12 „ = 1 51 60·165
	48·31	48·50	2·69	2·71	·50	1·35	·69	1·87	49·66	47·69	·16	·62	·58	General Mean = d = 1 51 60·449
	51·00	51·21	2·67	2·61	·53	1·42	·70	1·83	52·42	50·37	·21	·63	·53	
Comparison No. 2	53·67	53·82	2·65	2·78	·50	1·33	·70	1·95	55·00	53·04	·18	·63	·58	
	56·32	56·60	2·78	2·80	·50	1·39	·70	1·96	57·71	55·77	·11	·55	·63	
Exchange B	59·10	59·40	2·72	2·60	·52	1·41	·70	1·82	32 0·51	58·56	11	·54	·57	
	32 1·82	40 2·00	2·68	2·74	·51	1·37	·70	1·92	3·19	40 1·22	·19	·60	·51	
Current used	4·50	4·74	2·72	2·66	·53	1·44	·70	1·86	5·94	3·92	·20	·58	·61	
	7·22	7·40	2·69	2·60	·50	1·35	·71	1·85	8·57	6·60	·17	·62	·58	
at East, Negative	9·91	10·00	2·58	2·80	·50	1·29	·68	1·90	11·20	9·25	·20	·66	·51	
at West, „	12·49	12·80	2·73	2·74	·53	1·45	·68	1·86	13·94	11·90	·14	·59	·61	
	15·22	15·54	2·79	2·86	·52	1·45	·69	1·97	16·67	14·66	·13	·56	·58	
Pen Equation	18·01	18·40	2·89	2·86	·55	1·59	·66	1·89	19·60	17·51	·20	·50	·63	
	20·90	21·26	2·89	2·85	·54	1·56	·66	1·88	22·46	20·29	·20	·61	·59	
at East − 1·885s	23·79	24·11							...	23·14	...	·65	·55	
at West − 1·449														
Mean	17 32 3 = t_E										1 51 61·169	1 51 60·601	·568	

TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Bombay (E) and *Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 60·742 s; " 12 " = 1 51 60·178; General Mean = d = 1 51 60·460
May 5	17 32 39·05	15 40 40·53	3·15	2·77	·56	1·76	·71	1·97	17 32 40·81	...	1 51 60·28	...	...	
	42·20	43·30	2·85	2·80	·50	1·43	·71	1·99	43·63	15 40 42·50	·33	1 51 59·70	0·58	
	45·05	46·10	2·98	2·88	·48	1·43	·75	2·16	46·48	45·29	·38	·76	·57	
Comparison No. 2	48·03	48·98	2·77	4·52	·48	1·33	...	...	49·36	48·26	·38	·77	·61	
	50·80	53·50	4·45	2·91	·67	2·98	·69	2·01	53·78	...	·28	...	...	
Exchange C	55·25	56·41	2·94	2·89	·50	1·47	·69	1·99	56·72	55·51	·31	·74	·54	
	58·19	59·30	2·96	2·96	·49	1·45	·71	2·10	59·64	58·40	·34	·79	·52	
	33 1·15	41 2·26	3·05	3·15	·45	1·37	·70	2·21	33 2·52	41 1·40	·26	·75	·59	
Current used	4·20	5·41	3·01	2·99	·50	1·51	·70	2·09	5·71	4·47	·30	·73	·53	
at East, Positive	7·21	8·40	2·99	2·92	·50	1·50	·70	2·04	8·71	7·50	·31	·71	·59	
at West, Negative	10·20	11·32	3·00	2·99	·48	1·44	·70	2·09	11·64	10·44	·32	·76	·55	
	13·20	14·31	3·00	3·07	·46	1·38	·70	2·15	14·58	13·41	·27	·79	·53	
	16·20	17·38	2·94	3·01	·50	1·47	·67	2·02	17·67	16·46	·29	·74	·53	
Pen Equation	19·14	20·39	3·08	3·01	·50	1·54	·70	2·11	20·68	19·40	·29	·74	·55	
at East + 1·885 s	22·22	23·40	2·98	3·01	·48	1·43	·70	2·11	23·65	22·50	·25	·72	·57	
at West + 1·449	25·20	26·41							...	25·51	...	·69	·56	
Mean	17 33 2 = t_E										1 51 60·306	1 51 59·742	·559	
1877	17 33 50·60	15 41 51·00	2·88	2·91	·56	1·61	·64	1·86	17 33 52·21	...	1 51 61·21	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 51 m 60·743 s; " 12 " = 1 51 60·166; General Mean = d = 1 51 60·455
May 5	53·48	53·91	2·92	2·81	·56	1·64	·69	1·94	55·12	15 41 52·86	·21	1 51 60·62	0·59	
	56·40	56·72	2·90	2·94	·52	1·51	·67	1·97	57·91	55·85	·19	·55	·66	
Comparison No. 2	59·30	59·66	2·89	2·73	·53	1·53	·70	1·91	34 0·83	58·69	·17	·61	·58	
	34 2·19	42 2·39	2·72	2·78	·51	1·39	·70	1·95	3·58	42 1·57	·19	·62	·55	
	4·91	5·17	2·89	2·82	·50	1·45	·70	1·97	6·36	4·34	·19	·57	·62	
Exchange D	7·80	7·99	2·80	2·83	·50	1·40	·70	1·98	9·20	7·14	·21	·66	·53	
	10·60	10·82	2·81	2·80	·50	1·41	·70	1·96	12·01	9·97	·19	·63	·58	
Current used	13·41	13·62	2·81	2·87	·50	1·41	·70	2·01	14·82	12·78	·20	·63	·56	
	16·22	16·49	2·78	2·76	·50	1·39	·70	1·93	17·61	15·63	·12	·59	·61	
at East, Negative	19·00	19·25	2·82	2·81	·50	1·41	·70	1·97	20·41	18·42	·16	·58	·54	
at West, Positive	21·82	22·06	2·76	2·79	·51	1·41	·69	1·93	23·23	21·22	·17	·60	·56	
	24·58	24·85	2·83	2·84	·50	1·42	·69	1·96	26·00	23·99	·15	·59	·58	
Pen Equation	27·41	27·69	2·74	2·74	·52	1·42	·69	1·89	28·83	26·81	·14	·60	·55	
at East − 1·885 s	30·15	30·43	2·89	2·86	·51	1·47	·70	2·00	31·62	29·58	·19	·57	·57	
at West − 1·449	33·04	33·29							...	32·43	...	·61	·58	
Mean	17 34 12 = t_E										1 51 61·179	1 51 60·602	·577	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
May 7	14 26 27·20	12 34 24·80	3·36	3·20	·56	1·88	·65	2·08	14 26 29·08	...	1 52 4·28	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 52 m 4·683 s „ „ 12 „ „ = 1 52 4·085 General Mean = d = 1 52 4·384
	30·56	28·00	3·31	3·23	·50	1·66	·68	2·20	32·22	12 34 26·88	·22	1 52 3·68	0·60	
	33·87	31·23	3·08	3·16	·51	1·57	·66	2·09	35·44	30·20	·21	·67	·55	
Comparison No. 1	36·95	34·39	3·10	3·00	·53	1·64	·67	2·01	38·59	33·32	·20	·63	·58	
	40·05	37·39	3·07	3·01	·52	1·60	·69	2·08	41·65	36·40	·26	·65	·55	
Exchange A	43·12	40·40	2·96	3·00	·50	1·48	·66	1·98	44·60	39·47	·20	·65	·61	
	46·08	43·40	3·08	3·08	·53	1·63	·69	2·13	47·71	42·38	·31	·70	·50	
	49·16	46·48	2·99	3·02	·52	1·55	·69	2·08	50·71	45·53	·23	·63	·68	
Current used	52·15	49·50	3·09	3·00	·51	1·58	·70	2·10	53·73	48·56	·23	·59	·64	
at East, Positive	55·24	52·50	2·96	2·98	·53	1·57	·69	2·06	56·81	51·60	·31	·64	·59	
at West, „	58·20	55·48	2·94	2·90	·52	1·53	·69	2·00	59·73	54·56	·25	·64	·67	
	27 1·14	58·38	2·91	2·97	·51	1·48	·68	2·02	27 2·62	57·48	·24	·66	·59	
	4·05	35 1·35	2·96	2·97	·53	1·57	·67	1·99	5·62	35 0·40	·27	·65	·59	
Pen Equation	7·01	4·32	3·01	2·98	·52	1·57	·69	2·06	8·58	3·34	·26	·67	·60	
s at East + 1·900 at West + 1·465	10·02	7·30							...	6·38	...	·64	·62	
Mean	14 26 49 = t_E										1 52 4·248	1 52 3·650	·598	
1877	14 27 39·20	12 35 39·40	2·98	3·00	·50	1·49	·66	1·98	14 27 40·69	...	1 52 1·29	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 52 m 4·673 s „ „ 12 „ „ = 1 52 4·124 General Mean = d = 1 52 4·399
May 7	42·18	42·40	2·92	2·99	·53	1·55	·65	1·94	43·73	12 35 41·38	·33	1 52 0·80	0·49	
	45·10	45·39	2·98	2·78	·55	1·64	·68	1·89	46·74	44·34	·35	·76	·57	
Comparison No. 1	48·08	48·17	2·77	2·75	·50	1·39	·69	1·90	49·47	47·28	·30	·80	·55	
	50·85	50·92	2·76	2·78	·50	1·38	·68	1·89	52·23	50·07	·31	·78	·52	
	53·61	53·70	2·87	2·87	·47	1·35	·70	2·01	54·96	52·81	·26	·80	·51	
Exchange B	56·48	56·57	2·81	...	·49	1·38	...	...	57·86	55·71	·29	·77	·49	
	59·29	...	...	...	...	...	...	...	...	...	...	...	...	
Current used		...	...	...	...	...	...	...	...	...	...	...	...	
	28 4·91	36 5·10	2·80	2·66	·54	1·51	·70	1·86	28 6·42	...	·32	...	...	
at East, Negative	7·71	7·76	2·73	2·78	·49	1·34	·70	1·95	9·05	36 6·96	·29	·75	·57	
at West, „	10·44	10·54	2·86	2·91	·50	1·43	·69	2·01	11·87	9·71	·33	·73	·56	
	13·30	13·45	2·90	2·85	·51	1·48	·70	2·00	14·78	12·55	·33	·75	·58	
Pen Equation	16·20	16·30	2·78	2·88	·50	1·39	·70	2·02	17·59	15·45	·29	·75	·58	
s at East + 1·900 at West − 1·465	18·98	19·18							...	18·32	...	·66	·63	
Mean	14 27 59 = t_E										1 52 1·308	1 52 0·759	·550	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 7	14 28 41·54	12 36 35·60	3·70	3·24	·56	2·07	·70	2·27	14 28 43·61	...	1 52 8·01	...	...	Mean of col. 11 after Correction for Pen Equations = 1 52 4·621 (h m s); " " 12 " " = 1 52 4·055; General Mean = d = 1 52 4·338
	45·24	38·84	3·12	3·13	·50	1·56	·67	2·10	46·80	12 36 37·87	7·96	1 52 7·37	0·64	
	48·36	41·97	3·09	3·36	·50	1·55	·60	2·02	49·91	40·94	·94	·42	·54	
Comparison No. 1	51·45	45·33	3·34	2·87	·55	1·84	·70	2·01	53·29	43·99	·96	·46	·48	
	54·79	48·20	3·00	3·10	·50	1·50	·70	2·17	56·29	47·34	8·09	·45	·51	
Exchange C	57·79	51·30	2·94	2·84	·50	1·47	·70	1·99	59·26	50·37	7·96	·42	·67	
	29 0·73	54·14	2·88	3·05	·50	1·44	·68	2·07	29 2·17	53·29	8·03	·44	·52	
	3·61	57·19	3·14	3·11	·50	1·57	·67	2·08	5·18	56·21	7·99	·40	·63	
Current used	6·75	37 0·30	3·07	3·14	·50	1·54	·69	2·17	8·29	59·27	·99	·48	·51	
at East, Positive	9·82	3·44	3·15	3·16	·51	1·61	·67	2·12	11·43	37 2·47	·99	·35	·64	
at West, Negative	12·97	6·60	3·13	3·08	·51	1·60	·67	2·06	14·57	5·56	·97	·41	·58	
	16·10	9·68	3·10	3·03	·50	1·55	·67	2·03	17·65	8·66	·97	·44	·53	
Pen Equation	19·20	12·71	3·05	3·08	·50	1·53	·69	2·13	20·73	11·71	8·02	·49	·48	
s	22·25	15·79	3·05	3·20	·50	1·53	·68	2·18	23·78	14·84	7·99	·41	·61	
at East − 1·900	25·30	18·99	3·15	3·07	·51	1·61	·66	2·03	26·91	17·97	·92	·33	·66	
at West + 1·465	28·45	22·06							...	21·02	...	·43	·49	
Mean	14 29 5 = t_E										1 52 7·986	1 52 7·420	·566	
1877 May 7	14 29 50·80	12 37 47·28	2·90	2·80	·53	1·54	·67	1·88	14 29 52·34	...	1 52 5·06	...	...	Mean of col. 11 after Correction for Pen Equations = 1 52 4·643 (h m s); " " 12 " " = 1 52 4·096; General Mean = d = 1 52 4·370
	53·70	50·08	2·85	2·72	·50	1·43	·70	1·90	55·13	12 37 49·16	·05	1 52 4·54	0·52	
	56·55	52·80	2·65	2·69	·53	1·40	·69	1·86	57·95	51·98	·15	·57	·48	
Comparison No. 1	59·20	55·49	2·71	2·81	·51	1·38	·70	1·97	30 0·58	54·66	·09	·54	·61	
	30 1·91	58·30	2·74	2·72	·54	1·48	·66	1·80	3·39	57·46	·09	·45	·64	
	4·65	38 1·02	2·85	2·82	·50	1·43	·70	1·97	6·08	38 0·10	·06	·55	·54	
Exchange D	7·50	3·84	2·83	3·02	·51	1·44	·65	1·96	8·94	2·99	·10	·51	·55	
	10·33	6·86	2·93	2·95	·54	1·58	·63	1·86	11·91	5·80	·05	·53	·57	
Current used	13·26	9·81	2·94	2·87	·58	1·71	·64	1·84	14·97	8·72	·16	·54	·51	
	16·20	12·68	2·90	2·92	·50	1·45	·64	1·87	17·65	11·65	4·97	·55	·61	
at East, Negative	19·10	15·60	2·99	3·10	·53	1·58	·61	1·89	20·68	14·55	5·08	·55	·42	
at West, Positive	22·09	18·70	3·83	4·08	...	...	·66	2·69	...	17·49	...	·60	·48	
	25·92	22·78	3·48	3·31	·56	1·95	·64	2·12	27·87	21·39	·09	·53	...	
Pen Equation	29·40	26·09	3·23	3·03	·54	1·74	·67	2·03	31·14	24·90	·05	·50	·59	
s	32·63	29·12	3·10	3·05	·50	1·55	·69	2·10	34·18	28·12	·06	·51	·54	
at East − 1·900	35·73	32·17	3·17	3·62	·48	1·52	·60	2·17	37·25	31·22	·08	·51	·55	
at West − 1·465	38·90	35·79	3·50	3·21	·57	2·00	·66	2·12	40·90	34·34	·11	·56	·52	
	42·40	39·00							...	37·91	...	·49	·62	
Mean	14 30 16 = t_E										1 52 5·078	1 52 4·531	·547	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877	17 33 27·68	15 41 24·90	3·34	3·21	·53	1·77	·69	2·21	17 33 29·45	...	1 52 4·55	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 52m 4·953s „ „ 12 „ „ = 1 52 4·371 General Mean = d = 1 52 4·662
May 7	31·02	28·11	3·07	2·89	·50	1·54	·71	2·05	32·56	15 41 27·11	·45	1 52 3·91	0·64	
	34·09	31·00	2·91	3·02	·50	1·46	·68	2·05	35·55	30·16	·55	·93	·52	
Comparison No. 2	37·00	34·02	2·91	3·08	54	1·57	·65	2·00	38·57	33·05	·55	·95	·60	
	39·91	37·10	3·07	2·80	·55	1·69	·70	1·96	41·60	36·02	·50	·89	·66	
Exchange A	42·98	39·90	2·79	3·00	·53	1·48	·63	1·89	44·46	39·06	·56	·92	·58	
	45·77	42·90	2·93	2·87	·55	1·61	·65	1·87	47·38	41·79	·48	·98	·58	
	48·70	45·77	2·92	2·91	·54	1·58	·64	1·86	50·28	44·77	·51	·93	·55	
Current used	51·62	48·68	2·83	2·82	·56	1·58	·65	1·83	53·20	47·63	·52	·99	·52	
at East, Positive	54·45	51·50	2·76	2·75	·57	1·57	·65	1·79	56·02	50·51	·52	·94	·58	
at West, „	57·21	54·25	2·89	2·87	·52	1·50	·66	1·89	58·71	53·29	·46	·92	·60	
	34 0·10	57·12	2·81	2·82	·59	1·66	·66	1·86	34 1·76	56·14	·64	·96	·50	
Pen Equation	2·91	59·94	2·78	2·82	·56	1·56	·63	1·78	4·47	58·98	·53	·93	·71	
s	5·69	42 2·76	2·91	2·95	·54	1·57	·64	1·89	7·26	42 1·72	·50	·97	·56	
at East + 1·895	8·60	5·71							...	4·65	...	·95	·55	
at West + 1·465														
Mean	17 33 48 = t_E										1 52 4·523	1 52 3·941	·582	
1877	17 34 31·34	15 42 31·48	3·00	2·89	·56	1·68	·64	1·85	17 34 33·02	...	1 52 1·54	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 52m 4·947s „ „ 12 „ „ = 1 52 4·410 General Mean = d = 1 52 4·679
May 7	34·34	34·37	2·87	2·81	·54	1·55	·66	1·85	35·89	15 42 33·33	·52	1 52 1·01	0·53	
	37·21	37·18	2·87	2·85	·54	1·55	·65	1·85	38·76	36·22	·58	0·99	·53	
Comparison No. 2	40·08	40·03	2·89	2·81	·54	1·56	·66	1·85	41·64	39·03	·61	1·05	·53	
	42·97	42·84	2·80	2·91	·54	1·51	·63	1·83	44·48	41·88	·64	·09	·52	
	45·77	45·75	2·95	2·93	·54	1·59	·66	1·93	47·36	44·67	·61	·10	·54	
Exchange B	48·72	48·68	2·88	2·78	·54	1·56	·65	1·81	50·28	47·68	·60	·04	·57	
	51·60	51·46	2·78	2·80	·55	1·53	·66	1·85	53·13	50·49	·67	·11	·49	
Current used	54·38	54·26	2·80	2·83	·54	1·51	·65	1·84	55·89	53·31	·63	·07	·60	
	57·18	57·09	2·82	2·91	·53	1·49	·64	1·86	58·67	56·10	·58	·08	·55	
at East, Negative	35 0·00	43 0·00	2·91	2·98	·54	1·57	·63	1·88	35 1·57	58·95	·57	·05	·53	
at West, „	2·91	2·98	3·00	2·99	·55	1·65	·63	1·88	4·56	43 1·88	·58	·03	·54	
	5·91	5·97	2·94	2·97	·56	1·65	·61	1·81	7·56	4·86	·59	·05	·53	
Pen Equation	8·85	8·94	2·98	2·95	·56	1·67	·64	1·89	10·52	7·78	·58	·07	·52	
s	11·83	11·89	2·95	3·30	·53	1·56	·57	1·88	13·39	10·83	·50	·00	·58	
at East + 1·895	14·78	15·19							...	13·77	...	·01	·49	
at West − 1·465														
Mean	17 34 53 = t_E										1 52 1·587	1 52 1·050	·537	

Bombay (E) and *Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	East	West	East	West	Signals from West on East Tape		Signals from East on West Tape		West Signals by East Clock	East Signals by West Clock	East	West		
					Decimal	Seconds	Decimal	Seconds						
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877	17 35 35·64	15 43 29·40	3·36	2·98	·59	1·98	·65	1·94	17 35 37·62	...	1 52 8·22	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 52 m 4·873 s; " " 12 " " = 1 52 4·331; General Mean = d = 1 52 4·602
May 7	39·00	32·38	3·08	2·85	·54	1·66	·70	2·00	40·66	15 43 31·34	·28	1 52 7·66	0·56	
	42·08	35·23	2·83	2·90	·50	1·42	·69	2·00	43·50	34·38	·27	·70	·58	
Comparison No. 2	44·91	38·13	2·87	2·88	·50	1·44	·68	1·96	46·35	37·23	·22	·68	·59	
	47·78	41·01	2·92	2·95	·50	1·46	·67	1·98	49·24	40·09	·23	·69	·53	
Exchange C	50·70	43·96	2·98	2·95	·50	1·49	·68	2·01	52·19	42·99	·23	·71	·52	
	53·68	46·91	2·93	2·89	·50	1·47	·70	2·02	55·15	45·97	·24	·71	·52	
	56·61	49·80	2·79	2·87	·51	1·42	·67	1·92	58·03	48·93	·23	·68	·56	
Current used	59·40	52·67	2·87	2·87	·52	1·49	·64	1·84	36 0·89	51·72	·22	·68	·55	
at East, Positive	36 2·27	55·54	2·93	3·14	·53	1·55	·61	1·92	3·82	54·51	·28	·76	·46	
at West, Negative	5·20	58·68	3·13	2·90	·54	1·69	·69	2·00	6·89	57·46	·21	·74	·54	
	8·33	44 1·58	2·87	2·80	·50	1·44	·69	1·93	9·77	44 0·68	·19	·65	·56	
Pen Equation	11·20	4·38	2·83	2·91	·50	1·42	·69	2·01	12·62	3·51	·24	·69	·50	
s	14·03	7·29	2·97	2·95	·50	1·49	·68	2·01	15·52	6·39	·23	·64	·60	
at East − 1·895	17·00	10·24	2·90	2·87	·50	1·45	·69	1·98	18·45	9·30	·21	·70	·53	
at West + 1·465	19·90	13·11							...	12·22	...	·68	·53	
Mean	17 35 58 = t_E										1 52 8·233	1 52 7·691	·542	
1877	17 36 38·55	15 44 34·80	2·93	2·88	·54	1·58	·69	1·99	17 36 40·13	...	1 52 5·33	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 52 m 4·890 s; " " 12 " " = 1 52 4·349; General Mean = d = 1 52 4·620
May 7	41·48	37·68	2·92	2·82	·50	1·46	·70	1·97	42·94	15 44 36·79	·26	1 52 4·69	0·64	
	44·40	40·50	2·80	2·80	·51	1·43	·67	1·88	45·83	39·65	·33	·75	·51	
Comparison No. 2	47·20	43·30	2·83	2·79	·50	1·42	·69	1·93	48·62	42·38	·32	·82	·51	
	50·03	46·09	2·77	2·69	·52	1·44	·70	1·88	51·47	45·23	·38	·80	·52	
	52·80	48·78	2·71	2·82	·50	1·36	·69	1·95	54·16	47·97	·38	·83	·55	
Exchange D	55·51	51·60	2·90	2·90	·50	1·45	·70	2·03	56·96	50·73	·36	·78	·60	
	58·41	54·50	2·82	2·86	·50	1·41	·69	1·97	59·82	53·63	·32	·78	·58	
Current used	37 1·23	57·36	2·80	2·74	·50	1·40	·69	1·89	37 2·63	56·47	·27	·76	·56	
	4·03	45 0·10	2·67	2·70	·56	1·50	·69	1·86	5·53	59·25	·43	·78	·49	
at East, Negative	6·70	2·80	2·72	2·69	·50	1·36	·70	1·88	8·06	45 1·96	·26	·74	·69	
at West, Positive	9·42	5·49	2·68	2·71	·50	1·34	·66	1·79	10·76	4·68	·27	·74	·52	
	12·10	8·20	2·82	2·82	·49	1·38	·69	1·95	13·48	7·28	·28	·82	·45	
Pen Equation	14·92	11·02	2·80	2·94	·51	1·43	·64	1·88	16·35	10·15	·33	·77	·51	
s at East − 1·895	17·72	13·96	2·98	3·23	·51	1·52	·60	1·94	19·24	12·90	·28	·82	·51	
at West − 1·465	20·70	17·19							...	15·90	...	·80	·48	
Mean	17 37 0 = t_E										1 52 5·320	1 52 4·779	·541	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_x
					Signals from West on East Tape		Signals from East on West Tape							
	East	West	East	West	Decimal	Seconds	Decimal	Seconds	West Signals by East Clock	East Signals by West Clock	East	West		
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877	14 26 52·33	12 34 47·70	2·98	3·19	·50	1·49	·64	2·04	14 26 53·82	...	1 52 6·12	...	...	Mean of col. 11 after Correction for Pen Equations = 1 52 6·658 (h m s) " " 12 " " = 1 52 6·028 General Mean = d = 1 52 6·343
May 8	55·31	50·89	3·09	2·90	·55	1·70	·66	1·91	57·01	12 34 49·74	·12	1 52 5·57	0·55	
	58·40	53·79	2·93	2·86	·50	1·47	·69	1·97	59·87	52·80	·08	·60	·52	
Comparison No. 1	27 1·33	56·65	2·88	2·85	·52	1·50	·70	2·00	27 2·83	55·76	·18	·57	·51	
	4·21	59·50	2·97	3·00	·50	1·49	·68	2·04	5·70	58·65	·20	·56	·62	
Exchange A	7·18	35 2·50	3·04	3·00	·54	1·64	·72	2·16	8·82	35 1·54	·32	·64	·56	
	10·22	5·50	2·98	3·10	·50	1·49	·70	2·17	11·71	4·66	·21	·56	·76	
	13·20	8·60	3·04	3·00	·52	1·58	·70	2·10	14·78	7·67	·18	·53	·68	
Current used	16·24	11·60	3·07	3·20	·53	1·63	·66	2·11	17·87	10·70	·27	·54	·64	
at East, Positive	19·31	14·80	3·09	2·93	·55	1·70	·70	2·05	21·01	13·71	·21	·60	·67	
at West, "	22·40	17·73	3·00	3·13	·53	1·59	·68	2·13	23·99	16·85	·26	·55	·66	
	25·40	20·86	3·08	3·58	·55	1·69	·58	2·08	27·09	19·86	·23	·54	·72	
	28·48	24·44	3·75	3·36	·58	2·18	·65	2·18	30·66	22·94	·22	·54	·69	
Pen Equation	32·23	27·80							...	26·62	...	·61	·61	
at East + 1·891 s														
at West + 1·433														
Mean	14 27 12 = t_x										1 52 6·200	1 52 5·570	·630	
1877	14 27 54·26	12 35 52·50	3·06	3·08	·49	1·50	·70	2·16	14 27 55·76	...	1 52 3·26	...	...	Mean of col. 11 after Correction for Pen Equations = 1 52 6·580 (h m s) " 13 " " = 1 52 6·007 General Mean = d = 1 52 6·294
May 8	57·32	55·58	2·95	3·09	·50	1·48	·66	2·04	58·80	12 35 54·66	·22	1 52 2·66	0·60	
	28 0·27	58·67	3·33	3·04	·51	1·70	·71	2·16	28 1·97	57·62	·30	·65	·57	
Comparison No. 1	3·60	36 1·71	2·90	2·96	·47	1·36	·70	2·07	4·96	36 0·83	·25	·77	·53	
	6·50	4·67	2·92	3·00	·50	1·46	·68	2·04	7·96	3·78	·29	·72	·53	
	9·42	7·67	3·07	2·93	·48	1·47	·71	2·08	10·89	6·71	·22	·71	·58	
Exchange B	12·49	10·60	2·92	3·09	·49	1·43	·70	2·16	13·92	9·75	·32	·74	·48	
	15·41	13·69	3·01	3·11	·50	1·51	·67	2·08	16·92	12·76	·23	·65	·67	
Current used	18·42	16·80	3·08	3·04	·52	1·60	·67	2·04	20·02	15·77	·22	·65	·58	
	21·50	19·84	3·12	3·24	·52	1·62	·67	2·17	23·12	18·84	·28	·66	·56	
at East, Negative	24·62	23·08	3·19	3·02	·52	1·66	·68	2·05	26·28	22·01	·20	·61	·67	
at West, "	27·81	26·10	3·09	3·08	·50	1·55	·70	2·16	29·36	25·13	·26	·68	·52	
	30·90	29·18	3·12	3·32	·50	1·56	·64	2·12	32·46	28·26	·28	·64	·62	
Pen Equation	34·02	32·50	3·48	3·40	·50	1·74	·68	2·31	35·76	31·30	·26	·72	·56	
at East + 1·891 s	37·50	35·90	3·30	3·40	·50	1·65	·65	2·21	39·15	34·81	·25	·69	·57	
at West − 1·433	40·80	39·30							...	38·11	...	·69	·56	
Mean	14 28 18 = t_x										1 52 3·256	1 52 2·683	·573	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at East	Times of Local Signals recorded on Chronograph at West	Intervals between successive Local Signals as recorded at East	Intervals between successive Local Signals as recorded at West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape, Decimal	Signals from West on East Tape, Seconds	Signals from East on West Tape, Decimal	Signals from East on West Tape, Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at East	Observed Differences of Clocks at West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877 May 8	h m s 14 29 9·99	h m s 12 37 1·60	s 3·42	s 3·49	·44	s 1·50	·71	s 2·48	h m s 14 29 11·49	h m s ...	h m s 1 52 9·89	h m s ...	s ...	Mean of col. 11 after Correction for Pen Equations = h m s 1 52 6·607; " 12 " = 1 52 6·012; General Mean = d = 1 52 6·310
	13·41	5·09	3·23	3·19	·46	1·49	·70	2·23	14·90	12 37 4·08	·81	1 52 9·33	0·56	
	16·64	8·28	3·32	3·32	·46	1·53	·68	2·26	18·17	7·32	·89	·32	·49	
Comparison No. 1	19·96	11·60	3·24	3·16	·49	1·59	·70	2·21	21·55	10·54	·95	·42	·47	
	23·20	14·76	3·10	3·22	·49	1·52	·70	2·25	24·72	13·81	·96	·39	·56	
Exchange C	26·30	17·98	3·29	3·21	·50	1·65	·70	2·25	27·95	17·01	·97	·29	·67	
	29·59	21·19	3·08	3·21	·50	1·54	·69	2·21	31·13	20·23	·94	·36	·61	
	32·67	24·40	3·23	3·05	·51	1·65	·70	2·14	34·32	23·40	·92	·27	·67	
Current used	35·90	27·45	3·02	3·07	·50	1·51	·70	2·15	37·41	26·54	·96	·36	·56	
at East, Positive	38·92	30·52	3·15	3·17	·50	1·58	·70	2·22	40·50	29·60	·98	·32	·64	
at West, Negative	42·07	33·69	3·14	3·11	·50	1·57	·70	2·18	43·64	32·74	·95	·33	·65	
	45·21	36·80	3·18	3·28	·50	1·59	·69	2·26	46·80	35·87	10·00	·34	·61	
Pen Equation	48·39	40·08	3·31	3·38	·50	1·66	·68	2·30	50·05	39·06	9·97	·33	·67	
	51·70	43·46	3·29	3·33	·49	1·61	·66	2·20	53·31	42·38	·85	·32	·65	
at East − s 1·891	54·99	46·79							...	45·66	...	·33	·52	
at West + 1·433														
Mean	14 29 32 = t_E										1 52 9·931	1 52 9·336	·595	
1877 May 8	14 30 16·76	12 38 11·33	3·16	3·07	·49	1·55	·68	2·09	14 30 18·31	...	1 52 6·98	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 1 52 6·622; " 12 " = 1 52 6·021; General Mean = d = 1 52 6·322
	19·92	14·40	3·66	3·70	...	...	·72	2·66	...	12 38 13·42	...	1 52 6·50	0·48	
	23·58	18·10	3·21	3·20	·50	1·61	·70	2·24	25·19	17·06	7·09	·52	...	
Comparison No. 1	26·79	21·30	3·41	3·30	...	...	·70	2·31	...	20·34	...	·45	·64	
	30·20	24·60	3·15	3·32	·49	1·54	·70	2·32	31·74	23·61	·14	·59	...	
	33·35	27·92	3·30	3·24	·50	1·65	·70	2·27	35·00	26·92	·08	·43	·71	
Exchange D	36·65	31·16	3·17	3·24	·50	1·59	·70	2·27	38·24	30·19	·08	·46	·62	
	39·82	34·40	3·28	3·20	·50	1·64	·70	2·24	41·46	33·43	·06	·39	·69	
Current used	43·10	37·60	3·20	3·17	·50	1·60	·68	2·16	44·70	36·64	·10	·46	·60	
	46·30	40·77	3·12	3·19	·48	1·50	·67	2·14	47·80	39·76	·03	·54	·56	
at East, Negative	49·42	43·96	3·26	3·24	·48	1·56	·68	2·20	50·98	42·91	·02	·51	·52	
at West, Positive	52·68	47·20	3·24	3·23	·50	1·62	·70	2·26	54·30	46·16	·10	·52	·50	
	55·92	50·43	3·21	3·16	·50	1·61	·72	2·28	57·53	49·46	·10	·46	·64	
Pen Equation	59·13	53·59	3·17	3·21	·48	1·52	·70	2·25	31 0·65	52·71	·06	·42	·68	
	31 2·30	56·80	3·30	3·20	·50	1·65	·73	2·34	3·95	55·84	·15	·46	·60	
at East − s 1·891	5·60	39 0·00	3·16	3·38	·50	1·58	·67	2·26	7·18	59·14	·18	·46	·69	
at West − 1·433	8·76	3·38	3·30	3·28	·50	1·65	·67	2·20	10·41	39 2·26	·03	·50	·68	
	12·06	6·66							...	5·58	...	·48	·55	
Mean	14 30 44 = t_E										1 52 7·080	1 52 6·479	·611	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	East	West	East	West	Signals from West on East Tape		Signals from East on West Tape		West Signals by East Clock	East Signals by West Clock	East	West		
					Decimal	Seconds	Decimal	Seconds						
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 8	17 33 58·48	15 41 53·62	3·15	3·08	·50	1·58	·70	2·16	17 34 0·06	...	1 52 6·44	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 52m 6s·859; " 12 " = 1 52 6·265; General Mean = d = 1 52 6·562
	34 1·63	56·70	3·07	3·15	·47	1·44	·71	2·24	3·07	15 41 55·78	·37	1 52 5·85	0·59	
	4·70	59·85	2·96	2·88	·50	1·48	·70	2·02	6·18	58·94	·33	·76	·61	
Comparison No. 2	7·66	42 2·73	2·94	...	·52	1·53	...	...	9·19	42 1·87	·46	·79	·54	
	10·60	...	...	...	...	...	...	...	...	...	...	...	...	
Exchange A*	——	...	...	...	...	...	...	...	...	...	...	...	...	
	...	...	...	...	...	...	...	...	...	...	...	...	...	
	...	...	...	...	...	...	...	...	...	...	...	...	...	
Current used	...	...	...	...	...	...	...	...	...	...	...	...	...	
at East, Positive	...	...	...	...	...	...	...	...	...	...	...	...	...	
at West, "	27·73	22·88	2·81	2·73	·56	1·57	·70	1·91	29·30	...	·42	...	...	
	30·54	25·61	2·68	2·66	·55	1·47	·67	1·78	32·01	24·79	·40	·75	·67	
	33·22	28·27	2·68	2·58	·55	1·47	·67	1·73	34·69	27·39	·42	·83	·57	
Pen Equation	35·90	30·85	2·61	2·75	·51	1·33	·68	1·87	37·23	30·00	·38	·90	·52	
at East + 1s·894	38·51	33·60	2·74	2·70	·53	1·45	·70	1·89	39·96	32·72	·36	·79	·59	
at West + 1·433	41·25	36·30							...	35·49	...	·76	·60	
Mean	17 34 22 = t_E										1 52 6·398	1 52 5·804	·586	
1877 May 8	17 34 57·40	15 42 55·24	2·70	2·66	·50	1·35	·70	1·86	17 34 58·75	...	1 52 3·51	...	...	Mean of col. 11 after Correction for Pen Equations = 1h 52m 6s·865; " 12 " = 1 52 6·286; General Mean = d = 1 52 6·576
	35 0·10	57·90	2·60	2·63	·50	1·30	·70	1·84	35 1·40	15 42 57·10	·50	1 52 3·00	0·51	
	2·70	43 0·53	2·71	2·61	·50	1·36	·72	1·88	4·06	59·74	·53	2·96	·54	
	5·41	3·14	2·60	2·66	·50	1·30	·70	1·86	6·71	43 2·41	·57	3·00	·53	
Comparison No. 2	8·01	5·80	2·59	2·59	·52	1·35	·71	1·84	9·36	5·00	·56	·01	·56	
	10·60	8·39	2·60	2·71	·50	1·30	·70	1·90	11·90	7·64	·51	2·96	·60	
Exchange B	13·20	11·10	2·70	2·67	·53	1·43	·70	1·87	14·63	10·29	·53	·91	·60	
	15·90	13·77	2·64	2·58	·50	1·32	·71	1·83	17·22	12·97	·45	·93	·60	
Current used	18·54	16·35	2·75	2·73	·49	1·35	·72	1·97	19·89	15·60	·54	·94	·51	
	21·29	19·08	2·72	...	·50	1·36	...	...	22·65	18·32	·57	·97	·57	
at East, Negative	24·01	...	...	...	...	...	...	...	...	...	...	...	...	
at West, "	——	...	...	...	...	...	...	...	...	...	...	...	...	
	29·40	27·22	2·63	2·68	·54	1·42	·70	1·88	30·82	...	·60	...	...	
Pen Equation	32·03	29·90	2·72	2·82	·51	1·39	·67	1·89	33·42	29·10	·52	·93	·67	
at East + 1s·894	34·75	32·72	2·75	2·66	·57	1·57	·69	1·84	36·32	31·79	·60	·96	·56	
at West − 1·433	37·50	35·38							...	34·56	...	·94	·66	
Mean	17 35 16 = t_E										1 52 3·538	1 52 2·959	·576	

* At Bombay, during this Exchange, the local battery was not acting properly, and the "mouse mill" was turned by hand. All the West Signals on East Tape of Exchange A are ill defined and difficult to read with accuracy.

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at — East	West	Intervals between successive Local Signals as recorded at — East	West	Interpolation of Received, between Local, Signals recorded on Cable Tapes — Signals from West on East Tape — Decimal	Seconds	Signals from East on West Tape — Decimal	Seconds	Times of Signals in Terms of Distant Clock — West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at — East	West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_x
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877	17 36 2·03	15 43 53·50	2·86	2·72	·55	1·57	·69	1·88	17 36 3·60	...	1 52 10·10	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 52 m 6·810 s; " " 12 " = 1 52 6·212; General Mean = d = 1 52 6·511
May 8	4·89	56·22	2·79	2·70	·53	1·48	·70	1·89	6·37	15 43 55·38	·15	1 52 9·51	0·59	
	7·68	58·92	2·72	2·78	·52	1·41	·69	1·92	9·09	58·11	·17	·57	·58	
Comparison No. 2	10·40	44 1·70	2·70	2·70	·53	1·43	·67	1·81	11·83	44 0·84	·13	·56	·61	
	13·10	4·40	2·72	2·68	·53	1·44	·70	1·88	14·54	3·51	·14	·59	·54	
Exchange C	15·82	7·08	2·53	2·42	·54	1·37	·72	1·74	17·19	6·28	·11	·54	·60	
	18·35	9·50	2·53	2·50	·50	1·27	·72	1·80	19·62	8·82	·12	·53	·58	
	20·88	12·00	2·49	2·60	·50	1·25	·70	1·82	22·13	11·30	·13	·58	·54	
Current used	23·37	14·60	2·61	2·52	·53	1·38	·71	1·79	24·75	13·82	·15	·55	·58	
at East, Positive	25·98	17·12	2·54	2·66	·50	1·27	·70	1·86	27·25	16·39	·13	·59	·56	
at West, Negative	28·52	19·78	2·55	2·60	·56	1·43	·71	1·85	29·95	18·98	·17	·54	·59	
	31·07	22·38	2·63	2·58	·55	1·45	·70	1·81	32·52	21·63	·14	·44	·73	
	33·70	24·96	2·66	2·62	·53	1·41	·72	1·89	35·11	24·19	·15	·51	·63	
Pen Equation	36·36	27·58	2·64	2·78	·50	1·32	·69	1·92	37·68	26·85	·10	·51	·64	
(s) at East − 1·894	39·00	30·36	2·81	2·74	·54	1·52	·69	1·89	40·52	29·50	·16	·50	·60	
at West + 1·433	41·81	33·10							...	32·25	...	·56	·60	
Mean	17 36 22 = t_x										1 52 10·137	1 52 9·539	·598	
1877	17 37 0·92	15 44 55·20	2·88	2·50	·54	1·56	·75	1·88	17 37 2·48	...	1 52 7·28	...	...	Mean of col. 11 after Correction for Pen Equations = 1 h 52 m 6·862 s; " " 12 " = 1 52 6·271; General Mean = d = 1 52 6·567
May 8	3·80	57·70	2·45	2·60	·50	1·23	·69	1·79	5·03	15 44 57·08	·33	1 52 6·72	0·56	
	6·25	45 0·30	2·65	2·81	·50	1·33	·69	1·94	7·58	59·49	·28	·76	·57	
Comparison No. 2	8·90	3·11	2·80	2·59	·54	1·51	·70	1·81	10·41	45 2·24	·30	·66	·62	
	11·70	5·70	2·62	2·60	·50	1·31	·74	1·92	13·01	4·92	·31	·78	·52	
	14·32	8·30	2·50	2·60	·50	1·25	·70	1·82	15·57	7·62	·27	·70	·61	
Exchange D	16·82	10·90	2·63	2·54	·52	1·37	·70	1·78	18·19	10·12	·29	·70	·57	
	19·45	13·44	2·64	2·66	·53	1·40	·71	1·89	20·85	12·68	·41	·77	·52	
	22·09	16·10	2·70	...	·53	1·43	...	...	23·52	15·33	·42	·76	·65	
Current used	24·79	...	...	...	...	...	...	...	...	...	...	...	...	
at East, Negative	——	...	...	...	...	...	...	...	...	...	...	...	...	
at West, Positive	30·40	24·50	2·76	2·70	·50	1·38	·71	1·92	31·78	...	·28	...	...	
	33·16	27·20	2·64	2·60	·52	1·37	·72	1·87	34·53	26·42	·33	·74	·54	
Pen Equation	35·80	29·80	2·61	2·69	·50	1·31	·70	1·88	37·11	29·07	·31	·73	·60	
(s) at East − 1·894	38·41	32·49	2·78	2·81	·53	1·47	·70	1·97	39·88	31·68	·39	·73	·58	
at West − 1·433	41·19	35·30							...	34·46	...	·73	·66	
Mean	17 37 20 = t_x										1 52 7·323	1 52 6·732	·583	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_z
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s 14 25 42·21	h m s 12 33 36·20	s 3·39	s 2·89	·56	s 1·90	·70	s 2·02	h m s 14 25 44·11	h m s ...	h m s 1 52 7·91	h m s ...	s ...	Mean of col. 11 after Correction for Pen Equations = h m s 1 52 8·371 „ 12 „ „ = 1 52 7·815 General Mean = d = 1 52 8·093
May 9	45·60	39·09	2·80	2·90	·51	1·43	·68	1·97	47·03	12 33 38·22	·94	1 52 7·38	0·53	
	48·40	41·99	2·92	2·89	·50	1·46	·69	1·99	49·86	41·06	·87	·34	·60	
Comparison No. 1	51·32	44·88	3·02	2·91	·46	1·39	·70	2·04	52·71	43·98	·83	·34	·53	
	54·34	47·79	2·76	2·90	·50	1·38	·67	1·94	55·72	46·92	·93	·42	·41	
Exchange A	57·10	50·69	2·85	2·79	·53	1·51	·70	1·95	58·61	49·73	·92	·37	·56	
	59·95	53·48	2·85	2·82	·49	1·40	·70	1·97	26 1·35	52·64	·87	·31	·61	
	26 2·80	56·30	2·80	2·80	·50	1·40	·70	1·96	4·20	55·45	·90	·35	·52	
Current used	5·60	59·10	2·78	2·75	·53	1·47	·70	1·93	7·07	58·26	·97	·34	·56	
at East, Positive	8·38	34 1·85	2·82	2·85	·50	1·41	·70	2·00	9·79	34 1·03	·94	·35	·62	
at West, „	11·20	4·70	2·80	2·89	·50	1·40	·66	1·91	12·60	3·85	·90	·35	·59	
	14·00	7·59	2·87	2·80	·54	1·55	·70	1·96	15·55	6·61	·96	·39	·51	
	16·87	10·39	2·93	2·91	·50	1·47	·69	2·01	18·34	9·55	·95	·32	·64	
Pen Equation	19·80	13·30	2·84	2·88	·50	1·42	·68	1·96	21·22	12·40	·92	·40	·55	
s at East + 1·899	22·64	16·18	2·91	2·88	·50	1·46	·70	2·02	24·10	15·26	·92	·38	·54	
at West + 1·443	25·55	19·06							...	18·20	...	·35	·57	
Mean	14 26 4 = t_z										1 52 7·915	1 52 7·359	·556	
1877	14 26 45·81	12 34 42·67	3·29	2·83	...	...	·69	1·95	...	...	...	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 1 52 8·390 „ 12 „ „ = 1 52 7·819 General Mean = d = 1 52 8·105
May 9	49·10	45·50	2·93	2·89	...	...	·70	2·02	...	12 34 44·62	...	1 52 4·48	...	
	52·03	48·39	2·77	2·71	·50	1·39	·70	1·90	14 26 53·42	47·52	1 52 5·03	·51	...	
	54·80	51·10	2·70	2·70	·50	1·35	·70	1·89	56·15	50·29	·05	·51	0·52	
Comparison No. 1	57·50	53·80	2·71	2·80	·50	1·36	·70	1·96	58·86	52·99	·06	·51	·54	
	27 0·21	56·60	2·78	2·76	·54	1·50	·70	1·93	27 1·71	55·76	·11	·45	·61	
Exchange B	2·99	59·36	2·70	2·63	·52	1·40	·70	1·84	4·39	58·53	·03	·46	·65	
	5·69	35 1·99	2·93	3·11	...	...	·69	2·15	...	35 1·20	...	·49	·54	
	8·62	5·10	2·86	2·70	·52	1·49	·70	1·89	10·11	4·14	·01	·48	...	
Current used	11·48	7·80	2·78	2·86	·50	1·39	·70	2·00	12·87	6·99	·07	·49	·52	
at East, Negative	14·26	10·66	2·76	2·81	·52	1·44	·67	1·88	15·70	9·80	·04	·46	·61	
at West, „	17·02	13·47	2·88	2·88	·53	1·53	·67	1·93	18·55	12·54	·08	·48	·56	
	19·90	16·35	2·80	2·82	·54	1·51	·68	1·92	21·41	15·40	·06	·50	·58	
Pen Equation	22·70	19·17	2·80	2·73	·54	1·51	·70	1·91	24·21	18·27	·04	·43	·63	
s at East + 1·899	25·50	21·90	2·80	2·90	·50	1·40	·66	1·91	26·90	21·08	·00	·42	·62	
at West − 1·443	28·30	24·80							...	23·81	...	·49	·51	
Mean	14 27 7 = t_z										1 52 5·048	1 52 4·477	·574	

TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	East	West	East	West	Signals from West on East Tape		Signals from East on West Tape		West Signals by East Clock	East Signals by West Clock	East	West		
					Decimal	Seconds	Decimal	Seconds						
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877	14 27 53·28	12 35 43·53	3·42	2·96	·56	1·92	·70	2·07	14 27 55·20	...	1 52 11·67	...	...	Mean of col. 11 after Correction for Pen Equations = 1 52 8·347 (h m s); " " 12 " " = 1 52 7·805; General Mean = d = 1 52 8·076
May 9	56·70	46·49	2·82	2·81	·49	1·38	·67	1·88	58·08	12 35 45·60	·59	1 52 11·10	0·57	
	59·52	49·30	2·98	2·92	·50	1·49	·70	2·04	28 1·01	48·37	·71	·15	·44	
Comparison No. 1	28 2·50	52·22	2·90	2·79	·49	1·42	·70	1·95	3·92	51·34	·70	·16	·55	
	5·40	55·01	2·89	2·89	·43	1·24	·72	2·08	6·64	54·17	·63	·23	·47	
Exchange C	8·29	57·90	2·93	3·05	·46	1·35	·70	2·14	9·64	57·09	·74	·20	·43	
	11·22	36 0·95	2·88	3·01	·48	1·38	·67	2·02	12·60	36 0·04	·65	·18	·56	
	14·10	3·96	3·10	4·94	·50	1·55	...	..	15·65	2·97	·69	·13	·52	
Current used	17·20	8·90	5·00	3·16	·67	3·35	·69	2·18	20·55	...	·65	...	...	
at East, Positive	22·20	12·06	3·00	3·04	·51	1·53	·67	2·04	23·73	11·08	·67	·12	·53	
at West, Negative	25·20	15·10	3·12	2·98	·50	1·56	·70	2·09	26·76	14·10	·66	·10	·57	
	28·32	18·08	3·08	3·34	·50	1·54	·65	2·17	29·86	17·19	·78	·13	·53	
	31·40	21·42	3·22	3·18	·54	1·74	·66	2·10	33·14	20·25	·72	·15	·63	
Pen Equation	34·62	24·60	3·16	3·14	·53	1·67	·65	2·04	36·29	23·52	·69	·10	·62	
at East − 1·899 (s)	37·78	27·74	3·13	3·19	·53	1·66	·63	2·01	39·44	26·64	·70	·14	·55	
at West + 1·443	40·91	30·93	3·11	3·06	·58	1·80	·63	1·93	42·71	29·75	·78	·16	·54	
	44·02	33·99							...	32·86	...	·16	·62	
Mean	14 28 19 = t_E										1 52 11·689	1 52 11·147	·542	
1877	14 33 4·85	12 40 58·30	2·95	2·99	·48	1·42	·70	2·09	14 33 6·27	...	1 52 7·97	...	...	Mean of col. 11 after Correction for Pen Equations = 1 52 8·409 (h m s); " " 12 " " = 1 52 7·821; General Mean = d = 1 52 8·115
May 9	7·80	41 1·29	2·79	2·72	·51	1·42	·70	1·90	9·22	12 41 0·39	·93	1 52 7·41	0·56	
	10·59	4·01	2·75	2·90	·50	1·38	·69	2·00	11·97	3·19	·96	·40	·53	
Comparison No. 1	13·34	6·91	2·95	2·85	·51	1·50	·69	1·97	14·84	6·01	·93	·33	·63	
	16·29	9·76	2·79	2·77	·52	1·45	·70	1·94	17·74	8·88	·98	·41	·52	
	19·08	12·53	2·82	2·97	·50	1·41	·69	2·05	20·49	11·70	·96	·38	·60	
Exchange D	21·90	15·50	2·90	2·69	·54	1·57	·70	1·88	23·47	14·58	·97	·32	·64	
(Repetition)	24·80	18·19	2·73	2·88	·50	1·37	·70	2·02	26·17	17·38	·98	·42	·55	
Current used	27·53	21·07	2·96	2·97	·50	1·48	·70	2·08	29·01	20·21	·94	·32	·66	
	30·49	24·04	2·92	2·86	·50	1·46	·70	2·00	31·95	23·15	·91	·34	·60	
at East, Negative	33·41	26·90	2·83	2·80	·50	1·42	·70	1·96	34·83	26·04	·93	·37	·54	
at West, Positive	36·24	29·70	2·86	3·00	·50	1·43	·69	2·07	37·67	28·86	·97	·38	·55	
	39·10	32·70	2·99	3·00	·52	1·55	·69	2·07	40·65	31·77	·95	·33	·64	
Pen Equation	42·09	35 70	2·90	3·15	·54	1·57	·62	1·95	43·66	34·77	·96	·32	·63	
at East + 1·899 (s)	44·99	38·85	3·13	3·11	·58	1·82	·60	1·87	46·81	37·65	·96	·34	·62	
at West + 1·443	48·12	41·96							...	40·72	...	·40	·56	
Mean	14 33 26 = t_E										1 52 7·953	1 52 7·365	·589	

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_B
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = 1 52 8·619 (h m s); „ „ 12 „ = 1 52 8·048; General Mean = d = 1 52 8·334
May 9	17 31 18·60	15 39 12·14	3·30	3·06	·52	1·72	·71	2·17	17 31 20·32	...	1 52 8·18	...	...	
	21·90	15·20	3·00	3·11	·50	1·50	·69	2·15	23·40	15 39 14·31	·20	1 52 7·59	0·59	
	24·90	18·31	3·05	2·98	·51	1·56	·68	2·03	26·46	17·35	·15	·55	·65	
Comparison No. 2	27·95	21·29	2·85	3·07	·50	1·43	·63	1·93	29·38	20·34	·09	·61	·54	
	30·80	24·36	3·30	3·22	·50	1·65	·64	2·06	32·45	23·22	·09	·58	·51	
Exchange A	34·10	27·58	3·09	3·11	·54	1·67	·65	2·02	35·77	26·42	·19	·68	·41	
	37·19	30·69	3·11	2·98	·54	1·68	·69	2·06	38·87	29·60	·18	·59	·60	
	40·30	33·67	3·02	3·13	·50	1·51	·65	2·03	41·81	32·75	·14	·55	·63	
Current used	43·32	36·80	3·18	3·17	·53	1·69	·67	2·12	45·01	35·70	·21	·62	·52	
at East, Positive	46·50	39·97	3·10	2·94	·54	1·67	70	2·06	48·17	38·92	·20	·58	·63	
at West, „	49·60	42·91	2·90	2·79	·50	1·45	·71	1·98	51·05	42·03	·14	·57	·63	
	52·50	45·70	2·90	3·07	·49	1·42	·69	2·12	53·92	44·89	·22	·61	·53	
	55·40	48·77	2·91	3·01	·53	1·54	·65	1·96	56·94	47·82	·17	·58	·64	
Pen Equation	58·31	51·78	2·99	2·81	·53	1·58	·70	1·97	59·89	50·73	·11	·58	·59	
at East + 1·900 (s)	32 1·30	54·59	2·89	2·94	·50	1·45	·67	1·97	32 2·75	53·75	·16	·55	·56	
at West + 1·443	4·19	57·53							...	56·56	...	·63	·53	
Mean	17 31 41 = t_B										1 52 8·162	1 52 7·591	·571	
1877	17 32 24·20	15 40 20·40	2·83	2·69	·52	1·47	·70	1·88	17 32 25·67	...	1 52 5·27	...	...	Mean of col. 11 after Correction for Pen Equations = 1 52 8·587 (h m s); „ „ 12 „ = 1 52 8·056; General Mean = d = 1 52 8·322
May 9	27·03	23·09	2·67	2·81	·49	1·31	·69	1·94	28·34	15 40 22·28	·25	1 52 4·75	0·52	
	29·70	25·90	2·80	2·71	·52	1·46	·69	1·87	31·16	25·03	·26	·67	·58	
Comparison No. 2	32·50	28·61	2·70	2·69	·50	1·35	·70	1·88	33·85	27·77	·24	·73	·53	
	35·20	31·30	2·78	2·77	·49	1·36	·69	1·91	36·56	30·49	·26	·71	·53	
	37·98	34·07	2·80	2·89	·49	1·37	·70	2·02	39·35	33·21	·28	·77	·49	
Exchange B	40·78	36·96	2·72	2·73	·51	1·39	·67	1·83	42·17	36·09	21	·69	·59	
	43·50	39·69	2·80	2·71	·50	1·40	·70	1·90	44·90	38·79	·21	·71	·50	
Current used	46·30	42·40	2·68	2·70	·50	1·34	·69	1·86	47·64	41·59	·24	·71	·50	
	48·98	45·10	2·73	2·70	·50	1·37	·69	1·86	50·35	44·26	·25	·72	·52	
at East, Negative	51·71	47·80	2·63	2·90	·52	1·37	·63	1·83	53·08	46·96	·28	·75	·50	
at West, „	54·34	50·70	2·87	2·70	·55	1·58	·67	1·81	55·92	49·63	·22	·71	·57	
	57·21	53·40	2·81	2·88	·51	1·43	·68	1·96	58·64	52·51	·24	·70	·52	
Pen Equation	33 0·02	56·28	2·87	2·87	·51	1·46	·66	1·89	33 1·48	55·36	·20	·66	·58	
(s)	2·89	59·15	2·91	2·84	·52	1·51	·69	1·96	4·40	58·17	·25	·72	·48	
at East + 1·900	5·80	41 1·99							...	41 1·11	...	·69	·56	
at West − 1·443														
Mean	17 32 45 = t_B										1 52 5·244	1 52 4·713	·531	

TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Bombay (E) *and Aden* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877	17 33 33·02	15 41 22·58	2·85	2·62	·50	1·43	·70	1·83	17 33 34·45	...	1 52 11·87	...	...	Mean of col. 11 after Correction for Pen Equations = 1 52 8·588 (h m s)
May 9	35·87	25·20	2·79	3·08	·47	1·31	·66	2·03	37·18	15 41 24·41	·98	1 52 11·46	0·41	" " 12 " " = 1 52 8·051
	38·66	28·28	2·87	2·82	·53	1·52	·65	1·83	40·18	27·23	·90	·43	·55	General Mean = d = 1 52 8·320
Comparison No. 2	41·53	31·10	2·87	2·88	·51	1·46	·64	1·84	42·99	30·11	·89	·42	·48	
	44·40	33·98	2·90	2·89	·53	1·54	·68	1·97	45·94	32·94	·96	·46	·43	
Exchange C	47·30	36·87	2·87	2·80	·53	1·52	·68	1·90	48·82	35·95	·95	·35	·61	
	50·17	39·67	2·85	3·02	·51	1·45	·66	1·99	51·62	38·77	·95	·40	·55	
	53·02	42·69	2·98	2·84	·54	1·61	·69	1·96	54·63	41·66	·94	·36	·59	
Current used	56·00	45·53	2·82	2·87	·52	1·47	·66	1·89	57·47	44·65	·94	·35	·59	
at East, Positive	58·82	48·40	2·93	2·90	·50	1·47	·68	1·97	34 0·29	47·42	·89	·40	·54	
at West, Negative	34 1·75	51·30	2·89	3·00	·52	1·50	·64	1·92	3·25	50·37	·95	·38	·51	
	4·64	54·30	2·96	2·90	·54	1·60	·65	1·89	6·24	53·22	·94	·42	·53	
	7·60	57·20	...	...	...	...	...	...	...	56·19	...	·41	·53	
Pen Equation	——	——	...	...	...	...	...	...	...	...	...	...	...	
at East − 1·900 s	13·27	42 3·06	3·13	3·00	·55	1·72	·66	1·98	14·99	...	·93	...	...	
at West + 1·443	16·40	6·06	3·04	3·04	·52	1·58	·67	2·04	17·98	42 5·04	·92	·36	·57	
	19·44	9·10	3·00	2·99	·54	1·62	·66	1·97	21·06	8·10	·96	·34	·58	
	22·44	12·09							...	11·07	...	·37	·59	
Mean	17 33 57 = t_E										1 52 11·931	1 52 11·394	·537	
1877	17 34 43·30	15 42 35·76	2·90	2·74	·50	1·45	·71	1·95	17 34 44·75	...	1 52 8·99	...	...	Mean of col. 11 after Correction for Pen Equations = 1 52 8·595 (h m s)
May 9	46·20	38·50	2·84	3·01	·49	1·39	·68	2·05	47·59	15 42 37·71	9·09	1 52 8·49	0·50	" " 12 " " = 1 52 8·061
	49·04	41·51	2·92	3·07	·53	1·55	·63	1·93	50·59	40·55	·08	·49	·60	General Mean = d = 1 52 8·328
Comparison No. 2	51·96	44·58	2·95	2·89	·55	1·62	·63	1·82	53·58	43·44	·00	·52	·56	
	54·91	47·47	3·01	2·95	·53	1·60	·67	1·98	56·51	46·40	·04	·51	·49	
	57·92	50·42	3·29	3·28	...	...	·70	2·30	...	49·45	...	·47	·57	
Exchange D	35 1·21	53·70	3·42	3·50	...	...	·67	2·35	...	52·72	...	·49	...	
	4·63	57·20	3·37	3·34	...	...	·69	2·30	...	56·05	...	·58	...	
	8·00	43 0·54	3·06	2·91	·50	1·53	·70	2·04	35 9·53	59·50	8·99	·50	...	
Current used	11·06	3·45	2·98	3·05	·50	1·49	·69	2·10	12·55	43 2·58	9·10	·48	·51	
at East, Negative	14·04	6·50	2·95	2·90	·50	1·48	·70	2·03	15·52	5·55	·02	·49	·61	
at West, Positive	16·99	9·40	2·83	2·80	·50	1·42	·69	1·93	18·41	8·53	·01	·46	·56	
	19·82	12·20	2·77	2·75	·50	1·39	·69	1·90	21·21	11·33	·01	·49	·52	
Pen Equation	22·59	14·95	2·71	2·81	·53	1·44	·62	1·74	24·03	14·10	·08	·49	·52	
s	25·30	17·76	2·80	2·77	·55	1·54	·63	1·75	26·84	16·69	·08	·61	·47	
at East − 1·900	28·10	20·53	2·86	2·67	·54	1·54	·70	1·87	29·64	19·51	·11	·59	·49	
at West − 1·443	30·96	23·20	2·74	3·10	·50	1·37	·62	1·92	32·33	22·40	·13	·56	·55	
	33·70	26·30							...	25·12	...	·58	·55	
Mean	17 35 9 = t_E										1 52 9·052	1 52 8·518	·536	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	East	West	East	West	Signals from West on East Tape		Signals from East on West Tape		West Signals by East Clock	East Signals by West Clock	East	West		
					Decimal	Seconds	Decimal	Seconds						
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 38·640
May 25	16 33 21·50	15 43 44·89	3·23	3·31	·50	1·62	·67	2·22	16 33 23·12	...	0 49 38·23	...	...	„ 12 „ = 0 49 38·052
	24·73	48·20	3·16	3·09	·54	1·71	·66	2·04	26·44	15 43 47·11	·24	0 49 37·62	0·61	General Mean = d = 0 49 38·346
	27·89	51·29	3·04	3·00	·52	1·58	·67	2·01	29·47	50·24	·18	·65	·59	
Comparison No. 1	30·93	54·29	2·97	3·02	·54	1·60	·66	1·99	32·53	53·30	·24	·63	·55	
	33·90	57·31	3·01	3·04	·55	1·66	·66	2·01	35·56	56·28	·25	·62	·62	
Exchange A	36·91	44 0·35	6·16	3·02	·26	1·60	·69	2·08	38·51	59·32	·16	·59	·66	
	...	3·37	...	3·10	·76	4·68	·66	2·05	41·59	44 2·43	·22	...	...	
Current used	43·07	6·47	3·03	2·96	·52	1·58	·66	1·95	44·65	5·42	·18	·65	·57	
	46·10	9·43	2·98	3·11	·53	1·58	·65	2·02	47·68	8·42	·25	·68	·50	
at East, Negative	49·08	12·54	3·05	2·96	·55	1·68	·66	1·95	50·76	11·45	·22	·63	·62	
at West, „	52·13	15·50	3·07	3·17	·51	1·57	·67	2·12	53·70	14·49	·20	·64	·58	
	55·20	18·67	3·10	3·08	·55	1·71	·65	2·00	56·91	17·62	·24	·58	·62	
Pen Equation	58·30	21·75	3·10	3·05	·55	1·71	·65	1·98	34 0·01	20·67	·26	·63	·61	
s	34 1·40	24·80							...	23·73	...	·67	·59	
at East + 1·739														
at West + 1·320														
Cable No. 1														
Mean	16 33 42 = t_E										0 49 38·221	0 49 37·633	·593	
1877	16 34 42·63	15 45 5·50	3·32	3·12	·56	1·86	·64	2·00	16 34 44·49	...	0 49 38·99	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 38·605
May 25	45·95	8·62	3·03	3·28	·57	1·73	·59	1·94	47·68	15 45 7·50	39·06	0 49 38·45	0·54	„ 12 „ = 0 49 38·011
	48·98	11·90	3·38	3·30	·57	1·93	·61	2·01	50·91	10·56	·01	·42	·64	General Mean = d = 0 49 38·308
Comparison No. 1	52·36	15·20	3·39	3·60	·57	1·93	...	...	54·29	13·91	·09	·45	·56	
	55·75	18·80	3·50	3·40	·60	2·10	...	...	57·85	...	·05	...	...	
Exchange B	59·25	22·20	3·54	3·36	·56	1·98	·63	2·12	35 1·23	...	·03	...	...	
	35 2·79	25·56	3·25	3·30	·55	1·79	·63	2·08	4·58	24·32	·02	·47	·56	
	6·04	28·86	3·30	3·21	·55	1·82	·63	2·02	7·86	27·64	·00	·40	·62	
Current used	9·34	32·07	...	...	...	...	...	...	...	30·88	...	·46	·54	
at East, Positive	———	———	...	...	...	...	...	...	...	...	...	...	...	
at West, „	16·25	39·50	3·78	3·12	·60	2·27	·65	2·03	18·52	...	·02	...	...	
	20·03	42·62	3·10	3·23	·52	1·61	·64	2·07	21·64	41·53	·02	·50	·52	
Pen Equation	23·13	45·85	3·19	3·25	·54	1·72	·64	2·08	24·85	44·69	·00	·44	·58	
s	26·32	49·10	3·28	3·23	·53	1·74	·65	2·10	28·06	47·93	38·96	·39	·61	
at East − 1·739	29·60	52·33	3·33	3·35	·54	1·80	·66	2·21	31·40	51·20	39·07	·40	·56	
at West − 1·320	32·93	55·68	3·47	3·42	·50	1·74	·67	2·29	34·67	54·54	38·99	·39	·68	
	36·40	59·10	3·30	3·40	·53	1·75	·65	2 21	38·15	57·97	39·05	·43	·56	
Cable No. 1	39·70	46 2·50							...	46 1·31	...	·39	·66	
Mean	16 35 11 = t_E										0 49 39·024	0 49 38·430	·587	

 TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 25	16 36 15·27	15 46 38·78	3·55	3·82	·49*	1·74	·63	2·41	16 36 17·01	...	0 49 38·23	...	...	Mean of col. 11 after Correction for Pen Equations = 0 h 49 m 38·645 s; Mean of col. 12 after Correction for Pen Equations = 0 49 38·073; General Mean = d = 0 49 38·359
	18·82	42·60	3·48	3·00	·58	2·02	·68	2·04	20·84	15 46 41·19	·24	0 49 37·63	0·60	
	22·30	45·60	3·30	3·40	·48	1·58	·68	2·31	23·88	44·64	·28	·66	·58	
Comparison No. 1	25·60	49·00	5·80	6·40	·28	1·62	...	...	27·22	47·91	·22	·69	·59	
	31·40	55·40	4·01	3·54	·55	2·21	·67	2·37	33·61	...	·21	...	...	
Exchange C	35·41	58·94	3·39	3·36	·50	1·70	·66	2·22	37·11	57·77	·17	·64	·57	
	38·80	47 2·30	3·40	3·49	·52	1·77	·66	2·30	40·57	47 1·16	·27	·64	·53	
Current used	42·20	5·79	3·49	3·41	·54	1·88	·65	2·22	44·08	4·60	·29	·60	·67	
	45·69	9·20	3·38	3·40	·53	1·79	·64	2·18	47·48	8·01	·28	·68	·61	
at East, Negative	49·07	12·60	3·47	3·58	·49	1·70	·64	2·29	50·77	11·38	·17	·69	·59	
at West, Positive	52·54	16·18	3·56	3·60	·50	1·78	·63	2·27	54·32	14·89	·14	·65	·52	
	56·10	19·78	3·43	3·31	·55	1·89	·63	2·09	57·99	18·45	·21	·65	·49	
Pen Equation	59·53	23·09							...	21·87	...	·66	·55	
at East + 1·739 s														
at West + 1·320														
Cable No. 1														
Mean	16 36 38 = t_E										0 49 38·226	0 49 37·654	·573	
1877 May 25	16 37 22·35	15 47 42·27	3·16	3·23	·48	1·52	·67	2·16	16 37 23·87	...	0 49 41·60	...	...	Mean of col. 11 after Correction for Pen Equations = 0 h 49 m 38·575 s; Mean of col. 12 after Correction for Pen Equations = 0 49 38·000; General Mean = d = 0 49 38·288
	25·51	45·50	3·10	3·10	·51	1·58	·66	2·05	27·09	15 47 44·43	·59	0 49 41·08	0·52	
	28·61	48·60	3·09	3·20	·54	1·67	·63	2·02	30·28	47·55	·68	·06	·53	
Comparison No. 1	31·70	51·80	3·20	3·16	·57	1·82	·64	2·02	33·52	50·62	·72	·08	·60	
	34·90	54·96	3·10	3·12	·56	1·74	...	...	36·64	53·82	·68	·08	·64	
Exchange D	38·00	58·08	3·17	3·09	·54	1·71	·67	2·07	39·71	...	·63	...	...	
	41·17	48 1·17	3·05	3·13	·50	1·53	·64	2·00	42·70	48 0·15	·53	·02	·61	
Current used	44·22	4·30	3·19	3·10	·55	1·75	·66	2·05	45·97	3·17	·67	·05	·48	
	47·41	7·40	3·12	3·28	·50	1·56	·64	2·10	48·97	6·35	·57	·06	·61	
at East, Positive	50·53	10·68	3·40	3·13	·53	1·80	·70	2·19	52·33	9·50	·65	·03	·54	
at West, Negative	53·93	13·81	3·04	3·13	·50	1·52	·67	2·10	55·45	12·87	·64	·06	·59	
	56·97	16·94	3·13	3·23	·50	1·57	·64	2·07	58·54	15·91	·60	·06	·58	
Pen Equation	38 0·10	20·17	3·28	3·13	·52	1·71	·70	2·19	38 1·81	19·01	·64	·09	·51	
	3·38	23·30	3·08	3·16	·50	1·54	·66	2·09	4·92	22·36	·62	·02	·62	
at East − 1·739 s	6·46	26·46	3·37	3·97	·50	1·69	·58	2·30	8·15	25·39	·69	·07	·55	
at West + 1·320	9·83	30·43							...	28·76	...	·07	·62	
Cable No. 1														
Mean	16 37 46 = t_E										0 49 41·634	0 49 41·059	·571	

* Received Signals of Exchange C badly defined on East Tape.

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877 May 25	h m s 18 32 47·89	h m s 17 43 12·16	s 3·79	s 3·13	·63	s 2·39	·64	s 2·00	h m s 18 32 50·28	h m s ...	h m s 0 49 38·12	h m s ...	s ...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 38·516; ,, 12 ,, ,, = 0 49 37·928; General Mean = d = 0 49 38·222
	51·68	15·29	2·82	2·77	·61	1·72	·61	1·69	53·40	17 43 14·16	·11	0 49 37·52	0·60	
	54·50	18·06	2·90	2·96	·58	1·68	...	...	56·18	16·98	·12	·52	·59	
Comparison No. 2	57·40	21·02	2·90	3·07	·59	1·71	·59	1·81	59·11	...	·09	...	...	
	33 0·30	24·09	3·02	2·89	·61	1·84	·60	1·73	33 2·14	22·83	·05	·47	·62	
Exchange A	3·32	26·98	2·80	2·72	·63	1·76	·60	1·63	5·08	25·82	·10	·50	·55	
	6·12	29·70	2·70	2·64	·61	1·65	·60	1·58	7·77	28·61	·07	·51	·59	
Current used	8·82	32·34	2·61	2·76	·62	1·62	·59	1·63	10·44	31·28	·10	·54	·53	
at East, Negative	11·43	35·10	2·77	2·80	·65	1·80	·55	1·54	13·23	33·97	·13	·46	·64	
at West, ,,	14·20	37·90	2·84	2·97	·62	1·76	·54	1·60	15·96	36·64	·06	·56	·57	
	17·04	40·87	2·86	2·55	·67	1·92	·60	1·53	18·96	39·50	·09	·54	·52	
	19·90	43·42	2·63	2·68	·61	1·60	·60	1·61	21·50	42·40	·08	·50	·59	
Pen Equation	22·53	46·10	2·68	2·70	·63	1·69	·60	1·62	24·22	45·03	·12	·50	·58	
at East + s 1·740	25·21	48·80	2·77	2·80	·61	1·69	·60	1·68	26·90	47·72	·10	·49	·63	
at West + 1·320	27·98	51·60							...	50·48	...	·50	·60	
Cable No. 1														
Mean	18 33 9 = t_E										0 49 38·096	0 49 37·508	·585	
1877 May 25	18 34 7·40	17 44 30·26	3·18	3·04	·57	1·81	·64	1·95	18 34 9·21	...	0 49 38·95	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 38·536; ,, 12 ,, ,, = 0 49 37·934; General Mean = d = 0 49 38·235
	10·58	33·30	2·82	2·89	·60	1·69	·60	1·73	12·27	17 44 32·21	·97	0 49 38·37	0·58	
	13·40	36·19	2·89	5·50	·60	1·73	...	...	15·13	35·03	·94	·37	·60	
Comparison No. 2	16·29	41·69	5·93	5·71	·74	4·39	...	...	20·68	...	·99	...	...	
	22·22	47·40	5·43	3·02	·77	4·18	·62	1·87	26·40	...	39·00	...	...	
Exchange B	27·65	50·42	2·85	4·52	·60	1·71	·38	1·72	29·36	49·27	38·94	·38	·62	
	30·50	54·94	4·69	2·96	·72	3·38	·63	1·86	33·88	52·14	·94	·36	·58	
	35·19	57·90	2·79	2·78	·60	1·67	·63	1·75	36·86	56·80	·96	·39	·55	
Current used	37·98	45 0·68	2·77	2·92	·60	1·66	·60	1·75	39·64	59·65	·96	·33	·63	
at East, Positive	40·75	3·60	2·82	5·60	·64	1·80	...	...	42·55	45 2·43	·95	·32	·64	
at West, ,,	43·57	9·20	5·97	3·09	·77	4·60	·66	2·04	48·17	...	·97	...	...	
	49·54	12·29	2·80	2·93	·60	1·68	·59	1·73	51·22	11·24	·93	·30	·67	
Pen Equation	52·34	15·22	3·01	2·87	·60	1·81	·61	1·75	54·15	14·02	·93	·32	·61	
	55·35	18·09	2·85	2·87	·60	1·71	·60	1·72	57·06	16·97	·97	·38	·55	
at East − s 1·740	58·20	20·96	2·70	2·92	·63	1·70	·54	1·58	59·90	19·81	·94	·39	·58	
at West − 1·320	35 0·90	23·88	3·01	2·88	·64	1·93	·59	1·70	35 2·83	22·54	·95	·36	·58	
	3·91	26·76							...	25·58	...	·33	·62	
Cable No. 1														
Mean	18 34 37 = t_E										0 49 38·956	0 49 38·354	·601	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_z
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = 0 h 49 m 38·508 s; " " 12 " " = 0 49 37·917; General Mean = d = 0 49 38·213
May 25	18 35 30·09	17 45 53·88	3·01	2·89	·62	1·87	·60	1·73	18 35 31·96	...	0 49 38·08	...	...	
	33·10	56·77	2·89	2·79	·60	1·73	·61	1·70	34·83	17 45 55·61	·06	0 49 37·49	0·59	
	35·99	59·56	2·74	2·71	·60	1·64	·65	1·76	37·63	58·47	·07	·52	·54	
Comparison No. 2	38·73	46 2·27	2·79	2·83	·60	1·67	·61	1·73	40·40	46 1·32	·13	·41	·66	
	41·52	5·10	2·83	2·92	·58	1·64	·60	1·75	43·16	4·00	·06	·52	·61	
Exchange C	44·35	8·02	2·95	2·88	·61	1·80	·60	1·73	46·15	6·85	·13	·50	·56	
	47·30	10·90	2·72	2·60	·63	1·71	·62	1·61	49·01	9·75	·11	·55	·58	
Current used	50·02	13·50	2·64	2·81	·60	1·58	...	..	51·60	12·51	·10	·51	·60	
	52·66	16·31	2·74	2·88	·64	1·75	·54	1·56	54·41	...	·10	...	...	
at East, Negative	55·40	19·19	2·84	2·61	·65	1·85	·60	1·57	57·25	17·87	·06	·53	·57	
at West, Positive	58·24	21·80	2·73	2·80	·62	1·69	·60	1·68	59·93	20·76	·13	·48	·58	
	36 0·97	24·60	2·71	2·56	·64	1·73	·63	1·61	36 2·70	23·48	·10	·49	·64	
Pen Equation	3·68	27·16	2·82	2·92	·52	1·47	·64	1·87	5·15	26·21	37·99	·47	·63	
s at East + 1·740	6·50	30·08	2·80	3·02	·60	1·68	·56	1·69	8·18	29·03	38·10	·47	·52	
at West + 1·320	9·30	33·10	3·02	2·74	·63	1·90	·63	1·73	11·20	31·77	·10	·53	·57	
	12·32	35·84							...	34·83	...	·49	·61	
Cable No. 1														
Mean	18 35 51 = t_z										0 49 38·088	0 49 37·497	·590	
1877	18 37 11·66	17 47 34·47	2·78	2·63	·60	1·67	·60	1·58	18 37 13·33	...	0 49 38·86	...	...	Mean of col. 11 after Correction for Pen Equations = 0 h 49 m 38·522 s; " " 12 " " = 0 49 37·925; General Mean = d = 0 49 38·224
May 25	14·44	37·10	2·58	3·07	·64	1·65	·50	1·54	16·09	17 47 36·05	·99	0 49 38·39	0·47	
	17·02	40·17	3·12	2·46	·65	2·03	·66	1·62	19·05	38·64	·88	·38	·61	
Comparison No. 2	20·14	42·63	2·46	...	·60	1·48	...	...	21·62	41·79	·99	·35	·53	
	22·60	...	2·11	...	...	...	...	...	...	...	...	...	...	
Exchange D	—	...	...	...	...	...	...	...	...	...	...	...	...	
	42·71	48 5·58	3·42	3·31	·51	1·74	·69	2·28	44·45	...	·87	...	...	
Current used	46·13	8·89	2·85	2·74	·60	1·71	·64	1·75	47·84	48 7·86	·95	·27	·60	
	48·98	11·63	2·77	2·81	·57	1·58	·65	1·83	50·56	10·64	·93	·34	·61	
at East, Positive	51·75	14·44	2·83	2·77	·59	1·67	·63	1·75	53·42	13·46	·98	·29	·64	
at West, Negative	54·58	17·21	2·71	2·79	·59	1·60	·63	1·76	56·18	16·19	·97	·39	·59	
	57·29	20·00	2·90	2·85	·57	1·65	·64	1·82	58·94	18·97	·94	·32	·65	
Pen Equation	38 0·19	22·85	2·79	2·76	·59	1·65	·65	1·79	38 1·84	21·82	·99	·37	·57	
s	2·98	25·61	2·82	2·86	·55	1·55	·64	1·83	4·53	24·64	·92	·34	·65	
at East − 1·740	5·80	28·47	2·87	2·95	·57	1·64	·63	1·86	7·44	27·44	·97	·36	·56	
at West − 1·320	8·67	31·42							...	30·33	...	·34	·63	
Cable No. 1														
Mean	18 37 43 = t_z										0 49 38·942	0 49 38·345	·593	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at East	Times of Local Signals recorded on Chronograph at West	Intervals between successive Local Signals as recorded at East	Intervals between successive Local Signals as recorded at West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape, Decimal	Signals from West on East Tape, Seconds	Signals from East on West Tape, Decimal	Signals from East on West Tape, Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at East	Observed Differences of Clocks at West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	h m s
1877 May 26	16 50 22·40	16 0 49·50	3·26	3·11	·59	1·92	·62	1·93	16 50 24·32	...	0 49 34·82	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 37·781
	25·66	52·61	2·93	5·69	·57	1·67	...	...	27·33	16 0 51·43	·72	0 49 34·23	0·59	„ 12 „ = 0 49 37·195
Comparison No. 1	28·59	58·30	5·99	3·30	·74	4·43	·62	2·05	33·02	...	·72	...	...	General Mean = d = 0 49 37·488
	34·58	1 1·60	3·03	3·00	·60	1·82	·60	1·80	36·40	1 0·35	·80	·23	·49	
Exchange A	37·61	4·60	2·90	2·90	·60	1·74	·60	1·74	39·35	3·40	·75	·21	·59	
(Repetition)	40·51	7·50	2·91	2·90	·62	1·80	·61	1·77	42·31	6·34	·81	·17	·58	
	43·42	10·40	3·08	3·10	·57	1·76	·64	1·98	45·18	9·27	·78	·15	·66	
	46·50	13·50							...	12·38	...	·12	·66	
Current used at East, Negative at West, „														
Pen Equation at East + 1·704 s, at West − 1·306														
Cable No. 1														
Mean	16 50 35 = t_E										0 49 34·771	0 49 34·185	·595	
1877 May 26	16 34 59·90	15 45 23·46	3·03	3·13	·57	1·73	·60	1·88	16 35 1·63	...	0 49 38·17	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 37·783
	35 2·93	26·59	2·93	2·91	·60	1·76	·58	1·69	4·69	15 45 25·34	·10	0 49 37·59	0·58	„ 12 „ = 0 49 37·168
	5·86	29·50	2·99	3·00	·60	1·79	·60	1·80	7·65	28·28	·15	·58	·52	General Mean = d = 0 49 37·476
Comparison No. 1	8·85	32·50	3·05	3·10	·62	1·89	·61	1·89	10·74	31·30	·24	·55	·60	
	11·90	35·60	3·24	3·00	·60	1·94	·63	1·89	13·84	34·39	·24	·51	·73	
Exchange B	15·14	38·60	2·96	3·30	·58	1·72	·59	1·95	16·86	37·49	·26	·65	·59	
	18·10	41·90	3·17	3·01	·60	1·90	·59	1·78	20·00	40·55	·10	·55	·71	
	21·27	44·91	3·13	3·14	·60	1·88	·60	1·88	23·15	43·68	·24	·59	·51	
Current used	24·40	48·05	3·10	3·14	·59	1·83	...	...	26·23	46·79	·18	·61	·63	
at East, Positive	27·50	51·19	2·91	2·89	·65	1·89	...	...	29·39	...	·20	...	...	
at West, „	30·41	54·08	3·08	3·20	·60	1·85	·58	1·86	32·26	...	·18	...	...	
	33·49	57·28	3·21	2·99	·60	1·93	·63	1·88	35·42	55·94	·14	·55	·63	
Pen Equation	36·70	46 0·27	2·97	3·03	·59	1·75	·62	1·88	38·45	59·16	·18	·54	·60	
s	39·67	3·30	3·04	3·20	·60	1·82	·57	1·82	41·49	46 2·15	·19	·52	·66	
at East − 1·704	42·71	6·50	3·21	3·00	·60	1·93	·63	1·89	44·64	5·12	·14	·59	·60	
at West − 1·306	45·92	9·50							...	8·39	...	·53	·61	
Cable No. 1														
Mean	16 35 23 = t_E										0 49 38·181	0 49 37·566	·613	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
May 26	16 37 22·27	15 47 46·71	3·56	3·58	·54	1·92	·65	2·33	16 37 24·19	...	0 49 37·48	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 37·789 h m s; „ 12 „ „ = 0 49 37·180; General Mean = d = 0 49 37·485
	25·83	50·29	2·97	2·89	·62	1·84	·60	1·73	27·67	15 47 49·04	·38	0 49 36·79	0·69	
	28·80	53·18	2·94	3·08	·61	1·79	·58	1·79	30·59	52·02	·41	·78	·60	
Comparison No. 1	31·74	56·26	2·98	2·91	·62	1·85	·60	1·75	33·59	54·97	·33	·77	·64	
	34·72	59·17	2·99	3·08	·60	1·79	·58	1·79	36·51	58·01	·34	·71	·62	
Exchange C	37·71	48 2·25	3·10	3·05	·61	1·89	·57	1·74	39·60	48 0·96	·35	·75	·59	
	40·81	5·30	3·01	2·92	·63	1·90	·59	1·72	42·71	3·99	·41	·82	·53	
Current used	43·82	8·22	2·97	2·98	·62	1·84	·59	1·76	45·66	7·02	·44	·80	·61	
at East, Negative	46·79	11·20	3·01	3·18	·60	1·81	·56	1·78	48·60	9·98	·40	·81	·63	
at West, Positive	49·80	14·38	3·15	2·99	·61	1·92	·60	1·79	51·72	12·98	·34	·82	·58	
	52·95	17·37	2·73	2·72	·67	1·83	·56	1·52	54·78	16·17	·41	·78	·56	
	55·68	20·09	2·73	2·77	·65	1·77	...	...	57·45	18·89	·36	·79	·62	
Pen Equation	58·41	22·86	2·79	2·93	·65	1·81	·53	1·55	38 0·22	...	·36	...	...	
at East + 1·704 s	38 1·20	25·79	3·19	2·95	·64	2·04	·61	1·80	3·24	24·41	·45	·79	·57	
at West + 1·306	4·39	28·74	2·84	2·96	·62	1·76	·59	1·75	6·15	27·59	·41	·80	·65	
	7·23	31·70							...	30·49	...	·74	·67	
Cable No. 1														
Mean	16 37 45 = t_E										0 49 37·391	0 49 36·782	·611	
1877	16 38 58·88	15 49 22·96	4·12	3·87	·56	2·31	·63	2·44	16 39 1·19	...	0 49 38·23	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 37·808 h m s; „ 12 „ „ = 0 49 37·162; General Mean = d = 0 49 37·485
May 26	39 3·00	26·83	3·77	3·87	·55	2·07	·60	2·32	5·07	15 49 25·40	·24	0 49 37·60	0·63	
	6·77	30·70	3·51	3·49	·62	2·18	·57	1·99	8·95	29·15	·25	·62	·62	
Comparison No. 1	10·28	34·19	3·50	3·48	·60	2·10	·58	2·02	12·38	32·69	·19	·59	·66	
	13·78	37·67	3·91	4·03	·54	2·11	·60	2·42	15·89	36·21	·22	·57	·62	
Exchange D*	17·69	41·70	3·87	3·89	·58	2·24	·60	2·33	19·93	40·09	·23	·60	·62	
	21·56	45·59	3·54	3·38	·60	2·12	·59	1·99	23·68	44·03	·09	·53	·70	
	25·10	48·97	3·62	3·73	·57	2·06	·60	2·24	27·16	47·58	·19	·52	·57	
Current used	28·72	52·70	3·87	4·17	·57	2·21	·56	2·34	30·93	51·21	·23	·51	·68	
at East, Positive	32·59	56·87	4·21	4·28	·59	2·48	·56	2·40	35·07	55·04	·20	·55	·68	
at West, „	36·80	50 1·15	4·33	3·87	·59	2·55	·63	2·44	39·35	59·27	·20	·53	·67	
	41·13	5·02							...	50 3·59	...	·54	·66	
Pen Equation														
at East − 1·704 s														
at West − 1·306														
Cable No. 1														
Mean	16 39 20 = t_E										0 49 38·206	0 49 37·560	·646	

* Strong earth currents passing during this Exchange.

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 26	18 26 54.17	17 37 18.76	3.24	3.06	.60	1.94	.64	1.96	18 26 56.11	...	0 49 37.35	...	...	Mean of col. 11 after Correction for Pen Equations = 0 h 49 m 37.756 s; „ 12 „ = 0 49 37.121; General Mean = d = 0 49 37.439
	57.41	21.82	2.87	2.88	.64	1.84	.58	1.67	59.25	17 37 20.72	.43	0 49 36.69	0.66	
	27 0.28	24.70	2.82	2.90	.65	1.83	.56	1.62	27 2.11	23.49	.41	.79	.64	
Comparison No. 2	3.10	27.60	2.84	2.77	.64	1.82	.61	1.69	4.92	26.32	.32	.78	.63	
	5.94	30.37	2.79	2.76	.64	1.79	.58	1.60	7.73	29.29	.36	.65	.67	
Exchange A	8.73	33.13	2.69	2.58	.65	1.75	.61	1.57	10.48	31.97	.35	.76	.60	
	11.42	35.71	2.66	2.69	.60	1.60	.61	1.64	13.02	34.70	.31	.72	.63	
Current used	14.08	38.40	2.62	2.70	.63	1.65	.59	1.59	15.73	37.35	.33	.73	.58	
	16.70	41.10	2.75	2.80	.64	1.76	.59	1.65	18.46	39.99	.36	.71	.62	
at East, Negative	19.45	43.90	2.78	2.70	.64	1.78	60	1.62	21.23	42.75	.33	.70	.66	
at West, „	22.23	46.60	2.75	2.85	.63	1.73	.60	1.71	23.96	45.52	.36	.71	.62	
	24.98	49.45	2.73	2.60	.67	1.83	.60	1.56	26.81	48.31	.36	.67	.69	
Pen Equation	27.71	52.05	2.92	2.85	.60	1.75	.61	1.74	29.46	51.01	.41	.70	.66	
at East + 1.700 s	30.63	54.90	2.73	2.90	.60	1.64	.61	1.77	32.27	53.79	.37	.84	.57	
at West + 1.306	33.36	57.80	2.93	2.84	.62	1.82	.61	1.73	35.18	56.67	.38	.69	.68	
	36.29	38 0.64							...	59.53	...	.76	.62	
Cable No. 1														
Mean	18 27 15 = t_E										0 49 37.362	0 49 36.727	.635	
1877 May 26	18 28 50.50	17 39 14.11	2.78	2.89	.60	1.67	.59	1.71	18 28 52.17	...	0 49 38.06	...	...	Mean of col. 11 after Correction for Pen Equations = 0 h 49 m 37.710 s; „ 12 „ = 0 49 37.092; General Mean = d = 0 49 37.401
	53.28	17.00	3.01	2.97	.60	1.81	.60	1.78	55.09	17 39 15.82	.09	0 49 37.46	0.60	
	56.29	19.97	2.91	2.95	.62	1.80	.60	1.77	58.09	18.78	.12	.51	.58	
Comparison No. 2	59.20	22.92	2.90	2.78	.64	1.86	.61	1.70	29 1.06	21.74	.14	.46	.66	
	29 2.10	25.70	2.89	3.00	.59	1.71	.59	1.77	3.81	24.62	.11	.48	.66	
Exchange B	4.99	28.70							...	27.47	...	.52	.59	
Current used														
at East, Positive														
at West, „														
Pen Equation														
at East − 1.700 s														
at West − 1.306														
Cable No. 1														
Mean	18 28 58 = t_E										0 49 38.104	0 49 37.486	.618	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	East	West	East	West	Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	West Signals by East Clock	East Signals by West Clock	East	West		
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = 0 h 49 m 37·690 s
May 26	18 29 39·35	17 40 3·89	2·95	2·92	·63	1·86	·56	1·64	18 29 41·21	...	0 49 37·32	...	...	„ „ 12 „ „ = 0 49 37·145
	42·30	6·81	...	2·94	...	...	·63	1·85	...	17 40 5·53	...	0 49 36·77	0·55	General Mean = d = 0 49 37·418
	...	9·75	...	2·75	...	...	·61	1·68	...	8·66	...	...	...	
Comparison No. 2	48·13	12·50	2·67	2·75	·64	1·71	·58	1·60	49·84	11·43	·34	·70	...	
	50·80	15·25	2·80	2·74	·63	1·76	·60	1·64	52·56	14·10	·31	·70	·64	
Exchange C	53·60	17·99	2·80	2·86	·63	1·76	·55	1·57	55·36	16·89	·37	·71	·60	
	56·40	20·85	2·80	2·79	·60	1·68	·56	1·56	58·08	19·56	·23	·84	·53	
Current used	59·20	23·64	2·78	2·74	·60	1·67	·59	1·62	30 0·87	22·41	·23	·79	·44	
	30 1·98	26·38	2·77	2·82	·60	1·66	·59	1·66	3·64	25·26	·26	·72	·51	
at East, Negative	4·75	29·20	2·77	2·78	·61	1·69	·55	1·53	6·44	28·04	·24	·71	·55	
at West, Positive	7·52	31·98	2·84	2·85	·62	1·76	·55	1·57	9·28	30·73	·30	·79	·45	
	10·36	34·83	2·85	2·78	·60	1·71	·60	1·67	12·07	33·55	·24	·81	·49	
Pen Equation	13·21	37·61	2·87	2·84	·60	1·72	·61	1·73	14·93	36·50	·32	·71	·53	
at East + 1·700 s	16·08	40·45	2·86	2·85	·60	1·72	·61	1·74	17·80	39·34	·35	·74	·58	
at West + 1·306	18·94	43·30	2·86	2·99	·60	1·72	·58	1·73	20·66	42·19	·36	·75	·60	
	21·80	46·29	3·09	3·06	·57	1·76	·60	1·84	23·56	45·03	·27	·77	·59	
	24·89	49·35							...	48·13	...	·76	·51	
Cable No. 1														
Mean	18 30 3 = t_E										0 49 37·296	0 49 36·751	·541	
1877	18 31 0·28	17 41 23·96	2·87	2·84	·61	1·75	·61	1·73	18 31 2·03	...	0 49 38·07	...	...	Mean of col. 11 after Correction for Pen Equations = 0 h 49 m 37·677 s
May 26	3·15	26·80	2·85	2·90	·61	1·74	·62	1·80	4·89	17 41 25·69	·09	0 49 37·46	0·61	„ „ 12 „ „ = 0 49 37·099
	6·00	29·70	2·90	2·89	·60	1·74	·59	1·71	7·74	28·60	·04	·40	·69	General Mean = d = 0 49 37·388
Comparison No. 2	8·90	32·59	2·85	2·71	·62	1·77	·60	1·63	10·67	31·41	·08	·49	·55	
	11·75	35·30	2·68	2·75	·63	1·69	·58	1·60	13·44	34·22	·14	·53	·55	
	14·43	38·05	2·87	2·95	·61	1·75	·60	1·77	16·18	36·90	·13	·53	·61	
Exchange D	17·30	41·00	2·78	2·79	·62	1·72	·59	1·65	19·02	39·82	·02	·48	·65	
	20·08	43·79	2·83	2·84	·61	1·73	·56	1·59	21·81	42·65	·02	·43	·59	
Current used	22·91	46·63	2·96	2·87	·60	1·78	·60	1·72	24·69	45·38	·06	·53	·49	
at East, Positive	25·87	49·50	2·95	3·03	·58	1·71	·55	1·67	27·58	48·35	·08	·52	·54	
at West, Negative	28·82	52·53	2·92	2·84	·60	1·75	·61	1·73	30·57	51·17	·04	·65	·43	
	31·74	55·37	2·75	2·75	·63	1·73	·60	1·65	33·47	54·26	·10	·48	·56	
Pen Equation	34·49	58·12	2·73	2·77	·63	1·72	·59	1·63	36·21	57·02	·09	·47	·63	
s	37·22	42 0·89	2·79	2·80	·62	1·73	·59	1·65	38·95	59·75	·06	·47	·62	
at East − 1·700	40·01	3·69	2·74	2·71	·63	1·73	·58	1·57	41·74	42 2·54	·05	·47	·59	
at West − 1·306	42·75	6·40							...	5·26	...	·49	·56	
Cable No. 1														
Mean	18 31 22 = t_E										0 49 38·071	0 49 37·493	·578	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East (1)	Times of Local Signals recorded on Chronograph at: West (2)	Intervals between successive Local Signals as recorded at: East (3)	Intervals between successive Local Signals as recorded at: West (4)	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape, Decimal (5)	Signals from West on East Tape, Seconds (6)	Signals from East on West Tape, Decimal (7)	Signals from East on West Tape, Seconds (8)	Times of Signals in Terms of Distant Clock: West Signals by East Clock 9 (=1+6)	East Signals by West Clock 10 (=2+8)	Observed Differences of Clocks at: East 11 (=9−2)	West 12 (=1−10)	Resulting Values of double Retardation 13 (=11−12)	Deduction of d, the Final Difference between the Clocks at Epoch t_E
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 37·117; „ 12 „ = 0 49 36·557; General Mean = d = 0 49 36·837
May 27	16 37 58·70	15 48 23·60	2·81	5·01	·58	1·63	...	...	16 38 0·33	...	0 49 36·73	...	...	
	38 1·51	28·61	5·14	3·39	·75	3·86	·55	1·86	5·37	...	·76	...	...	
	6·65	32·00	3·25	2·93	·65	2·11	·60	1·76	8·76	15 48 30·47	·76	0 49 36·18	0·58	
Comparison No. 1	9·90	34·93	2·99	2·97	·60	1·79	·60	1·78	11·69	33·76	·76	·14	·62	
	12·89	37·90	2·86	3·05	·58	1·66	·56	1·71	14·55	36·71	·65	·18	·58	
Exchange A	15·75	40·95	3·02	2·75	·63	1·90	·60	1·65	17·65	39·61	·70	·14	·51	
	18·77	43·70	2·98	3·01	·55	1·64	·62	1·87	20·41	42·60	·71	·17	·53	
Current used	21·75	46·71	2·99	2·94	·59	1·76	·64	1·88	23·51	45·57	·80	·18	·53	
	24·74	49·65	5·86	2·93	·28	1·64	...	...	26·38	48·59	·73	·15	·65	
at East, Negative	...	52·58	...	2·93	·77	4·51	·64	1·88	29·25	...	·67	...	...	
at West, „	30·60	55·51	2·97	3·07	·57	1·69	·62	1·90	32·29	54·46	·78	·14	·53	
	33·57	58·58	6·09	3·00	·27	1·64	...	...	35·21	57·41	·63	·16	·62	
Pen Equation	...	49 1·58	...	3·08	·77	4·69	·63	1·94	38·26	...	·68	...	...	
s at East + 1·700	39·66	4·66	3·04	3·02	·56	1·70	·62	1·87	41·36	49 3·52	·70	·14	·54	
at West + 1·302	42·70	7·68							...	6·53	...	·17	·53	
Cable No. 1														
Mean	16 38 20 = t_E										0 49 36·719	0 49 36·159	·565	
1877	16 39 20·10	15 49 44·30	2·92	3·29	·59	1·72	·55	1·81	16 39 21·82	...	0 49 37·52	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 37·136; „ 12 „ = 0 49 36·495; General Mean = d = 0 49 36·816
May 27	23·02	47·59	3·18	3·00	·65	2·07	·55	1·65	25·09	15 49 46·11	·50	0 49 36·91	0·61	
	26·20	50·59	3·00	2·86	·64	1·92	·59	1·69	28·12	49·24	·53	·96	·54	
Comparison No. 1	29·20	53·45	2·95	2·88	·60	1·77	·60	1·73	30·97	52·28	·52	·92	·61	
	32·15	56·33	2·88	3·03	·61	1·76	·60	1·82	33·91	55·18	·58	·97	·55	
	35·03	59·36	3·03	2·88	·61	1·85	·62	1·79	36·88	58·15	·52	·88	·70	
Exchange B	38·06	50 2·24	2·99	3·16	·57	1·70	·61	1·93	39·76	50 1·15	·52	·91	·61	
	41·05	5·40	3·09	3·97	·61	1·88	...	...	42·93	4·17	·53	·88	·64	
Current used	44·14	9·37	4·00	3·43	·68	2·72	·56	1·92	46·86	...	·49	...	...	
at East, Positive	48·14	12·80	3·45	3·09	·64	2·21	·63	1·95	50·35	11·29	·55	·85	·64	
at West, „	51·59	15·89	3·11	3·41	·60	1·87	...	...	53·46	14·75	·57	·84	·71	
	54·70	19·30	3·47	4·49	·63	2·19	...	...	56·89	...	·59	...	...	
Pen Equation	58·17	23·79	4·53	4·21	·69	3·13	...	...	40 1·30	...	·51	...	...	
s	40 2·70	28·00	4·20	3·00	·69	2·90	·68	2·04	5·60	...	·60	...	...	
at East − 1·700	6·90	31·00	3·10	3·17	·52	1·61	·67	2·12	8·51	30·04	·51	·86	·74	
at West − 1·302	10·00	34·17	3·05	3·02	·55	1·68	·67	2·02	11·68	33·12	·51	·88	·63	
	13·05	37·19							...	36·19	...	·86	·65	
Cable No. 1														
Mean	16 39 46 = t_E										0 49 37·534	0 49 36·893	·636	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_x
	East	West	East	West	Signals from West on East Tape		Signals from East on West Tape		West Signals by East Clock	East Signals by West Clock	East	West		
					Decimal	Seconds	Decimal	Seconds						
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
	16 40 46·65	15 51 11·80	3·26	3·05	·60	1·96	·64	1·95	16 40 48·61	...	0 49 36·81	...	...	
	49·91	14·85	2·89	2·93	·58	1·68	·61	1·79	51·59	15 51 13·75	·74	0 49 36·16	0·65	
1877	52·80	17·78	3·00	3·19	·55	1·65	...	...	54·45	16·64	·67	·16	·58	
May 27	55·80	20·97	3·10	5·93	·60	1·86	·31	1·84	57·66	...	·69	...	...	
	58·90	...	2·98	...	·60	1·79	...	...	41 0·69	22·81	...	·09	·60	
	41 1·88	26·90	3·00	2·91	·60	1·80	·61	1·78	3·68	...	·78	...	...	
	4·88	29·81	2·96	2·90	·59	1·75	·66	1·91	6·63	28·68	·82	·20	·58	
	7·84	32·71	2·86	2·98	·53	1·52	·61	1·82	9·36	31·72	·65	·12	·70	
Comparison No. 1	10·70	35·69	2·91	2·91	·60	1·75	·63	1·83	12·45	34·53	·76	·17	·48	
	13·61	38·60							...	37·52	...	·09	·67	
Exchange C										Mean	0 49 36·740	0 49 36·141	·609	Mean of col. 11 after Correction for Pen Equations = 0h 49m 37s·138 and 37s·148; " 12 " " = 0 49 36·539 " 36·571; General Mean = d = 0 49 36·849
Current used at East, Negative at West, Positive														
	16 41 47·20	15 52 14·89	3·20	3·10	·56	1·79	·64	1·98	16 41 48·99	...	0 49 34·10	...	...	
Pen Equation	50·40	17·99	3·02	3·01	·59	1·78	·61	1·84	52·18	15 52 16·87	·19	0 49 33·53	0·57	
s	53·42	21·00	2·99	2·95	·58	1·73	·63	1·86	55·15	19·83	·15	·59	·60	
at East + 1·700	56·41	23·95	3·01	3·05	·55	1·66	·62	1·89	58·07	22·86	·12	·55	·60	
at West + 1·302	59·42	27·00	3·05	3·01	·56	1·71	·61	1·84	42 1·13	25·84	·13	·58	·54	
" − 1·302	42 2·47	30·01	3·13	3·18	·55	1·72	·65	2·07	4·19	28·84	·18	·63	·50	
	5·60	33·19	3·10	3·21	·56	1·74	·60	1·93	7·34	32·08	·15	·52	·66	
	8·70	36·40							...	35·12	...	·58	·57	
Cable No. 1														
Mean	16 41 26 = t_x										0 49 34·146	0 49 33·569	·577	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	East	West	East	West	Signals from West on East Tape		Signals from East on West Tape		West Signals by East Clock	East Signals by West Clock	East	West		
					Decimal	Seconds	Decimal	Seconds						
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 27	16 42 48·58	15 53 12·83	2·96	2·95	·62	1·84	·63	1·86	16 42 50·42	...	0 49 37·59	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 37·130; „ 12 „ = 0 49 36·487; General Mean = d = 0 49 36·809
	51·54	15·78	2·86	2·86	·60	1·72	·60	1·72	53·26	15 53 14·69	·48	0 49 36·85	0·74	
	54·40	18·64	3·00	3·04	·60	1·80	·63	1·92	56·20	17·50	·56	·90	·58	
Comparison No. 1	57·40	21·68	3·07	2·91	·59	1·81	·66	1·92	59·21	20·56	·53	·84	·72	
	43 0·47	24·59	2·91	2·82	·56	1·63	·68	1·92	43 2·10	23·60	·51	·87	·66	
Exchange D	3·38	27·41	2·86	2·99	·54	1·54	·64	1·91	4·92	26·51	·51	·87	·64	
	6·24	30·40	2·95	2·90	·56	1·65	·64	1·86	7·89	29·32	·49	·92	·59	
Current used	9·19	33·30	2·81	2·78	·58	1·63	·64	1·78	10·82	32·26	·52	·93	·56	
	12·00	36·08	2·79	2·73	·58	1·62	·67	1·83	13·62	35·08	·54	·92	·60	
at East, Positive	14·79	38·81	2·81	2·89	·55	1·55	·64	1·85	16·34	37·91	·53	·88	·66	
at West, Negative	17·60	41·70	2·77	2·84	·59	1·63	·64	1·82	19·23	40·66	·53	·94	·59	
	20·37	44·54	2·84	2·77	·58	1·65	·65	1·80	22·02	43·52	·48	·85	·68	
Pen Equation	23·21	47·31	2·81	2·93	·57	1·60	·64	1·88	24·81	46·34	·50	·87	·61	
at East − 1·700 s	26·02	50·24	2·98	2·76	·60	1·79	·67	1·85	27·81	49·19	·57	·83	·67	
at West − 1·302	29·00	53·00	2·77	2·80	·56	1·55	·66	1·85	30·55	52·09	·55	·91	·66	
	31·77	55·80	2·88	3·01	·55	1·58	·66	1·99	33·35	54·85	·55	·92	·63	
Cable No. 1	34·65	58·81							...	57·79	...	·86	·69	
Mean	16 43 12 = t_E										0 49 37·528	0 49 36·885	·643	
1877 May 27	18 29 51·40	17 40 17·40	4·08	3·10	·65	2·65	·67	2·08	18 29 54·05	...	0 49 36·65	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 37·014; „ 12 „ = 0 49 36·438; General Mean = d = 0 49 36·726
	55·48	20·50	2·82	2·90	·59	1·66	·60	1·74	57·14	17 40 19·48	·64	0 49 36·00	0·65	
	58·30	23·40	3·08	3·01	·59	1·82	·63	1·90	30 0·12	22·24	·72	·06	·58	
Comparison No. 2	30 1·38	26·41	2·83	2·97	·59	1·67	·60	1·78	3·05	25·30	·64	·08	·64	
	4·21	29·38	2·86	2·67	·63	1·80	·62	1·66	6·01	28·19	·63	·02	·62	
Exchange A*	7·07	32·05	2·84	2·84	·56	1·59	·64	1·82	8·66	31·04	·61	·03	·60	
	9·91	34·89	2·99	3·06	·52	1·55	·66	2·02	11·46	33·87	·57	·04	·57	
Current used	12·90	37·95	3·00	2·85	·56	1·68	·67	1·91	14·58	36·91	.63	35·99	·58	
	15·90	40·80	2·87	3·00	·51	1·46	·63	1·89	17·36	39·86	·56	36·04	·59	
at East, Negative	18·77	43·80	2·97	2·90	·57	1·69	·66	1·91	20·46	42·69	·66	·08	·48	
at West, „	21·74	46·70	2·99	2·95	·53	1·58	·67	1·98	23·32	45·71	·62	·03	·63	
	24·73	49·65	2·71	2·76	·57	1·54	·63	1·74	26·27	48·68	·62	·05	·57	
Pen Equation	27·44	52·41	2·86	2·89	·55	1·57	·63	1·82	29·01	51·39	·60	·05	·57	
	30·30	55·30	2·87	2·92	·59	1·69	·62	1·81	31·99	54·23	·69	·07	·53	
at East + 1·697 s	33·17	58·22	5·93	2·88	·27	1·60	·62	1·79	34·77	57·11	·55	·06	·63	
at West + 1·302	...	41 1·10	...	3·01	·75	4·45	·65	1·96	37·62	41 0·01	·52	...	...	
Cable No. 1	39·10	4·11							...	3·06	...	·04	·48	
Mean	18 30 14 = t_E										0 49 36·619	0 49 36·043	·581	

* Signals received at Aden during this Exchange very weak.

TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	West	Intervals between successive Local Signals as recorded at: East	West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Seconds	Signals from East on West Tape: Decimal	Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at: East	West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (= 1 + 6)	10 (= 2 + 8)	11 (= 9 − 2)	12 (= 1 − 10)	13 (= 11 − 12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 37·020
	18 31 25·54	17 41 49·83	2·96	3·07	·58	1·72	·60	1·84	18 31 27·26	...	0 49 37·43	...	...	” 12 ” = 0 49 36·404
May 27	28·50	52·90	3·10	2·91	·59	1·83	·62	1·80	30·33	17 41 51·67	·43	0 49 36·83	0·60	General Mean = d = 0 49 36·712
	31·60	55·81	2·90	2·97	·60	1·74	·63	1·87	33·34	54·70	·53	·90	·53	
Comparison No. 2	34·50	58·78	3·00	3·01	·56	1·68	·64	1·93	36·18	57·68	·40	·82	·71	
	37·50	42 1·79	3·07	3·01	·55	1·69	·66	1·99	39·19	42 0·71	·40	·79	·61	
Exchange B *	40·57	4·80	3·08	2·99	·53	1·63	·70	2·09	42·20	3·78	·40	·79	·61	
	43·65	7·79	2·76	2·90	·56	1·55	·64	1·86	45·20	6·89	·41	·76	·64	
Current used	46·41	10·69	2·74	2·51	·57	1·56	·67	1·68	47·97	9·65	·28	·76	·65	
	49·15	13·20	2·75	3·00	·55	1·51	·62	1·86	50·66	12·37	·46	·78	·50	
at East, Positive	51·90	16·20	2·89	2·70	·59	1·71	·67	1·81	53·61	15·06	·41	·84	·62	
at West, ”	54·79	18·90	2·72	2·77	·56	1·52	·65	1·80	56·31	18·01	·41	·78	·63	
	57·51	21·67	2·79	2·73	·54	1·51	·69	1·88	59·02	20·70	·35	·81	·60	
Pen Equation	32 0·30	24·40	2·79	2·88	·55	1·53	·67	1·93	32 1·83	23·55	·43	·75	·60	
at East − 1·697 s	3·09	27·28	2·80	2·70	·56	1·57	·66	1·78	4·66	26·33	·38	·76	·67	
at West − 1·302	5·89	29·98	2·81	2·92	·55	1·55	...	...	7·44	29·06	·46	·83	·55	
	8·70	32·90	2·91	2·96	·57	1·66	·65	1·92	10·36	...	·46	...	...	
	11·61	35·86							...	34·82	...	·79	·67	
Cable No. 1														
Mean	18 31 49 = t_E										0 49 37·415	0 49 36·799	·613	
1877	18 32 51·83	17 43 16·97	3·09	3·02	·56	1·73	·61	1·84	18 32 53·56	...	0 49 36·59	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 36·991
May 27	54·92	19·99	2·88	2·91	·59	1·70	·61	1·78	56·62	17 43 18·81	·63	0 49 36·11	0·48	” 12 ” = 0 49 36·443
	57·80	22·90	2·81	2·60	·60	1·69	·63	1·64	59·49	21·77	·59	·03	·60	General Mean = d = 0 49 36·717
Comparison No. 2	33 0·61	25·50	2·68	2·80	·58	1·55	·63	1·76	33 2·16	24·54	·66	·07	·52	
	3·29	28·30	2·84	2·80	·57	1·62	·63	1·76	4·91	27·26	·61	·03	·63	
Exchange C *	6·13	31·10	2·82	2·86	·56	1·58	·64	1·83	7·71	30·06	·61	·07	·54	
	8·95	33·96	...	...	...	...	...	...	...	32·93	...	·02	·59	
	19·42	44·50	2·98	3·00	·57	1·70	·62	1·86	21·12	...	·62	...	...	
Current used	22·40	47·50	3·07	3·00	·55	1·69	·63	1·89	24·09	46·36	·59	·04	·58	
at East, Negative	25·47	50·50	2·83	2·87	·56	1·58	·62	1·78	27·05	49·39	·55	·08	·51	
at West, Positive	28·30	53·37	3·04	2·97	·55	1·67	·65	1·93	29·97	52·28	·60	·02	·53	
	31·34	56·34	3·06	3·11	·55	1·68	·65	2·02	33·02	55·30	·68	·04	·56	
Pen Equation	34·40	59·45	6·12	3·12	·25	1·53	·63	1·97	35·93	58·36	·48	·04	·64	
	...	44 2·57	...	2·90	·77	4·71	·66	1·91	39·11	44 1·42	·54	...	...	
at East + 1·697 s	40·52	5·47	2·78	2·92	·55	1·53	·61	1·78	42·05	4·48	·58	·04	·50	
at West + 1·302	43·30	8·39	3·00	2·92	·56	1·68	·65	1·90	44·98	7·25	·59	·05	·53	
	46·30	11·31	3·00	2·91	·54	1·62	·66	1·92	47·92	10·29	·61	·01	·58	
Cable No. 1	49·30	14·22							...	13·23	...	·07	·54	
Mean	18 33 20 = t_E										0 49 36·596	0 49 36·048	·555	

* Signals received at Aden during these Exchanges very weak.

Aden (E) *and* *Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = 0 49 37·018 h m s; " " 12 " = 0 49 36·402; General Mean = d = 0 49 36·710
May 27	18 34 25·78	17 44 50·10	3·10	3·00	...	...	·65	1·95	...	...	...	...	...	
	28·88	53·10	2·79	2·75	·59	1·65	·62	1·71	18 34 30·53	17 44 52·05	0 49 37·43	0 49 36·83	...	
	31·67	55·85	2·75	2·80	·60	1·65	·64	1·79	33·32	54·81	·47	·86	0·57	
Comparison No. 2	34·42	58·65	2·84	2·85	·59	1·68	·64	1·82	36·10	57·64	·45	·78	·69	
	37·26	45 1·50	2·71	2·59	·61	1·65	·65	1·68	38·91	45 0·47	·41	·79	·66	
Exchange D *	39·97	4·09	2·58	2·71	·61	1·57	·61	1·65	41·54	3·18	·45	·79	·62	
	42·55	6·80	2·68	2·60	·60	1·61	·61	1·59	44·16	5·74	·36	·81	·64	
Current used	45·23	9·40	2·72	2·52	·60	1·63	·69	1·74	46·86	8·39	·46	·84	·52	
	47·95	11·92	2·57	2·68	·54	1·39	·68	1·82	49·34	11·14	·42	·81	·65	
at East, Positive	50·52	14·60	2·58	2·60	·55	1·42	·67	1·74	51·94	13·74	·34	·78	·64	
at West, Negative	53·10	17·20	2·66	2·60	·60	1·60	·68	1·77	54·70	16·34	·50	·76	·58	
	55·76	19·80	2·58	2·59	·55	1·42	·69	1·79	57·18	18·97	·38	·79	·71	
Pen Equation	58·34	22·39	2·56	2·71	·55	1·41	·63	1·71	59·75	21·59	·36	·75	·63	
s	35 0·90	25·10	2·70	2·68	·56	1·51	·64	1·72	35 2·41	24·10	·31	·80	·56	
at East − 1·697	3·60	27·78	2·70	2·62	·60	1·62	·66	1·73	5·22	26·82	·44	·78	·53	
at West − 1·302	6·30	30·40								29·51		·79	·65	
Cable No. 1														
Mean	18 34 46 = t_E										0 49 37·413	0 49 36·797	·618	
1877	16 33 30·50	15 43 56·14	2·95	2·95	·63	1·86	...	...	16 33 32·36	...	0 49 36·22	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 36·555 h m s; " " 12 " = 0 49 35·994; General Mean = d = 0 49 36·275
May 28	33·45	59·09	2·99	2·92	·60	1·79	·60	1·75	35·24	...	·15	...	...	
	36·44	44 2·01	3·06	2·95	·58	1·77	·61	1·80	38·21	15 44 0·84	·20	0 49 35·60	0·55	
Comparison No. 1	39·50	4·96	2·80	2·79	·63	1·76	·62	1·73	41·26	3·81	·30	·69	·51	
	42·30	7·75	2·83	2·87	·60	1·70	·63	1·81	44·00	6·69	·25	·61	·69	
Exchange A	45·13	10·62	2·77	2·68	·63	1·75	·62	1·66	46·88	9·56	·26	·57	·68	
	47·90	13·30	2·80	3·03	·55	1·54	·60	1·82	49·44	12·28	·14	·62	·64	
	50·70	16·33	3·00	2·79	·59	1·77	·60	1·67	52·47	15·12	·14	·58	·56	
Current used	53·70	19·12	2·74	2·77	·55	1·51	·63	1·75	55·21	18·00	·09	·70	·44	
at East, Negative	56·44	21·89	2·83	2·81	·55	1·56	·63	1·77	58·00	20·87	·11	·57	·52	
at West, "	59·27	24·70	2·85	2·96	·55	1·57	·61	1·81	34 0·84	23·66	·14	·61	·50	
	34 2·12	27·66	2·93	3·21	·54	1·58	·54	1·73	3·70	26·51	·04	·61	·53	
Pen Equation	5·05	30·87	3·15	2·76	·65	2·05	·64	1·77	7·10	29·39	·23	·66	·38	
s	8·20	33·63	2·71	2·77	·59	1·60	·60	1·66	9·80	32·64	·17	·56	·67	
at East + 1·696	10·91	36·40	2·95	3·27	·58	1·71	·56	1·83	12·62	35·29	·22	·62	·55	
at West + 1·318	13·86	39·67							...	38·23	...	·63	·59	
Cable No. 1														
Mean	16 33 52 = t_E										0 49 36·177	0 49 35·616	·558	

* Signals received at Aden during this Exchange very weak.

TABLE V. TRANSCRIPT AND REDUCTION OF CLOCK COMPARISONS.

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_x
	East	West	East	West	Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	West Signals by East Clock	East Signals by West Clock	East	West		
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877 May 28	h m s 16 34 55·72	h m s 15 45 20·35	s 2·63	s 2·70	·60	s 1·58	·62	s 1·67	h m s 16 34 57·30	h m s ...	h m s 0 49 36·95	h m s ...	s ...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 36·558 „ „ 12 „ „ = 0 49 35·956 General Mean = d = 0 49 36·257
	58·35	23·05	2·74	2·63	·58	1·59	·65	1·71	59·94	15 45 22·02	·89	0 49 36·33	0·62	
Comparison No. 1	35 1·09	25·68	2·58	2·65	·60	1·55	·63	1·67	35 2·64	24·76	·96	·33	·56	
	3·67	28·33	2·67	2·67	·60	1·60	·61	1·63	5·27	27·35	·94	·32	·64	
	6·34	31·00	2·71	2·70	·60	1·63	·63	1·70	7·97	29·96	·97	·38	·56	
Exchange B	9·05	33·70	...	...	...	...	...	...	...	32·70	...	·35	·62	
			...	...	...	...	...	...	...	...	...	...	...	
Current used	23·29	48·18	2·92	2·97	·61	1·78	·58	1·72	25·07	...	·89	...	...	
at East, Positive	26·21	51·15	2·93	2·77	·64	1·88	·60	1·66	28·09	49·90	·94	·31	·58	
at West, „	29·14	53·92	2·75	2·72	·65	1·79	·60	1·63	30·93	52·81	37·01	·33	·61	
	31·89	56·64	2·82	2·96	·62	1·75	·60	1·78	33·64	55·55	·00	·34	·67	
	34·71	59·60	2·84	2·60	·62	1·76	·61	1·59	36·47	58·42	36·87	·29	·71	
Pen Equation	37·55	46 2·20	2·65	5·60	·62	1·64	...	...	39·19	46 1·19	·99	·36	·51	
at East − s 1·696	40·20	...	2·89	...	·62	1·79	·80	4·48	41·99	...	...	...	...	
at West − 1·318	43·09	7·80	2·78	2·78	·55	1·53	·65	1·81	44·62	6·68	·82	·41	...	
	45·87	10·58							...	9·61	...	·26	·56	
Cable No. 1														
Mean	16 35 22 = t_x										0 49 36·936	0 49 36·334	·604	
1877 May 28	16 36 18·40	15 46 43·93	2·93	2·86	·56	1·64	·63	1·80	16 36 20·04	...	0 49 36·11	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 36·526 „ „ 12 „ „ = 0 49 35·992 General Mean = d = 0 49 36·259
	21·33	46·79	2·77	2·73	·56	1·55	·60	1·64	22·88	15 46 45·73	·09	0 49 35·60	0·51	
	24·10	49·52	3·28	3·38	·48	1·57	·66	2·23	25·67	48·43	·15	·67	·42	
Comparison No. 1	27·38	52·90	2·90	2·77	·60	1·74	·60	1·66	29·12	51·75	·22	·63	·52	
	30·28	55·67	2·75	2·72	·55	1·51	·63	1·71	31·79	54·56	·12	·72	·50	
Exchange C	33·03	58·39	2·67	2·81	·55	1·47	·60	1·69	34·50	57·38	·11	·65	·47	
	35·70	47 1·20	2·90	2·79	·56	1·62	·66	1·84	37·32	47 0·08	·12	·62	·49	
	38·60	3·99	2·70	2·74	·59	1·59	·63	1·73	40·19	3·04	·20	·56	·56	
Current used	41·30	6·73	2·76	2·94	·59	1·63	·57	1·68	42·93	5·72	·20	·58	·62	
at East, Negative	44·06	9·67	2·98	2·73	·59	1·76	·65	1·77	45·82	8·41	·15	·65	·55	
at West, Positive	47·04	12·40	2·60	2·70	·56	1·46	·62	1·67	48·50	11·44	·10	·60	·55	
	49·64	15·10	3·86	4·30	·40	1·54	·65	2·80	51·18	14·07	·08	·57	·53	
Pen Equation	53·50	19·40	3·41	2·89	·61	2·08	·66	1·91	55·58	17·90	·18	·60	·48	
s	56·91	22·29	2·79	2·91	·55	1·53	·63	1·83	58·44	21·31	·15	·60	·58	
at East + 1·696	59·70	25·20	2·94	3·00	·56	1·65	·61	1·83	37 1·35	24·12	·15	·58	·57	
at West + 1·318	37 2·64	28·20	2·96	2·89	·60	1·78	·63	1·82	4·42	27·03	·22	·61	·54	
	5·60	31·09	2·80	2·81	·59	1·65	·60	1·69	7·25	30·02	·16	·58	·64	
Cable No. 1	8·40	33·90							...	32·78	...	·62	·54	
Mean	16 36 43 = t_x										0 49 36·148	0 49 35·614	·534	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	West	Intervals between successive Local Signals as recorded at: East	West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Seconds	Signals from East on West Tape: Decimal	Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at: East	West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = 0h 49m 36s·555
May 28	16 37 50·04	15 48 14·92	2·88	2·62	·61	1·76	·60	1·57	16 37 51·80	...	0 49 36·88	...	...	" 12 " " = 0 49 35·974
	52·92	17·54	2·62	2·56	·60	1·57	·65	1·66	54·49	15 48 16·49	·95	0 49 36·43	0·45	General Mean = d = 0 49 36·265
Comparison No. 1	55·54	20·10	2·59	2·70	·57	1·48	·63	1·70	57·02	19·20	·92	·34	·61	
	58·13	22·80	2·69	2·79	·58	1·56	·63	1·76	59·69	21·80	·89	·33	·59	
Exchange D	38 0·82	25·59	2·82	2·61	·60	1·69	·65	1·70	38 2·51	24·56	·92	·26	·63	
	3·64	28·20	2·63	2·91	·58	1·53	·58	1·69	5·17	27·29	·97	·35	·57	
Current used	6·27	31·11	2·96	2·89	·60	1·78	·63	1·82	8·05	29·89	·94	·38	·59	
	9·23	34·00	2·94	3·00	·59	1·73	·60	1·80	10·96	32·93	·96	·30	·64	
at East, Positive	12·17	37·00	2·98	2·92	·60	1·79	·61	1·78	13·96	35·80	·96	·37	·59	
at West, Negative	15·15	39·92	3·02	2·88	·56	1·69	·65	1·87	16·84	38·78	·92	·37	·59	
	18·17	42·80	2·95	3·10	·55	1·62	·62	1·92	19·79	41·79	·99	·38	·54	
Pen Equation	21·12	45·90	2·90	2·92	·59	1·71	·60	1·75	22·83	44·72	·93	·40	·59	
s	24·02	48·82	2·88	2·77	·60	1·73	·60	1·66	25·75	47·65	·93	·37	·56	
at East − 1·696	26·90	51·59	2·80	2·89	·59	1·65	·63	1·82	28·55	50·48	·96	·42	·51	
at West − 1·318	29·70	54·48	3·00	3·02	·55	1·65	·64	1·93	31·35	53·41	·87	·29	·67	
Cable No. 1	32·70	57·50								56·41		·29	·58	
Mean	16 38 11 = t_E										0 49 36·933	0 49 36·352	·581	
1877	18 38 5·92	17 48 31·45	2·82	2·68	·57	1·61	·65	1·74	18 38 7·53	...	0 49 36·08	...	...	Mean of col. 11 after Correction for Pen Equations = 0h 49m 36s·454
May 28	8·74	34·13	2·63	2·70	·59	1·55	·61	1·65	10·29	17 48 33·19	·16	0 49 35·55	0·53	" 12 " " = 0 49 35·913
	11·37	36·83	2·77	2·72	·58	1·61	·65	1·77	12·98	35·78	·15	·59	·57	General Mean = d = 0 49 36·184
Comparison No. 2	14·14	39·55	2·68	2·70	·57	1·53	·66	1·78	15·67	38·60	·12	·54	·61	
	16·82	42·25	2·65	2·71	·57	1·51	·63	1·71	18·33	41·33	·08	·49	·63	
Exchange A	19·47	44·96	2·59	2·51	·58	1·50	·63	1·58	20·97	43·96	·01	·51	·57	
	22·06	47·47	2·54	2·47	·60	1·52	·64	1·58	23·58	46·54	·11	·52	·49	
Current used	24·60	49·94	2·43	2·51	·57	1·39	·62	1·56	25·99	49·05	·05	·55	·56	
	27·03	52·45	2·46	2·43	·63	1·55	·60	1·46	28·58	51·50	·13	·53	·52	
at East, Negative	29·49	54·88	2·42	2·42	·60	1·45	·63	1·52	30·94	53·91	·06	·58	·55	
at West, "	31·91	57·30	2·53	2·50	·60	1·52	·63	1·58	33·43	56·40	·13	·51	·55	
	34·44	59·80	2·46	2·56	·57	1·40	·63	1·61	35·84	58·88	·04	·56	·57	
Pen Equation	36·90	49 2·36	2·55	2·51	·57	1·45	·63	1·58	38·35	49 1·41	35·99	·49	·55	
s	39·45	4·87	2·54	2·59	·57	1·45	·61	1·58	40·90	3·94	36·03	·51	·48	
at East + 1·697	41·99	7·46	2·51	2·50	·58	1·46	·60	1·50	43·45	6·45	35·99	·54	·49	
at West + 1·318	44·50	9·96								8·96		·54	·45	
Cable No. 2														
Mean	18 38 26 = t_E										0 49 36·075	0 49 35·534	·541	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 36·424
May 28	18 39 20·81	17 49 45·60	2·78	2·69	·60	1·67	·63	1·69	18 39 22·48	...	0 49 36·88	...	...	" " 12 " = 0 49 35·908
	23·59	48·29	2·58	2·63	·57	1·47	·60	1·58	25·06	17 49 47·29	·77	0 49 36·30	0·58	General Mean = d = 0 49 36·166
	26·17	50·92	2·73	2·68	·54	1·47	·61	1·63	27·64	49·87	·72	·30	·47	
Comparison No. 2	28·90	53·60	2·62	2·58	·57	1·49	·63	1·63	30·39	52·55	·79	·35	·37	
	31·52	56·18	2·51	2·44	·60	1·51	·64	1·56	33·03	55·23	·85	·29	·50	
Exchange B	34·03	58·62	2·51	2·68	·57	1·43	·64	1·72	35·46	57·74	·84	·29	·56	
	36·54	50 1·30	2·72	2·55	·56	1·52	·66	1·68	38·06	50 0·34	·76	·20	·64	
Current used	39·26	3·85	2·54	2·65	·57	1·45	·63	1·67	40·71	2·98	·86	·28	·48	
	41·80	6·50	2·53	2·60	·60	1·52	·60	1·56	43·32	5·52	·82	·28	·58	
at East, Positive	44·33	9·10	2·70	2·70	·58	1·57	...	...	45·90	8·06	·80	·27	·55	
at West, "	47·03	11·80	2·58	2·60	·59	1·52	...	...	48·55	...	·75	...	...	
	49·61	14·40	2·60	2·54	·61	1·59	...	...	51·20	...	·80	...	...	
Pen Equation	52·21	16·94	2·57	2·56	·59	1·52	·60	1·54	53·73	...	·79	...	...	
at East − 1·697 s	54·78	19·50	2·63	2·62	·59	1·55	·64	1·68	56·33	18·48	·83	·30	·49	
at West − 1·318	57·41	22·12	2·67	2·60	·56	1·50	·63	1·61	58·91	21·18	·79	·23	·60	
	40 0·08	24·72							...	23·73	...	·35	·44	
Cable No. 2														
Mean	18 39 41 = t_E										0 49 36·803	0 49 36·287	·522	
1877	18 40 28·05	17 50 53·54	2·65	2·67	·59	1·56	·60	1·60	18 40 29·61	...	0 49 36·07	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 36·420
May 28	30·70	56·21	2·70	2·79	·60	1·62	·60	1·67	32·32	17 50 55·14	·11	0 49 35·56	0·51	" " 12 " = 0 49 35·924
	33·40	59·00	2·74	2·60	·60	1·64	·60	1·56	35·04	57·88	·04	·52	·59	General Mean = d = 0 49 36·172
Comparison No. 2	36·14	51 1·60	2·56	2·60	·61	1·56	·60	1·56	37·70	51 0·56	·10	·58	·46	
	38·70	4·20	2·70	5·13	·59	1·59	...	...	40·29	3·16	·09	·54	·56	
Exchange C	41·40	...	2·51	...	·61	1·53	·82	4·21	42·93	...	...	...	...	
	43·91	9·33	2·56	2·56	·54	1·38	·61	1·56	45·29	8·41	35·96	·50	...	
	46·47	11·89	2·53	2·61	·54	1·37	...	...	47·84	10·89	·95	·58	·38	
Current used	49·00	14·50	2·61	2·60	·60	1·57	·60	1·56	50·57	...	36·07	...	...	
at East, Negative	51·61	17·10	5·45	5·59	·27	1·47	·80	4·47	53·08	16·06	35·98	·55	·52	
at West, Positive	57·06	22·69	2·84	2·71	·57	1·62	·62	1·68	58·68	21·57	·99	·49	·49	
	59·90	25·40	2·73	2·70	·56	1·53	·63	1·70	41 1·43	24·37	36·03	·53	·46	
Pen Equation	41 2·63	28·10	2·67	2·61	·57	1·52	·61	1·59	4·15	27·10	·05	·53	·50	
	5·30	30·71	2·64	2·68	·54	1·43	·61	1·63	6·73	29·69	·02	·61	·44	
at East + 1·697 s	7·94	33·39	2·66	2·81	·57	1·52	·60	1·69	9·46	32·34	·07	·60	·42	
at West + 1·318	10·60	36·20	2·80	2·67	·60	1·68	·63	1·68	12·28	35·08	·08	·52	·55	
	13·40	38·87							...	37·88	...	·52	·56	
Cable No. 2														
Mean	18 40 50 = t_E										0 49 36·041	0 49 35·545	·495	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	East	West	East	West	Signals from West on East Tape		Signals from East on West Tape		West Signals by East Clock	East Signals by West Clock	East	West		
					Decimal	Seconds	Decimal	Seconds						
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 28	18 41 51·26	17 52 16·24	2·82	2·56	·62	1·75	·62	1·59	18 41 53·01	...	0 49 36·77	...	...	Mean of col. 11 after Correction for Pen Equations = 0h 49m 36s·416; „ 12 „ = 0 49 35·877; General Mean = d = 0 49 36·147
	54·08	18·80	2·63	2·60	·59	1·55	·62	1·61	55·63	17 52 17·83	·83	0 49 36·25	0·52	
	56·71	21·40	2·54	2·50	·57	1·45	·64	1·60	58·16	20·41	·76	·30	·53	
Comparison No. 2	59·25	23·90	2·36	2·38	·57	1·35	·61	1·45	42 0·60	23·00	·70	·25	·51	
	42 1·61	26·28	2·43	2·32	·60	1·46	·66	1·53	3·07	25·35	·79	·26	·44	
Exchange D	4·04	28·60	2·36	2·47	·60	1·42	·63	1·56	5·46	27·81	·86	·33	·56	
	6·40	31·07	2·49	2·49	·59	1·47	·65	1·62	7·87	30·16	·80	·24	·62	
Current used	8·89	33·56	2·50	2·54	·57	1·43	·60	1·52	10·32	32·69	·76	·20	·60	
	11·39	36·10	2·53	2·52	·63	1·59	·60	1·51	12·98	35·08	·88	·31	·45	
at East, Positive	13·92	38·62	2·51	2·48	·63	1·58	64	1·59	15·50	37·61	·88	·31	·57	
at West, Negative	16·43	41·10	2·48	2·48	·60	1·49	·63	1·56	17·92	40·21	·82	·22	·66	
	18·91	43·58	2·59	2·59	·57	1·48	·64	1·66	20·39	42·66	·81	·25	·57	
Pen Equation	21·50	46·17	2·59	2·58	·54	1·40	·63	1·63	22·90	45·24	·73	·26	·55	
s at East − 1·697	24·09	48·75	2·51	2·55	·58	1·46	·64	1·63	25·55	47·80	·80	·29	·44	
at West − 1·318	26·60	51·30	2·60	2·54	·55	1·43	·65	1·65	28·03	50·38	·73	·22	·58	
	29·20	53·84								52·95	...	·25	·48	
Cable No. 2														
Mean	18 42 10 = t_E										0 49 36·795	0 49 36·256	·539	
1877	16 36 29·79	15 46 55·70	3·01	2·90	·57	1·72	·63	1·83	16 36 31·51	...	0 49 35·81	...	...	Mean of col. 11 after Correction for Pen Equations = 0h 49m 36s·166; „ 12 „ = 0 49 35·638; General Mean = d = 0 49 35·902
May 29	32·80	58·60	2·60	2·60	·60	1·56	·60	1·56	34·36	15 46 57·53	·76	0 49 35·27	0·54	
	35·40	47 1·20	2·69	2·70	·60	1·61	·61	1·65	37·01	47 0·16	·81	·24	·52	
Comparison No. 1	38·09	3·90	2·71	2·61	·57	1·54	·64	1·67	39·63	2·85	·73	·24	·57	
	40·80	6·51	2·70	2·79	·57	1·54	·62	1·73	42·34	5·57	·83	·23	·50	
Exchange A	43·50	9·30	2·82	2·80	·54	1·52	·65	1·82	45·02	8·24	·72	·26	·57	
	46·32	12·10	2·78	2·80	·57	1·58	·64	1·79	47·90	11·12	·80	·20	·52	
	49·10	14·90	2·72	2·71	·60	1·63	·60	1·63	50·73	13·89	·83	·21	·59	
Current used	51·82	17·61	2·70	2·71	·57	1·54	·61	1·65	53·36	16·53	·75	·29	·54	
at East, Negative	54·52	20·32	2·77	2·78	·57	1·58	·62	1·72	56·10	19·26	·78	·26	·49	
at West, „	57·29	23·10	2·53	2·60	·63	1·59	·59	1·53	58·88	22·04	·78	·25	·53	
	59·82	25·70	2·72	2·70	·60	1·63	·60	1·62	37 1·45	24·63	·75	·19	·59	
Pen Equation	37 2·54	28·40	2·66	2·53	·60	1·60	·62	1·57	4·14	27·32	·74	·22	·53	
s	5·20	30·93	2·63	2·86	·55	1·45	·56	1·60	6·65	29·97	·72	·23	·51	
at East + 1·707	7·83	33·79	2·87	2·91	·60	1·72	·57	1·66	9·55	32·53	·76	·30	·42	
at West + 1·312	10·70	36·70								35·45	...	·25	·51	
Cable No. 2														
Mean	16 36 50 = t_E										0 49 35·771	0 49 35·243	·529	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 29	16 37 47·70	15 48 13·00	2·92	2·60	·61	1·78	·60	1·56	16 37 49·48	...	0 49 36·48	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 36·162 h m s; „ 12 „ „ = 0 49 35·615; General Mean = d = 0 49 35·889
	50·62	15·60	2·78	2·80	·54	1·50	·65	1·82	52·12	15 48 14·56	·52	0 49 36·06	0·42	
	53·40	18·40	2·80	2·79	·56	1·57	·65	1·81	54·97	17·42	·57	35·98	·54	
Comparison No. 1	56·20	21·19	2·75	2·70	·56	1·54	·67	1·81	57·74	20·21	·55	·99	·58	
	58·95	23·89	2·72	2·71	·56	1·52	·66	1·79	38 0·47	23·00	·58	·95	·60	
Exchange B	38 1·67	26·60	2·63	2·64	·58	1·53	·65	1·72	3·20	25·68	·60	·99	·59	
	4·30	29·24	2·78	2·72	·54	1·50	·65	1·77	5·80	28·32	·56	·98	·62	
	7·08	31·96	2·60	2·64	·55	1·43	·65	1·72	8·51	31·01	·55	36·07	·49	
Current used	9·68	34·60	2·61	2·60	·55	1·44	·64	1·66	11·12	33·68	·52	·00	·55	
at East, Positive	12·29	37·20	2·71	2·76	·56	1·52	·66	1·82	13·81	36·26	·61	·03	·49	
at West, „	15·00	39·96	2·71	2·67	·55	1·49	·65	1·74	16·49	39·02	·53	35·98	·63	
	17·71	42·63	2·67	2·68	·52	1·39	·64	1·72	19·10	41·70	·47	36·01	·52	
Pen Equation	20·38	45·31	2·72	2·72	·58	1·58	·65	1·77	21·96	44·35	·65	·03	·44	
at East − 1·707 s	23·10	48·03	2·70	2·76	·54	1·46	·64	1·77	24·56	47·08	·53	·02	·63	
at West − 1·312	25·80	50·79	2·71	2·72	·60	1·63	·61	1·66	27·43	49·80	·64	·00	·53	
	28·51	53·51								52·45	...	·06	·58	
Cable No. 2														
Mean	16 38 8 = t_E										0 49 36·557	0 49 36·010	·547	
1877 May 29	16 38 58·30	15 49 24·25	2·80	2·72	·60	1·68	·60	1·63	16 38 59·98	...	0 49 35·73	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 36·152 h m s; „ 12 „ „ = 0 49 35·630; General Mean = d = 0 49 35·891
	39 1·10	26·97	2·72	2·67	·60	1·63	·60	1·60	39 2·73	15 49 25·88	·76	0 49 35·22	0·51	
	3·82	29·64	2·77	2·68	·59	1·63	·62	1·66	5·45	28·57	·81	·25	·51	
Comparison No. 1	6·59	32·32	2·56	2·73	·60	1·54	·57	1·56	8·13	31·30	·81	·29	·52	
	9·15	35·05	2·76	2·74	·60	1·66	·58	1·59	10·81	33·88	·76	·27	·54	
Exchange C	11·91	37·79	2·74	2·67	·60	1·64	·62	1·66	13·55	36·64	·76	·27	·49	
	14·65	40·46	2·65	2·73	·60	1·59	·59	1·61	16·24	39·45	·78	·20	·56	
	17·30	43·19	2·73	2·57	·60	1·64	·63	1·62	18·94	42·07	·75	·23	·55	
Current used	20·03	45·76	2·62	2·74	·54	1·41	·60	1·64	21·44	44·81	·68	·22	·53	
at East, Negative	22·65	48·50	2·76	2·66	·60	1·66	·64	1·70	24·31	47·40	·81	·25	·43	
at West, Positive	25·41	51·16	2·59	2·64	·56	1·45	·61	1·61	26·86	50·20	·70	·21	·60	
	28·00	53·80	...	...	...	...	...	...	...	52·77	...	·23	·47	
Pen Equation	——	——	...	...	...	...	...	...	...	...	...	...	...	
at East + 1·707 s	33·75	50 1·35	4·67	2·97	·72	3·36	·63	1·87	37·11	...	·76	...	...	
	38·42	4·32	2·80	2·77	·59	1·65	·61	1·69	40·07	50 3·22	·75	·20	·56	
at West + 1·312	41·22	7·09	2·77	2·77	·60	1·66	·61	1·69	42·88	6·01	·79	·21	·54	
	43·99	9·86	2·71	2·64	·58	1·57	·60	1·58	45·56	8·78	·70	·21	·58	
Cable No. 2	46·70	12·50							...	11·44	...	·26	·44	
Mean	16 39 21 = t_E										0 49 35·757	0 49 35·235	·522	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = 0 49 36·184 (h m s); " " 12 " = 0 49 35·605; General Mean = d = 0 49 35·895
May 29	16 40 32·33	15 50 57·26	2·62	2·66	·55	1·44	·64	1·70	16 40 33·77	...	0 49 36·51	...	...	
	34·95	59·92	2·66	2·73	·55	1·46	·62	1·69	36·41	15 50 58·96	·49	0 49 35·99	0·52	
	37·61	51 2·65	2·69	2·67	·60	1·61	·60	1·60	39·22	51 1·61	·57	36·00	·49	
Comparison No. 1	40·30	5·32	2·72	2·65	·60	1·63	·63	1·67	41·93	4·25	·61	·05	·52	
	43·02	7·97	2·69	2·74	·58	1·56	·60	1·64	44·58	6·99	·61	·03	·58	
Exchange D	45·71	10·71	2·77	2·79	·60	1·66	·64	1·79	47·37	9·61	·66	·10	·51	
	48·48	13·50	2·80	2·73	·58	1·62	·67	1·83	50·10	12·50	·60	35·98	·68	
Current used	51·28	16·23	2·63	2·70	·57	1·50	·63	1·70	52·78	15·33	·55	·95	·65	
	53·91	18·93	2·80	2·79	·58	1·62	·67	1·87	55·53	17·93	·60	·98	·57	
at East, Positive	56·71	21·72	2·62	2·76	·60	1·57	·60	1·66	58·28	20·80	·56	·91	·69	
at West, Negative	59·33	24·48	2·88	2·80	·60	1·73	·63	1·76	41 1·06	23·38	·58	·95	·61	
	41 2·21	27·28	2·78	2·75	·59	1·64	·60	1·65	3·85	26·24	·57	·97	·61	
Pen Equation	4·99	30·03	2·85	2·85	·57	1·62	·63	1·80	6·61	28·93	·58	36·06	·51	
at East − 1·707 s	7·84	32·88	2·81	2·82	·59	1·66	·62	1·75	9·50	31·83	·62	·01	·57	
at West − 1·312	10·65	35·70							...	34·63	...	·02	·60	
Cable No. 2														
Mean	16 40 51 = t_E										0 49 36·579	0 49 36·000	·579	
1877	18 28 58·19	17 39 24·19	2·82	2·78	·64	1·80	·59	1·64	18 28 59·99	...	0 49 35·80	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 36·130 (h m s); " " 12 " = 0 49 35·590; General Mean = d = 0 49 35·860
May 29	29 1·01	26·97	2·69	2·67	·64	1·72	·59	1·58	29 2·73	17 39 25·83	·76	0 49 35·18	0·62	
	3·70	29·64	2·77	2·66	·63	1·75	·60	1·60	5·45	28·55	·81	·15	·61	
Comparison No. 2	6·47	32·30	2·63	2·69	·60	1·58	·60	1·61	8·05	31·24	·75	·23	·58	
	9·10	34·99	2·69	2·61	·60	1·61	·60	1·57	10·71	33·91	·72	·19	·56	
Exchange A	11·79	37·60	2·71	2·73	·56	1·52	·62	1·69	13·31	36·56	·71	·23	·49	
	14·50	40·33	2·70	5·46	·58	1·57	·30	1·64	16·07	39·29	·74	·21	·50	
	17·20	...	2·65	...	·61	1·62	...	...	18·82	41·97	...	·23	·51	
Current used	19·85	45·79	2·73	2·56	·61	1·67	·61	1·56	21·52	...	·73	...	...	
at East, Negative	22·58	48·35	2·42	2·42	·64	1·55	·60	1·45	24·13	47·35	·78	·23	·50	
at West, "	25·00	50·77	2·51	2·63	·60	1·51	·60	1·58	26·51	49·80	·74	·20	·58	
	27·51	53·40	2·61	2·61	·63	1·64	·59	1·54	29·15	52·35	·75	·16	·58	
Pen Equation	30·12	56·01	2·56	2·44	·62	1·59	·60	1·46	31·71	54·94	·70	·18	·57	
s	32·68	58·45	2·41	2·44	·60	1·45	·59	1·44	34·13	57·47	·68	·21	·49	
at East + 1·703	35·09	40 0·89	2·46	2·46	·60	1·48	·60	1·48	36·57	59·89	·68	·20	·48	
at West + 1·312	37·55	3·35							...	40 2·37	...	·18	·50	
Cable No. 2														
Mean	18 29 18 = t_E										0 49 35·739	0 49 35·199	·541	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at East	Times of Local Signals recorded on Chronograph at West	Intervals between successive Local Signals as recorded at East	Intervals between successive Local Signals as recorded at West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape, Decimal	Signals from West on East Tape, Seconds	Signals from East on West Tape, Decimal	Signals from East on West Tape, Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at East	Observed Differences of Clocks at West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877 May 29	h m s 18 30 15·10	h m s 17 40 40·16	s 2·61	s 2·65	·60	s 1·57	·60	s 1·59	h m s 18 30 16·67	h m s ...	h m s 0 49 36·51	h m s ...	s ...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 36·115; „ 12 „ „ = 0 49 35·582; General Mean = d = 0 49 35·849
	17·71	42·81	2·59	2·50	·60	1·55	·60	1·50	19·26	17 40 41·75	·45	0 49 35·96	0·55	
	20·30	45·31	2·55	2·61	·60	1·53	·60	1·57	21·83	44·31	·52	·99	·46	
Comparison No. 2	22·85	47·92	...	...	...	...	...	..	...	46·88	...	·97	·55	
	...	50·70	...	4·56	...	...	·77	3·51	...	...	...	...	...	
Exchange B	30·17	55·26	2·69	2·63	·58	1·56	·60	1·58	31·73	54·21	·47	·96	...	
	32·86	57·89	2·83	2·90	·53	1·50	·64	1·86	34·36	56·84	·47	36·02	·45	
Current used	35·69	41 0·79	2·63	2·66	·60	1·58	·60	1·60	37·27	59·75	·48	35·94	·53	
at East, Positive	38·32	3·45	2·75	2·63	·60	1·65	·64	1·68	39·97	41 2·39	·52	·93	·55	
at West, „	41·07	6·08	2·68	2·75	·59	1·58	·62	1·71	42·65	5·13	·57	·94	·58	
	43·75	8·83	2·69	2·67	·58	1·56	·60	1·60	45·31	7·79	·48	·96	·61	
	46·44	11·50	2·75	2·78	·57	1·57	·60	1·67	48·01	10·43	·51	36·01	·47	
Pen Equation	49·19	14·28	2·71	2·70	·59	1·60	·60	1·62	50·79	13·17	·51	·02	·49	
at East − 1·703 s	51·90	16·98	2·70	2·81	·60	1·62	·60	1·69	53·52	15·90	·54	·00	·51	
at West − 1·312	54·60	19·79	2·77	2·61	·60	1·66	·61	1·59	56·26	18·67	·47	35·93	·61	
	57·37	22·40	2·73	2·78	·59	1·61	·62	1·72	58·98	21·38	·58	·99	·48	
	31 0·10	25·18							...	24·12	...	·98	·60	
Cable No. 2														
Mean	18 30 38 = t_E										0 49 36·506	0 49 35·973	·531	
1877 May 29	18 31 32·30	17 41 58·09	2·58	2·61	·60	1·55	·60	1·57	18 31 33·85	...	0 49 35·76	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 36·109; „ 12 „ „ = 0 49 35·617; General Mean = d = 0 49 35·863
	34·88	42 0·70	2·69	2·70	·54	1·45	·60	1·62	36·33	17 41 59·66	·63	0 49 35·22	0·54	
	37·57	3·40	2·68	2·70	·60	1·61	·60	1·62	39·18	42 2·32	·78	·25	·38	
Comparison No. 2	40·25	6·10	2·75	2·67	·58	1·60	·63	1·68	41·85	5·02	·75	·23	·55	
	43·00	8·77	2·60	2·93	·54	1·40	·57	1·67	44·40	7·78	·63	·22	·53	
Exchange C	45·60	11·70	2·90	2·51	·60	1·74	·64	1·61	47·34	10·44	·64	·16	·47	
	48·50	14·21	2·60	2·75	·56	1·46	·61	1·68	49·96	13·31	·75	·19	·45	
	51·10	16·96	2·64	2·54	·59	1·56	·63	1·60	52·66	15·89	·70	·21	·54	
Current used	53·74	19·50	2·69	2·80	·54	1·45	·60	1·68	55·19	18·56	·69	·18	·52	
at East, Negative	56·43	22·30	2·82	2·62	·59	1·66	·66	1·73	58·09	21·18	·79	·25	·44	
at West, Positive	59·25	24·92	2·65	2·75	·53	1·40	·65	1·79	32 0·65	24·03	·73	·22	·57	
	32 1·90	27·67	2·68	2·73	·55	1·47	·60	1·64	3·37	26·71	·70	·19	·54	
Pen Equation	4·58	30·40	2·62	2·72	·60	1·57	·55	1·50	6·15	29·31	·75	·27	·43	
s	7·20	33·12	2·69	2·48	·63	1·69	·60	1·49	8·89	31·90	·77	·30	·45	
at East + 1·703	9·89	35·60	2·52	2·60	·56	1·41	·61	1·59	11·30	34·61	·70	·28	·49	
at West + 1·312	12·41	38·20							...	37·19	...	·22	·48	
Cable No. 2														
Mean	18 31 52 = t_E										0 49 35·718	0 49 35·226	·492	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at East	Times of Local Signals recorded on Chronograph at West	Intervals between successive Local Signals as recorded at East	Intervals between successive Local Signals as recorded at West	Interpolation: Signals from West on East Tape, Decimal	Signals from West on East Tape, Seconds	Signals from East on West Tape, Decimal	Signals from East on West Tape, Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at East	Observed Differences of Clocks at West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
May 29	18 32 51·52	17 43 16·60	2·74	2·67	·57	1·56	·66	1·76	18 32 53·08	...	0 49 36·48	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 36·076
	54·26	19·27	2·74	2·63	·53	1·45	·69	1·81	55·71	17 43 18·36	·44	0 49 35·90	0·58	" " 12 " = 0 49 35·560
	57·00	21·90	2·55	2·56	·52	1·33	·68	1·74	58·33	21·08	·43	·92	·52	General Mean = d = 0 49 35·818
Comparison No. 2	59·55	24·46	2·57	2·44	·52	1·34	·71	1·73	33 0·89	23·64	·43	·91	·52	
	33 2·12	26·90	2·78	3·20	·49	1·36	·64	2·05	3·48	26·19	·58	·93	·50	
Exchange D	4·90	30·10	2·95	2·69	·60	1·77	·67	1·80	6·67	28·95	·57	·95	·63	
•	7·85	32·79	2·62	2·69	·50	1·31	...	...	9·16	31·90	·37	·95	·62	
Current used	10·47	35·48	2·59	2·52	·59	1·53	·63	1·59	12·00	...	·52	...	...	
	13·06	38·00	2·53	2·60	·54	1·37	·62	1·61	14·43	37·07	·43	·99	·53	
at East, Positive	15·59	40·60	2·62	2·70	·56	1·47	·60	1·62	17·06	39·61	·46	·98	·45	
at West, Negative	18·21	43·30	2·72	2·64	·60	1·63	·64	1·69	19·84	42·22	·54	·99	·47	
	20·93	45·94	2·72	2·66	·54	1·47	·64	1·70	22·40	44·99	·46	·94	·60	
Pen Equation	23·65	48·60	2·65	2·79	·50	1·33	·63	1·76	24·98	47·64	·38	36·01	·45	
at East − 1·703 s	26·30	51·39	2·67	2·59	·56	1·50	·63	1·63	27·80	50·36	·41	35·94	·44	
at West − 1·312	28·97	53·98	2·53	2·61	·60	1·52	·60	1·57	30·49	53·02	·51	·95	·46	
	31·50	56·59							...	55·55	...	·95	·56	
Cable No. 2														
Mean	18 33 12 = t_E										0 49 36·467	0 49 35·951	·524	
1877	16 33 27·92	15 43 54·17	2·93	2·77	·60	1·76	·60	1·66	16 33 29·68	...	0 49 35·51	...	...	Mean of col. 11 after Correction for Pen Equations = h m s 0 49 35·942
May 30	30·85	56·94	2·65	2·60	·63	1·67	·60	1·56	32·52	15 43 55·83	·58	0 49 35·02	0·49	" " 12 " = 0 49 35·412
	33·50	59·54	2·67	2·66	·58	1·55	·60	1·60	35·05	58·50	·51	·00	·58	General Mean = d = 0 49 35·677
Comparison No. 1	36·17	44 2·20	2·59	2·60	·63	1·63	·61	1·59	37·80	44 1·14	·60	·03	·48	
	38·76	4·80	2·66	2·59	·60	1·60	·63	1·63	40·36	3·79	·56	34·97	·63	
Exchange A	41·42	7·39	2·48	2·51	·57	1·41	·61	1·53	42·83	6·43	·44	·99	·57	
	43·90	9·90	2·57	2·57	·60	1·54	·60	1·54	45·44	8·92	·54	·98	·46	
	46·47	12·47	2·61	2·59	·60	1·57	·61	1·58	48·04	11·44	·57	35·03	·51	
Current used	49·08	15·06	2·56	2·54	·60	1·54	·62	1·57	50·62	14·05	·56	·03	·54	
at East, Negative	51·64	17·60	2·56	2·50	·60	1·54	·63	1·58	53·18	16·63	·58	·01	·55	
at West, "	54·20	20·10	2·40	2·51	·60	1·44	·60	1·51	55·64	19·18	·54	·02	·56	
	56·60	22·61	2·60	2·57	·58	1·51	·60	1·54	58·11	21·61	·50	34·99	·55	
Pen Equation	59·20	25·18	2·50	2·50	·62	1·55	·62	1·55	34 0·75	24·15	·57	35·05	·45	
	34 1·70	27·68	2·56	2·42	·58	1·48	·63	1·52	3·18	26·73	·50	34·97	·60	
at East + 1·709 s	4·26	30·10	2·41	2·67	·59	1·42	·57	1·52	5·68	29·20	·58	35·06	·44	
at West + 1·310	6·67	32·77							...	31·62	...	·05	·53	
Cable No. 2														
Mean	16 33 48 = t_E										0 49 35·543	0 49 35·013	·529	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at East	Times of Local Signals recorded on Chronograph at West	Intervals between successive Local Signals as recorded at East	Intervals between successive Local Signals as recorded at West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape, Decimal	Signals from West on East Tape, Seconds	Signals from East on West Tape, Decimal	Signals from East on West Tape, Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	East Signals by West Clock	Observed Differences of Clocks at East	Observed Differences of Clocks at West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877	16 34 45·30	15 45 10·60	2·67	2·52	·63	1·68	·61	1·54	16 34 46·98	...	0 49 36·38	...	...	Mean of col. 11 after Correction for Pen Equations = 0h 49m 35s·958; „ 12 „ = 0 49 35·425; General Mean = d = 0 49 35·692
May 30	47·97	13·12	2·49	2·54	·62	1·54	·59	1·50	49·51	15 45 12·14	·39	0 49 35·83	0·55	
	50·46	15·66	2·45	2·44	·64	1·57	·57	1·39	52·03	14·62	·37	·84	·55	
Comparison No. 1	52·91	18·10	2·44	2·50	·62	1·51	·56	1·40	54·42	17·05	·32	·86	·51	
	55·35	20·60	2·56	2·50	·64	1·64	·60	1·50	56·99	19·50	·39	·85	·47	
Exchange B	57·91	23·10	2·50	2·50	·61	1·53	·60	1·50	59·44	22·10	·34	·81	·58	
	35 0·41	25·60	2·58	2·54	·60	1·55	·62	1·57	35 1·96	24·60	·36	·81	·53	
Current used	2·99	28·14	2·57	2·59	·58	1·49	·63	1·63	4·48	27·17	·34	·82	·54	
	5·56	30·73	2·59	2·59	·60	1·55	·62	1·61	7·11	29·77	·38	·79	·55	
at East, Positive	8·15	33·32	2·55	2·48	·59	1·50	·64	1·59	9·65	32·34	·33	·81	·57	
at West, „	10·70	35·80	2·48	2·56	·55	1·36	·59	1·51	12·06	34·91	·26	·79	·54	
	13·18	38·36	2·58	2·57	·60	1·55	·62	1·59	14·73	37·31	·37	·87	·39	
Pen Equation	15·76	40·93	2·54	2·52	·60	1·52	·61	1·54	17·28	39·95	·35	·81	·56	
	18·30	43·45	2·61	2·65	·59	1·54	·62	1·64	19·84	42·47	·39	·83	·52	
at East − 1s·709	20·91	46·10	2·62	2·59	·60	1·57	·62	1·61	22·48	45·09	·38	·82	·57	
at West − 1·310	23·53	48·69							...	47·71	...	·82	·56	
Cable No. 2														
Mean	16 35 4 = t_E										0 49 36·357	0 49 35·824	·533	

Astronomical Date and Descriptive Details	1	2	3	4	5	6	7	8	9	10	11	12	13	Deduction of d
1877	16 35 55·33	15 46 21·50	2·75	2·60	·60	1·65	·59	1·53	16 35 56·98	...	0 49 35·48	...	...	Mean of col. 11 after Correction for Pen Equations = 0h 49m 35s·958; „ 12 „ = 0 49 35·442; General Mean = d = 0 49 35·700
May 30	58·08	24·10	2·56	2·60	·60	1·54	·57	1·48	59·62	15 46 23·03	·52	0 49 35·05	0·43	
	36 0·64	26·70	2·66	2·77	·60	1·60	·57	1·58	36 2·24	25·58	·54	·06	·46	
Comparison No. 1	3·30	29·47	2·80	2·60	·60	1·68	·62	1·61	4·98	28·28	·51	·02	·52	
	6·10	32·07	2·59	2·59	·60	1·55	60	1·55	7·65	31·08	·58	·02	·49	
Exchange C	8·69	34·66	2·71	2·73	·56	1·52	·62	1·69	10·21	33·62	·55	·07	·51	
	11·40	37·39	2·68	2·57	·59	1·58	·63	1·62	12·98	36·35	·59	·05	·50	
	14·08	39·96	2·63	2·77	·57	1·50	·60	1·66	15·58	39·01	·62	·07	·52	
Current used	16·71	42·73	2·63	2·55	·60	1·58	·62	1·58	18·29	41·62	·56	·09	·53	
at East, Negative	19·34	45·28	2·57	2·52	·60	1·54	·66	1·66	20·88	44·31	·60	·03	·53	
at West, Positive	21·91	47·80	2·51	2·50	·60	1·51	·64	1·60	23·42	46·94	·62	34·97	·63	
	24·42	50·30	2·62	2·69	·56	1·47	·63	1·69	25·89	49·40	·59	35·02	·60	
Pen Equation	27·04	52·99	2·56	2·61	·56	1·43	·59	1·54	28·47	51·99	·48	·05	·54	
	29·60	55·60	2·64	2·69	·59	1·56	·60	1·61	31·16	54·53	·56	·07	·41	
at East + 1s·709	32·24	58·29	2·67	2·63	·60	1·60	·59	1·55	33·84	57·21	·55	·03	·53	
at West + 1·310	34·91	47 0·92	2·67	2·65	·60	1·60	·62	1·64	36·51	59·84	·59	·07	·48	
	37·58	3·57							...	47 2·56	...	·02	·57	
Cable No. 2														
Mean	16 36 17 = t_E										0 49 35·559	0 49 35·043	·516	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_s
	East	West	East	West	Signals from West on East Tape		Signals from East on West Tape		West Signals by East Clock	East Signals by West Clock	East	West		
					Decimal	Seconds	Decimal	Seconds						
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 30	16 37 19·25	15 47 44·44	2·68	2·76	·59	1·58	·59	1·63	16 37 20·83	...	0 49 36·39	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 35·972 h m s; „ „ 12 „ = 0 49 35·434; General Mean = d = 0 49 35·703
	21·93	47·20	2·64	2·60	·63	1·66	·59	1·53	23·59	15 47 46·07	·39	0 49 35·86	0·53	
	24·57	49·80	2·63	2·48	·60	1·58	·62	1·54	26·15	48·73	·35	·84	·55	
Comparison No. 1	27·20	52·28	2·50	2·62	·59	1·48	·62	1·62	28·68	51·34	·40	·86	·49	
	29·70	54·90	2·58	2·50	·60	1·55	·60	1·50	31·25	53·90	·35	·80	·60	
Exchange D	32·28	57·40	2·57	2·65	·58	1·49	·63	1·67	33·77	56·40	·37	·88	·47	
	34·85	48 0·05	2·59	2·60	·60	1·55	·60	1·56	36·40	59·07	·35	·78	·59	
Current used	37·44	2·65	2·63	2·55	·60	1·58	·63	1·61	39·02	48 1·61	·37	·83	·52	
	40·07	5·20	2·58	2·63	·57	1·47	·62	1·63	41·54	4·26	·34	·81	·56	
at East, Positive	42·65	7·83	2·60	2·56	·60	1·56	·63	1·61	44·21	6·83	·38	·82	·52	
at West, Negative	45·25	10·39	2·65	2·61	·56	1·48	·64	1·67	46·73	9·44	·34	·81	·57	
	47·90	13·00	2·57	2·60	·56	1·44	·62	1·61	49·34	12·06	·34	·84	·50	
Pen Equation	50·47	15·60	2·52	2·50	·60	1·51	·62	1·55	51·98	14·61	·38	·86	·48	
	52·99	18·10	2·61	2·60	·60	1·57	·63	1·64	54·56	17·15	·46	·84	·54	
at East − 1·709 s	55·60	20·70	2·52	2·60	·58	1·46	·62	1·61	57·06	19·74	·36	·86	·60	
at West − 1·310	58·12	23·30							...	22·31	...	·81	·55	
Cable No. 2														
Mean	16 37 39 = t_s										0 49 36·371	0 49 35·833	·538	
1877 May 30	18 27 6·30	17 37 32·48	2·70	5·63	·60	1·62	...	...	18 27 7·92	...	0 49 35·44	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 35·936 h m s; „ „ 12 „ = 0 49 35·391; General Mean = d = 0 49 35·664
	9·00	...	2·98	...	·67	2·00	·80	4·50	11·00	...	...	...	...	
	11·98	38·11	2·80	2·72	·60	1·68	·61	1·66	13·66	17 37 36·98	·55	0 49 35·00	...	
Comparison No. 2	14·78	40·83	2·64	2·67	·60	1·58	·60	1·60	16·36	39·77	·53	·01	0·54	
	17·42	43·50	2·56	2·50	·64	1·64	·60	1·50	19·06	42·43	·56	34·99	·54	
	19·98	46·00	2·52	2·58	·67	1·69	·59	1·52	21·67	45·00	·67	·98	·58	
Exchange A	22·50	48·58	2·51	2·90	·64	1·61	...	...	24·11	47·52	·53	·98	·69	
	25·01	51·48	3·06	2·62	·66	2·02	·60	1·57	27·03	...	·55	...	...	
Current used	28·07	54·10	2·54	2·50	·63	1·60	·60	1·50	29·67	53·05	·57	35·02	·53	
at East, Negative	30·61	56·60	2·45	2·43	·60	1·47	·60	1·46	32·08	55·60	·48	·01	·56	
at West, „	33·06	59·03	2·54	2·63	·60	1·52	...	...	34·58	58·06	·55	·00	·48	
	35·60	38 1·66	2·51	2·46	·63	1·58	·60	1·48	37·18	...	·52	...	...	
Pen Equation	38·11	4·12	2·55	2·48	·60	1·53	·62	1·54	39·64	38 3·14	·52	34·97	·55	
s	40·66	6·60	2·43	2·48	·60	1·46	·61	1·51	42·12	5·66	·52	35·00	·52	
at East + 1·710	43·09	9·08	2·42	2·51	·62	1·50	·59	1·48	44·59	8·11	·51	34·98	·54	
at West + 1·310	45·51	11·59							...	10·56	...	·95	·56	
Cable No. 2														
Mean	18 27 26 = t_s										0 49 35·536	0 49 34·991	·554	

Aden (E) and *Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at		Intervals between successive Local Signals as recorded at		Interpolation of Received, between Local, Signals recorded on Cable Tapes				Times of Signals in Terms of Distant Clock		Observed Differences of Clocks at		Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
					Signals from West on East Tape		Signals from East on West Tape							
	East	West	East	West	Decimal	Seconds	Decimal	Seconds	West Signals by East Clock	East Signals by West Clock	East	West		
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
1877	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	Mean of col. 11 after Correction for Pen Equations = 0 49 35·927 (h m s); " " 12 " " = 0 49 35·394; General Mean = d = 0 49 35·661
May 30	18 28 21·49	17 38 47·03	3·11	2·76	·60	1·87	·65	1·79	18 28 23·36	...	0 49 36·33	...	...	
	24·60	49·79	2·55	2·55	·60	1·53	·61	1·56	26·13	17 38 48·82	·34	0 49 35·78	0·55	
	27·15	52·34	2·49	2·45	·60	1·49	·60	1·47	28·64	51·35	·30	·80	·54	
Comparison No. 2	29·64	54·79	2·48	2·59	·60	1·49	·61	1·58	31·13	53·81	·34	·83	·47	
	32·12	57·38	2·58	2·57	·60	1·55	·60	1·54	33·67	56·37	·29	·75	·59	
Exchange B	34·70	59·95	2·59	2·45	·60	1·55	·63	1·54	36·25	58·92	·30	·78	·51	
	37·29	39 2·40	2·45	2·50	·59	1·45	·60	1·50	38·74	39 1·49	·34	·80	·50	
Current used	39·74	4·90	2·54	2·50	·58	1·47	·63	1·58	41·21	3·90	·31	·84	·50	
	42·28	7·40	2·50	2·59	·60	1·50	·60	1·55	43·78	6·48	·38	·80	·51	
at East, Positive	44·78	9·99	2·62	2·51	·59	1·55	·65	1·63	46·33	8·95	·34	·83	·55	
at West, "	47·40	12·50	2·63	2·70	·54	1·42	·66	1·78	48·82	11·62	·32	·78	·56	
	50·03	15·20	2·61	2·54	·59	1·54	·65	1·65	51·57	14·28	·37	·75	·57	
Pen Equation	52·64	17·74	2·56	2·74	·54	1·38	·60	1·64	54·02	16·85	·28	·79	·58	
s	55·20	20·48	2·63	2·40	·60	1·58	·66	1·58	56·78	19·38	·30	·82	·46	
at East − 1·710	57·83	22·88	2·50	2·63	·56	1·40	·63	1·66	59·23	22·06	·35	·77	·53	
at West − 1·310	29 0·33	25·51	2·57	2·52	·59	1·52	·63	1·59	29 1·85	24·54	·34	·79	·56	
	2·90	28·03							...	27·10	...	·80	·54	
Cable No. 2														
Mean	18 28 42 = t_E										0 49 36·327	0 49 35·794	·533	
1877	18 29 33·90	17 39 59·90	2·73	2·80	·56	1·53	·63	1·76	18 29 35·43	...	0 49 35·53	...	...	Mean of col. 11 after Correction for Pen Equations = 0 49 35·938 (h m s); " " 12 " " = 0 49 35·390; General Mean = d = 0 49 35·664
May 30	36·63	40 2·70	2·60	2·56	·60	1·56	·60	1·54	38·19	17 40 1·66	·49	0 49 34·97	0·56	
	39·23	5·26	2·62	2·73	·59	1·55	·60	1·64	40·78	4·24	·52	·99	·50	
Comparison No. 2	41·85	7·99	2·74	2·71	·61	1·67	·59	1·60	43·52	6·90	·53	·95	·57	
	44·59	10·70	2·63	2·59	·60	1·58	·60	1·55	46·17	9·59	·47	35·00	·53	
	47·22	13·29	2·67	2·50	·60	1·60	·65	1·63	48·82	12·25	·53	34·97	·50	
Exchange C	49·89	15·79	2·49	2·41	·59	1·47	·66	1·59	51·36	14·92	·57	·97	·56	
	52·38	18·20	2·46	2·60	·57	1·40	·63	1·64	53·78	17·38	·58	35·00	·57	
Current used	54·84	20·80	2·63	2·60	·58	1·53	·64	1·66	56·37	19·84	·57	·00	·58	
at East, Negative	57·47	23·40	2·60	2·64	·58	1·51	·63	1·66	58·98	22·46	·58	·01	·56	
at West, Positive	30 0·07	26·04	2·57	2·62	·58	1·49	·62	1·62	30 1·56	25·06	·52	·01	·57	
	2·64	28·66	2·61	2·62	·59	1·54	·61	1·60	4·18	27·66	·52	34·98	·54	
Pen Equation	5·25	31·28	2·64	2·53	·59	1·56	·64	1·62	6·81	30·26	·53	·99	·53	
s	7·89	33·81	2·55	2·66	·59	1·50	·62	1·65	9·39	32·90	·58	·99	·54	
at East + 1·710	10·44	36·47	2·63	2·56	·60	1·58	·61	1·56	12·02	35·46	·55	·98	·60	
at West + 1·310	13·07	39·03							...	38·03	...	35·04	·51	
Cable No. 2														
Mean	18 29 54 = t_E										0 49 35·538	0 49 34·990	·548	

Aden (E) *and Suez* (W).

Astronomical Date and Descriptive Details	Times of Local Signals recorded on Chronograph at: East	Times of Local Signals recorded on Chronograph at: West	Intervals between successive Local Signals as recorded at: East	Intervals between successive Local Signals as recorded at: West	Interpolation of Received, between Local, Signals recorded on Cable Tapes: Signals from West on East Tape: Decimal	Signals from West on East Tape: Seconds	Signals from East on West Tape: Decimal	Signals from East on West Tape: Seconds	Times of Signals in Terms of Distant Clock: West Signals by East Clock	Times of Signals in Terms of Distant Clock: East Signals by West Clock	Observed Differences of Clocks at: East	Observed Differences of Clocks at: West	Resulting Values of double Retardation	Deduction of d, the Final Difference between the Clocks at Epoch t_E
	1	2	3	4	5	6	7	8	9 (=1+6)	10 (=2+8)	11 (=9−2)	12 (=1−10)	13 (=11−12)	
	h m s	h m s	s	s		s		s	h m s	h m s	h m s	h m s	s	
1877 May 30	18 30 52·35	17 41 17·60	2·65	2·57	·58	1·54	·64	1·64	18 30 53·89	...	0 49 36·29	...	...	Mean of col. 11 after Correction for Pen Equations = 0h 49m 35s·946; " " 12 " " = 0 49 35·363; General Mean = d = 0 49 35·655
	55·00	20·17	2·50	2·53	·59	1·48	·63	1·59	56·48	17 41 19·24	·31	0 49 35·76	0·53	
	57·50	22·70	2·48	2·40	·60	1·49	·64	1·54	58·99	21·76	·29	·74	·57	
Comparison No. 2	59·98	25·10	2·47	2·44	·60	1·48	·66	1·61	31 1·46	24·24	·36	·74	·55	
	31 2·45	27·54	2·44	2·39	·60	1·46	·64	1·53	3·91	26·71	·37	·74	·62	
Exchange D	4·89	29·93	2·41	2·41	·58	1·40	·66	1·59	6·29	29·07	·36	·82	·55	
	7·30	32·34	2·43	2·48	·56	1·36	·66	1·64	8·66	31·52	·32	·78	·58	
Current used	9·73	34·82	2·45	2·50	·60	1·47	·64	1·60	11·20	33·98	·38	·75	·57	
	12·18	37·32	2·52	2·43	·59	1·49	·67	1·63	13·67	36·42	·35	·76	·62	
at East, Positive	14·70	39·75	2·45	2·55	·60	1·47	·63	1·61	16·17	38·95	·42	·75	·60	
at West, Negative	17·15	42·30	2·56	2·52	·60	1·54	·63	1·59	18·69	41·36	·39	·79	·63	
	19·71	44·82	2·59	2·64	·56	1·45	·65	1·72	21·16	43·89	·34	·82	·57	
Pen Equation	22·30	47·46	2·60	2·63	·56	1·46	·64	1·68	23·76	46·54	·30	·76	·58	
at East − 1s·710	24·90	50·09	2·60	2·61	·60	1·56	·64	1·67	26·46	49·14	·37	·76	·54	
at West − 1·310	27·50	52·70	2·65	2·60	·58	1·54	·66	1·72	29·04	51·76	·34	·74	·63	
	30·15	55·30							...	54·42	...	·73	·61	
Cable No. 2														
Mean	18 31 11 = t_E										0 49 36·346	0 49 35·763	·583	

TABLE VI. REDUCTION OF COMPARISONS OF CLOCKS.

Bombay (E) *and Aden* (W).

Astronomical Date	Conditions and Mean Results of each Exchange of Signals								Relative Hourly Clock Rate Correction R	Deduced Clock Differences D at Epochs by E Clock T_E
	Cable used	No. of Comparison	Letter of Exchange	Current used at East Station	Current used at West Station	Mean Time by E Clock t_E	Mean Clock Difference d	Mean Value of Retardation		
						h m s	h m s	s		
1877 April 30	No. 2	1	A	Positive	Positive	14 19 6	1 51 49·686	0·290		h m s
		„	B	Negative	Negative	24 14	49·688	·276		D = 1 51 49·740
		„	C	Positive	Positive	25 26	49·697	·287		T_E = 14 53 38
		„	D	Negative	Negative	26 42	49·697	·271		
					Mean ...	14 23 52	1 51 49·692	0·281	s + 0·0966 at 16h 6m 30s	D = 1 51 49·785
		2	A	Positive	Positive	17 47 16	1 51 50·037	0·276		T_E = 15 21 31
		„	B	Negative	Negative	48 27	50·026	·260		
		„	C	Positive	Positive	49 47	50·014	·272		
		„	D	Negative	Negative	51 0	50·013	·249		D = 1 51 49·861
					Mean ...	17 49 8	1 51 50·023	0·264		T_E = 16 8 36
May 1	No. 2	1	A	Positive	Positive	14 17 17	1 51 51·811	0·271		
		„	B	Negative	Negative	18 37	51·830	·267		
		„	C	Positive	Positive	19 47	51·802	·288		D = 1 51 51·917
		„	D	Negative	Negative	21 5	51·830	·268		T_E = 15 25 12
					Mean ...	14 19 12	1 51 51·818	0·274	s + 0·0903 at 15h 56m 14s	
		2	A	Positive	Positive	17 31 13	1 51 52·089	0·256		
		„	B	Negative	Negative	32 42	52·124	·270		
		„	C	Positive	Negative	33 53	52·115	·265		D = 1 51 51·944
		„	D	Negative	Negative	35 11	52·111	·265		T_E = 15 43 43
					Mean ...	17 33 15	1 51 52·110	0·264		
May 2	No. 2	2	A	Positive	Positive	17 34 8	1 51 54·173	0·268		D = 1 51 53·917
		„	B	Negative	Negative	35 25	54·153	·264		T_E = 14 51 27
		„	C	Positive	Positive	36 32	54·179	·274		D = 1 51 53·961
		„	D	Negative	Negative	37 46	54·148	·269	s + 0·0896*	T_E = 15 20 29
					Mean ...	17 35 58	1 51 54·163	0·269		D = 1 51 54·059 T_E = 16 26 39

* Interpolated by the values obtained on 1st and 3rd May.

Bombay (E) *and Aden* (W).

Astronomical Date	Conditions and Mean Results of each Exchange of Signals								Relative Hourly Clock Rate Correction R	Deduced Clock Differences D at Epochs by E Clock T_E
	Cable used	No. of Comparison	Letter of Exchange	Current used at East Station	Current used at West Station	Mean Time by E Clock t_E	Mean Clock Difference d	Mean Value of Retardation		
						h m s	h m s	s		h m s
1877 May 3	No. 2	1	A	Positive	Positive	14 16 51	1 51 55·931	0·294		
		"	B	Negative	Negative	18 2	55·930	·277		D = 1 51 56·988
		"	C	Positive	Positive	19 2	55·933	·290		T_E = 14 55 59
		"	D	Negative	Negative	20 7	55·940	·285		
					Mean ...	14 18 31	1 51 55·933	0·286	+ 0·0888 s at $15^h\ 55^m\ 30^s$	D = 1 51 56·027
		2	A	Positive	Positive	17 30 46	1 51 56·229	0·297		T_E = 15 21 50
		"	B	Negative	Negative	31 52	56·213	·282		
		"	C	Positive	Negative	32 50	56·223	·293		D = 1 51 56·073
		"	D	Negative	Positive	34 25	56·214	·286		T_E = 15 52 51
					Mean ...	17 32 28	1 51 56·220	0·290		
May 4	No. 2	1	A	Positive	Positive	14 19 23	1 51 58·065	0·296		
		"	B	Negative	Negative	20 34	58·069	·274		D = 1 51 58·109
		"	C	Positive	Negative	21 36	58·080	·287		T_E = 14 54 15
		"	D	Negative	Positive	22 48	58·038	·297		
					Mean ...	14 21 5	1 51 58·063	0·288	+ 0·0839 s at $15^h\ 57^m\ 42^s$	D = 1 51 58·147
		2	A	Positive	Positive	17 32 34	1 51 58·329	0·283		T_E = 15 21 29
		"	B	Negative	Negative	33 45	58·335	·277		
		"	C	Positive	Negative	34 51	58·335	·284		D = 1 51 58·203
		"	D	Negative	Positive	36 3	58·335	·286		T_E = 16 1 26
					Mean ...	17 34 18	1 51 58·333	0·283		
May 5	No. 2	1	A	Positive	Positive	14 15 31	1 51 60·131	0·279		
		"	B	Negative	Negative	16 45	60·130	·271		D = 1 52 0·195
		"	C	Positive	Negative	17 50	60·133	·280		T_E = 14 52 12
		"	D	Negative	Positive	19 3	60·153	·283		
					Mean ...	14 17 17	1 51 60·137	0·278	+ 0·0988 s at $15^h\ 54^m\ 55^s$	D = 1 52 0·244
		2	A	Positive	Positive	17 30 55	1 51 60·470	0·282		T_E = 15 22 23
		"	B	Negative	Negative	32 3	60·449	·284		
		"	C	Positive	Negative	33 2	60·460	·279		D = 1 52 0·315
		"	D	Negative	Positive	34 12	60·455	·289		T_E = 16 5 33
					Mean ...	17 32 33	1 51 60·459	0·283		

Bombay (E) *and Aden* (W).

Astronomical Date	Conditions and Mean Results of each Exchange of Signals								Relative Hourly Clock Rate Correction R	Deduced Clock Differences D at Epochs by E Clock T_E
	Cable used	No. of Comparison	Letter of Exchange	Current used at East Station	Current used at West Station	Mean Time by E Clock t_E	Mean Clock Difference d	Mean Value of Retardation		
						h m s	h m s	s		h m s
1877 May 7	No. 2	1	A	Positive	Positive	14 26 49	1 51 64·384	0·299		
		„	B	Negative	Negative	27 59	64·399	·275		D = 1 52 4·407
		„	C	Positive	Negative	29 5	64·338	·283		
		„	D	Negative	Positive	30 16	64·370	·274		T_E = 14 51 59
					Mean ...	14 28 32	1 51 64·373	0·283	s + 0·0860 at 16h 1m 59s	D = 1 52 4·450
		2	A	Positive	Positive	17 33 48	1 51 64·662	0·291		T_E = 15 21 54
		„	B	Negative	Negative	34 53	64·679	·269		
		„	C	Positive	Negative	35 58	64·602	·271		D = 1 52 4·495
		„	D	Negative	Positive	37 0	64·620	·270		T_E = 15 53 25
					Mean ...	17 35 25	1 51 64·641	0·275		
May 8	No. 2	1	A	Positive	Positive	14 27 12	1 52 6·343	0·315		
		„	B	Negative	Negative	28 18	6·294	·287		
		„	C	Positive	Negative	29 32	6·310	·297		D = 1 52 6·348
		„	D	Negative	Positive	30 44	6·322	·306		T_E = 14 53 3
					Mean ...	14 28 57	1 52 6·317	0·301	s + 0·0761 at 16h 2m 24s	D = 1 52 6·382
		2	A	Positive	Positive	17 34 22	1 52 6·562	0·293		T_E = 15 20 15
		„	B	Negative	Negative	35 16	6·576	·288		
		„	C	Positive	Negative	36 22	6·511	·299		D = 1 52 6·415
		„	D	Negative	Positive	37 20	6·567	·292		T_E = 15 46 4
					Mean ...	17 35 50	1 52 6·554	0·293		
May 9	No. 2	1	A	Positive	Positive	14 26 4	1 52 8·093	0·278		
		„	B	Negative	Negative	27 7	8·105	·287		D = 1 52 8·129
		„	C	Positive	Negative	28 19	8·076	·271		
		„	D	Negative	Positive	33 26	8·115	·295		T_E = 14 54 40
					Mean ...	14 28 44	1 52 8·097	0·283	s + 0·0744 at 16h 1m 4s	D = 1 52 8·163
		2	A	Positive	Positive	17 31 41	1 52 8·334	0·286		T_E = 15 21 32
		„	B	Negative	Negative	32 45	8·322	·265		
		„	C	Positive	Negative	33 57	8·320	·269		D = 1 52 8·203
		„	D	Negative	Positive	35 9	8·328	·268		T_E = 15 54 37
					Mean ...	17 33 23	1 52 8·326	0·272		

Aden (E) *and Suez* (W).

Astronomical Date	Conditions and Mean Results of each Exchange of Signals								Relative Hourly Clock Rate Correction R	Deduced Clock Differences D at Epochs by E Clock T_E
	Cable used	No. of Comparison	Letter of Exchange	Current used at East Station	Current used at West Station	Mean Time by E Clock t_E	Mean Clock Difference d	Mean Value of Retardation		
1877 May 25	No. 1	1	A	Negative	Negative	h m s 16 33 42	h m s 0 49 38·346	s 0·297		
		„	B	Positive	Positive	35 11	38·308	·293		h m s D = 0 49 38·320
		„	C	Negative	Positive	36 38	38·359	·287		T_E = 16 42 5
		„	D	Positive	Negative	37 46	38·288	·285		
					Mean	16 35 49	0 49 38·325	0·291	s − 0·0510 at 17h 35m 35s	D = 0 49 38·321
		2	A	Negative	Negative	18 33 9	0 49 38·222	0·293		T_E = 16 41 4
		„	B	Positive	Positive	34 37	38·235	·300		
		„	C	Negative	Positive	35 51	38·213	·295		D = 0 49 38·238
		„	D	Positive	Negative	37 43	38·224	·297		T_E = 18 18 45
					Mean	18 35 20	0 49 38·224	0·296		
May 26	No. 1	1	A	Negative	Negative	16 50 35	0 49 37·488	0·298		
		„	B	Positive	Positive	35 23	37·476	·306		D = 0 49 37·480
		„	C	Negative	Positive	37 45	37·485	·306		T_E = 16 46 26
		„	D	Positive	Positive	39 20	37·485	·323		
					Mean	16 40 46	0 49 37·483	0·308	s − 0·0395 at 17h 35m 6s	D = 0 49 37·484
		2	A	Negative	Negative	18 27 15	0 49 37·439	0·318		T_E = 16 40 11
		„	B	Positive	Positive	28 58	37·401	·309		
		„	C	Negative	Positive	30 3	37·418	·270		D = 0 49 37·419
		„	D	Positive	Negative	31 22	37·388	·289		T_E = 18 18 33
					Mean	18 29 25	0 49 37·412	0·297		
May 27	No. 1	1	A	Negative	Negative	16 38 20	0 49 36·837	0·283		
		„	B	Positive	Positive	39 46	36·816	·318		D = 0 49 36·822
		„	C	Negative	Positive	41 29	36·849	·296		T_E = 16 46 30
		„	D	Positive	Negative	43 12	36·809	·322		
					Mean	16 40 42	0 49 36·828	0·305	s − 0·0601 at 17h 36m 37s	D = 0 49 36·828
		2	A	Negative	Negative	18 30 14	0 49 36·726	0·291		T_E = 16 41 6
		„	B	Positive	Positive	31 49	36·712	·306		
		„	C	Negative	Positive	33 20	36·717	·278		D = 0 49 36·732
		„	D	Positive	Negative	34 46	36·710	·309		T_E = 18 16 28
					Mean	18 32 32	0 49 36·716	0·296		

Aden (E) *and Suez* (W).

Astronomical Date	Conditions and Mean Results of each Exchange of Signals: Cable used	No. of Comparison	Letter of Exchange	Current used at: East Station	Current used at: West Station	Mean Time by E Clock t_E	Mean Clock Difference d	Mean Value of Retardation	Relative Hourly Clock Rate Correction R	Deduced Clock Differences D at Epochs by E Clock T_E
						h m s	h m s	s		
1877 May 28	No. 1	1	A	Negative	Negative	16 33 52	0 49 36·275	0·279		h m s
		"	B	Positive	Positive	35 22	36·257	·302		D = 0 49 36·249
		"	C	Negative	Positive	36 43	36·259	·267		T_E = 16 54 48
		"	D	Positive	Negative	38 11	36·265	·291		
					Mean	16 36 2	0 49 36·264	0·284	s − 0·0468 at $17^h\ 38^m\ 10^s$	D = 0 49 36·256
	No. 2	2	A	Negative	Negative	18 38 26	0 49 36·184	0·271		T_E = 16 46 0
		"	B	Positive	Positive	39 41	36·166	·261		
		"	C	Negative	Positive	40 50	36·172	·248		D = 0 49 36·191
		"	D	Positive	Negative	42 10	36·147	·269		T_E = 18 9 58
					Mean	18 40 17	0 49 36·167	0·262		
May 29	No. 2	1	A	Negative	Negative	16 36 50	0 49 35·902	0·265		
		"	B	Positive	Positive	38 8	35·889	·273		D = 0 49 35·891
		"	C	Negative	Positive	39 21	35·891	·261		T_E = 16 46 32
		"	D	Positive	Negative	40 51	35·895	·290		
					Mean	16 38 48	0 49 35·894	0·272	s − 0·0248 at $17^h\ 35^m\ 2^s$	D = 0 49 35·893
		2	A	Negative	Negative	18 29 18	0 49 35·860	0·271		T_E = 16 41 9
		"	B	Positive	Positive	30 38	35·849	·265		
		"	C	Negative	Positive	31 52	35·863	·246		D = 0 49 35·853
		"	D	Positive	Negative	33 12	35·818	·262		T_E = 18 16 58
					Mean	18 31 15	0 49 35·847	0·261		
May 30	No. 2	1	A	Negative	Negative	16 33 48	0 49 35·677	0·265		
		"	B	Positive	Positive	35 4	35·692	·266		D = 0 49 35·687
		"	C	Negative	Positive	36 17	35·700	·258		T_E = 16 56 54
		"	D	Positive	Negative	37 39	35·703	·269		
					Mean	16 35 42	0 49 35·693	0·265	s − 0·0169 at $17^h\ 32^m\ 30^s$	D = 0 49 35·689
		2	A	Negative	Negative	18 27 26	0 49 35·664	0·277		T_E = 16 51 5
		"	B	Positive	Positive	28 42	35·661	·266		
		"	C	Negative	Positive	29 54	35·664	·274		D = 0 49 35·664
		"	D	Positive	Negative	31 11	35·655	·292		T_E = 18 18 52
					Mean	18 29 18	0 49 35·661	0·277		

Of Captains Campbell and Heaviside.

Bombay-Aden.				Aden-Suez.					
Heaviside at Bombay		Campbell at Aden		Heaviside at Aden				Campbell at Suez	
Star's Name or B.A.C. No.	Equation N − S	Star's Name or B.A.C. No.	Equation N − S	Star's Name or B.A.C. No.	Equation N − S	Star's Name or B.A.C. No.	Equation N − S	Star's Name or B.A.C. No.	Equation N − S
	s		s		s		s		s
4905	+ 0·031	4440*	+ 0·027	20 Herculis γ	+ 0·039	72 Ophiuchi	+ 0·041	5061*	+ 0·012
	+ ·020		+ ·076		− ·012		− ·016		+ ·075
	+ ·018		+ ·137		− ·011		+ ·002		+ ·056
	− ·041		+ ·069		− ·034		+ ·112		+ ·076
	+ ·014		+ ·067		− ·023		+ ·024		+ ·047
	+ ·019		+ ·086	5490	+ ·053	60 Ophiuchi β	+ ·027	5473*	+ ·014
	− ·058		+ ·160		+ ·060	5674	+ ·005		+ ·097
	− ·025		+ ·065		+ ·019		+ ·033		+ ·052
	+ ·069		+ ·095		+ ·013	General Mean	+ 0·022		+ ·111
5048	+ ·029	4504*	+ ·031		+ ·013		± 0·003		+ ·030
	+ ·006		+ ·069		+ ·014				+ ·068
	+ ·094		+ ·117	27 Ophiuchi κ	− ·016			5541*	+ ·026
	− ·019		+ ·061		+ ·026				+ ·031
	− ·086		+ ·066		+ ·064				+ ·088
	− ·017		− ·028		+ ·090				+ ·110
	− ·022		+ ·052		+ ·045				+ ·020
	− ·057	4853*	+ ·120	5765	+ ·065				+ ·028
	− ·002		+ ·102		+ ·018			5652*	− ·016
5126	− ·016		+ ·100		+ ·004				+ ·031
	− ·021		+ ·092		+ ·007				+ ·029
	+ ·049		+ ·046		+ ·013				+ ·142
	− ·047		+ ·080	64 Herculis α^1	− ·013				+ ·093
	− ·010	4724*	+ ·155		− ·001			5927*	− ·112
	+ ·002		+ ·084		+ ·058				+ ·051
4933	+ ·002		+ ·094		+ ·066				+ ·120
	+ ·034		+ ·083		+ ·046				+ ·093
	+ ·006		+ ·038		+ ·045				+ ·127
	+ ·092	5067	+ ·044	55 Ophiuchi α	+ ·011				+ ·069
	+ ·066		+ ·106		+ ·020			5962*	+ ·061
	− ·014		+ ·059		+ ·031				+ ·089
	+ ·057		+ ·064		+ ·030				+ ·083
	− ·007		+ ·108		+ ·023				+ ·081
49 Herculis	+ ·115		+ ·100	13 Aquilæ ε	+ ·002				+ ·013
	− ·047	5135	− ·017		− ·074				+ ·090
	− ·006		+ ·035		+ ·053			General Mean	+ 0·058
	− ·013		+ ·053		− ·014				± 0·006
	+ ·011		+ ·029		+ ·012				
	+ ·013		+ ·104		+ ·033				
16 Bootis α	− ·032		+ ·076	17 Aquilæ ζ	− ·028				
	+ ·043	5150	+ ·100		+ ·073				
General Mean	+ 0·006		+ ·113		+ ·044				
	± 0·005		+ ·073		+ ·024				
			+ ·091		+ ·036				
			+ ·031	49 Ophiuchi σ	+ ·047				
			+ ·056		+ ·012				
			+ ·035		+ ·055				
		General Mean	+ 0·074		− ·022				
			± 0·004						

* These stars were observed for the determination of this equation only, and are not otherwise used.

Note.—The symbol, N − S, signifies a quantity which must be added to the times observed for Stars of South Aspect, before they can be compared with those for Stars of North Aspect, by the same Observer.

The values of the Relative Personal Equations, $C_N - H_N$, and $C_S - H_S$, adopted for the reduction of the observations between Bombay, Aden, and Suez are those obtained by observations at Bombay in April 1877—*vide* Part I, page 56, *viz.*, $C_N - H_N = +\,0^s{\cdot}030$, and $C_S - H_S = -\,0^s{\cdot}026$.

The general symbol, C − H, signifies a quantity which must be added to times observed by Captain Heaviside, before they are compared with those observed by Captain Campbell.

Of the Corrected difference of observed times, M_N.

BOMBAY (E), *Lat. 18° 54′, Long. 4h 51m*: AND ADEN (W), *Lat. 12° 46′, Long. 3h 0m*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_B = +0^s{\cdot}074$, $H_N - H_B = +0{\cdot}006$	M_N
1877		° ′			h m s	s	s			h m s	s	s	s				
Apl. 30	4895	−15 32	S	*I. P. E.*	14 44 11·89	+1·36	13·25	S	*I. P. E.*	14 43 41·90	+1·53	43·43	− 29·82				
	4895½*	−15 32	S	d; c − 1·3	44 23·32	+1·36	24·68	S	d; c − 1·9	43 53·32	+1·53	54·85	29·83				
	4905	+19 37	N	b + 3·0; a −43·2	46 1·30	+1·95	3·25	N	b + 3·6; a + 3·1	45 31·88	+1·49	33·37	29·88				
	4917	+46 59	N	s; Q + 1·90	48 1·33	+2·62	3·95	N	s; Q + 1·46	47 32·57	+1·43	34·00	29·95				
	4926	+14 57	S		50 43·31	+1·87	45·18	N		50 13·78	+1·50	15·28	29·90				
	4933	+16 53	N		51 45·89	+1·90	47·79	N		51 16·43	+1·49	17·92	29·87				
	4939	− 8 2	S		54 42·79	+1·49	44·28	S		54 12·83	+1·51	14·34	29·94	s −29·900	+ 0·118	+ 0·021	− 29·761
	4945	− 7 5	S		55 54·48	+1·51	55·99	S		55 24·57	+1·52	26·09	29·90				
	4953	+25 30	N		57 1·48	+2·07	3·55	N		56 32·15	+1·47	33·62	29·93				
	4962	+27 34	N		58 50·03	+2·10	52·13	N		58 20·75	+1·48	22·23	29·90				
	4969	+27 26	N		59 28·76	+2·11	30·87	N		58 59·48	+1·48	60·96	29·91				
	4981	+25 21	N		15 2 12·21	+2·07	14·28	N		15 1 42·87	+1·48	44·35	29·93				
	4993	+25 35	N		3 32·33	+2·07	34·40	N		3 2·98	+1·48	4·46	29·94				
				Mean, T_E	14 53 38												
Apl. 30	5036	+33 46	N	*I. P. E.*	15 10 54·66	−1·56	53·10	N	*I. P. E.*	15 10 24·56	−1·44	23·12	− 29·98				
	5048	+21 2	N	d; c − 1·3	13 15·75	−1·82	13·93	N	d; c − 1·9	12 45·41	−1·42	43·99	29·94				
	5061	+30 4	N	b + 3·0; a −43·2	15 25·25	−1·64	23·61	N	b + 3·6; a + 3·1	14 55·08	−1·44	53·64	29·97				
	5067	+13 1	S	s; Q − 1·90	16 55·90	−1·96	53·94	S	s; Q − 1·46	16 25·38	−1·42	23·96	29·98				
	5075	+30 44	N		18 29·42	−1·62	27·80	N		17 59·21	−1·44	57·77	30·03				
	5085	+15 52	S		20 27·27	−1·92	25·35	N		19 56·78	−1·42	55·36	29·99				
	5092	+47 30	N		21 30·62	−1·17	29·45	N		20 60·86	−1·48	59·38	30·07	s −30·005	+ 0·118	+ 0·020	− 29·867
	5098	+29 32	N		23 7·50	−1·65	5·85	N		22 37·24	−1·44	35·80	30·05				
	5104	−19 45	S		24 61·68	−2·52	59·16	S		24 30·58	−1·39	29·19	29·97				
	5120	+16 29	N		26 51·80	−1·91	49·89	N		26 21·30	−1·42	19·88	30·01				
	5126	+16 26	S		27 46·57	−1·90	44·67	N		27 16·09	−1·42	14·67	30·00				
	5135	+10 57	S		29 17·80	−2·00	15·80	S		28 47·18	−1·41	45·77	30·03				
	5150	+10 25	S		30 57·19	−2·01	55·18	S		30 26·54	−1·41	25·13	30·05				
				Mean, T_E	15 21 31												

NOTE. $1^d = 0^s{\cdot}0225$. * This star does not occur in the B.A.C.

Of the Corrected Difference of Observed Times, M_N.

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4^h 51^m: AND ADEN (W), *Lat.* 12° 46′, *Long.* 3^h 0^m.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.074$, $H_N - H_S = +0.006$	M_N
1877		° ′			h m s	s	s			h m s	s	s	s	s	s	s	s
May 1	5085	+15 52	S	*I. P. W.*	15 20 28·00	−1·90	26·10	N	*I. P. W.*	15 19 52·67	+1·37	54·04	−32·06				
	5092	+47 30	N	d: c + 1·0	21 31·75	−1·56	30·19	N	d: c − 1·0	20 56·55	+1·55	58·10	32·09				
	5098	+29 32	N	b + 0·4, a −18·7	23 8·37	−1·77	6·60	N	b − 2·8, a −11·0	22 33·01	+1·44	34·45	32·15	−32·105	+0·111	+0·021	−31·973
	5109	−19 15	S	s: Q −1·90	25 56·04	−2·14	53·90	S	s: Q +1·45	25 20·53	+1·23	21·76	32·14				
	5135	+10 57	S		29 18·38	−1·93	16·45	N		28 43·08	+1·36	44·44	32·01				
	5150	+10 25	S		30 57·78	−1·93	55·85	S		30 22·32	+1·35	23·67	32·18				
				Mean, T_E	15 25 12												
May 2	4890	−13 38	S	*I. P. W.*	14 42 54·45	+1·63	56·08	S	*I. P. W.*	14 42 20·89	+1·33	22·22	−33·86				
	4895½*	−15 32	S	d: c + 1·0	44 24·39	+1·62	26·01	S	d: c − 1·0	43 50·74	+1·32	52·06	33·95				
	4905	+19 37	N	b − 0·2, a −23·0	46 2·71	+1·92	4·63	N	b − 0·2, a − 6·5	45 29·16	+1·41	30·57	34·06				
	4926	+14 57	S	s: Q +1·90	50 44·62	+1·88	46·50	N	s: Q +1·43	50 11·09	+1·40	12·49	34·01	−34·004	+0·111	+0·016	−33·877
	4933	+16 53	N		51 47·28	+1·90	49·18	N		51 13·74	+1·41	15·15	34·03				
	4953	+25 30	N		57 2·92	+1·99	4·91	N		56 29·43	+1·44	30·87	34·04				
	4962	+27 34	N		58 51·48	+2·01	53·49	N		58 18·06	+1·44	19·50	33·99				
	4969	+27 26	N		59 30·22	+2·01	32·23	N		58 56·70	+1·44	58·14	34·09				
				Mean, T_E	14 51 27												
May 2	5036	+33 46	N	*I. P. W.*	15 10 56·11	−1·71	54·40	N	*I. P. W.*	15 10 21·70	−1·39	20·31	−34·09				
	5048	+21 2	N	d: c + 1·0	13 17·15	−1·86	15·29	N	d: c − 1·0	12 42·63	−1·43	41·20	34·09				
	5061	+30 4	N	b − 0·2, a −23·0	15 26·79	−1·76	25·03	N	b − 0·2, a − 6·5	14 52·27	−1·40	50·87	34·16	−34·132	+0·111	+0·023	−33·998
	5098	+29 32	N	s: Q −1·90	23 8·95	−1·77	7·18	N	s: Q −1·43	22 34·41	−1·41	33·00	34·18				
	5135	+10 57	S		29 19·07	−1·96	17·11	S		28 44·49	−1·46	43·03	34·08				
	5150	+10 25	S		30 58·50	−1·96	56·54	S		30 23·81	−1·46	22·35	34·19				
				Mean, T_E	15 20 29												

NOTE. $1^d = 0^s.0225$. * This star does not occur in the B. A. C.

Of the Corrected Difference of Observed Times, M_N.

BOMBAY (E), *Lat. 18° 54′, Long. 4h 51m*: AND ADEN (W), *Lat. 12° 46′, Long. 3h 0m*.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference of Corrected Times (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s{\cdot}074$, $H_N - H_S = +0{\cdot}006$	M_N
1877		° ′			h m s	s	s			h m s	s	s	s				
May 3	4905	+ 19 37	N	*I. P. W.*	14 46 3·42	+ 1·92	5·34	N	*I. P. W.*	14 45 27·79	+ 1·46	29·25	− 36·09				
	4926	+ 14 57	S	(d) c + 1·0	50 45·42	+ 1·87	47·29	N	(d) c − 1·0	50 9·67	+ 1·44	11·11	36·18				
	4933	+ 16 53	N	b + 0·2; a − 26·7	51 48·05	+ 1·90	49·95	N	b 0·0; a − 8·0	51 12·27	+ 1·45	13·72	36·23				
	4939	− 8 2	S	(s) Q + 1·89	54 44·73	+ 1·64	46·37	S	(s) Q + 1·46	54 8·78	+ 1·38	10·16	36·21	s − 36·170	+ 0·109	+ 0·008	− 36·053
	4962	+ 27 34	N		58 52·19	+ 2·02	54·21	N		58 16·54	+ 1·48	18·02	36·19				
	4969	+ 27 26	N		59 30·94	+ 2·02	32·96	N		58 55·32	+ 1·48	56·80	36·16				
	4981	+ 25 21	N		15 2 14·42	+ 1·99	16·41	N		15 1 38·74	+ 1·47	40·21	36·20				
	4993	+ 25 35	N		3 34·48	+ 2·00	36·48	N		2 58·90	+ 1·48	60·38	36·10				
				Mean, T_E	14 55 59												
May 3	5048	+ 21 2	N	*I. P. W.*	15 13 17·81	− 1·83	15·98	N	*I. P. W.*	15 12 41·35	− 1·46	39·89	− 36·09				
	5098	+ 29 32	N	(d) c + 1·0	23 9·61	− 1·73	7·88	N	(d) c − 1·0	22 33·12	− 1·43	31·69	36·19	s − 36·163	+ 0·109	+ 0·034	− 36·020
	5104	− 19 45	S	b + 0·2; a − 26·7	25 3·46	− 2·25	1·21	S	b 0·0; a − 8·0	24 26·61	− 1·59	25·02	36·19				
	5109	− 19 15	S	(s) Q − 1·89	25 57·48	− 2·25	55·23	S	(s) Q − 1·46	25 20·64	− 1·59	19·05	36·18				
				Mean, T_E	15 21 50												
May 4	4895	− 15 32	S	*I. P. W.*	14 44 25·99	+ 1·58	27·57	S	*I. P. W.*	14 43 47·92	+ 1·41	49·33	− 38·24				
	4905	+ 19 37	N	(d) c + 1·0	46 4·19	+ 1·96	6·15	N	(d) c − 1·0	45 26·33	+ 1·45	27·78	38·37				
	4917	+ 46 59	N	b + 1·4; a − 27·6	48 4·50	+ 2·40	6·90	N	b + 0·5; a − 3·2	47 26·92	+ 1·50	28·42	38·48				
	4926	+ 14 57	S	(s) Q + 1·89	50 46·18	+ 1·90	48·08	N	(s) Q + 1·45	50 8·26	+ 1·44	9·70	38·38				
	4933	+ 16 53	N		51 48·79	+ 1·93	50·72	N		51 10·91	+ 1·44	12·35	38·37				
	4939	− 8 2	S		54 45·45	+ 1·66	47·11	S		54 7·37	+ 1·42	8·79	38·32	s − 38·350	+ 0·104	+ 0·023	− 38·223
	4945	− 7 5	S		55 57·16	+ 1·67	58·83	S		55 19·09	+ 1·42	20·51	38·32				
	4946	− 7 21	S		56 18·30	+ 1·67	19·97	S		55 40·20	+ 1·42	41·62	38·35				
	4953	+ 25 30	N		57 4·37	+ 2·03	6·40	N		56 26·64	+ 1·46	28·10	38·30				
	4969	+ 27 26	N		59 31·68	+ 2·06	33·74	N		58 53·95	+ 1·46	55·41	38·33				
	4981	+ 25 21	N		15 2 15·14	+ 2·03	17·17	N		15 1 37·31	+ 1·46	38·77	38·40				
	4993	+ 25 35	N		3 35·19	+ 2·03	37·22	N		2 57·42	+ 1·46	58·88	38·34				
				Mean, T_E	14 54 15												

NOTE $1^d = 0^s{\cdot}0225$.

TABLE VIII. OBSERVATIONS OF TRANSITS WITH LOCAL CLOCKS, AND DEDUCTION

Of the Corrected Difference of Observed Times, M_N.

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m: AND ADEN (W), *Lat.* 12° 46′, *Long.* 3h 0m.

Astronomical Date	Star		Transits Observed at E — By Heaviside, with Telescope No. 1					Transits Observed at W — By Campbell, with Telescope No. 2					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $O_N - O_S = +0^s{\cdot}074$, $H_N - H_S = +0{\cdot}006$	M_N
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	s				
May 4	5036	+33 46	N	*I. P. W.*	15 10 57·53	−1·64	55·89	N	*I. P. W.*	15 10 18·97	−1·43	17·54	− 38·35				
	5048	+21 2	N	d c + 1·0	13 18·52	−1·81	16·71	N	d c −1·0	12 39·88	−1·46	38·42	38·29				
	5061	+30 4	N	b + 1·4 a −27·6	15 28·14	−1·70	26·44	N	b +0·5 a −3·2	14 49·59	−1·45	48·14	38·30				
	5067	+13 1	S	s Q − 1·89	16 58·73	−1·91	56·82	S	s Q −1·45	16 19·87	−1·46	18·41	38·41				
	5075	+30 44	N		18 32·28	−1·68	30·60	N		17 53·66	−1·44	52·22	38·38				
	5085	+15 52	S		20 30·04	−1·87	28·17	N		19 51·30	−1·46	49·84	38·33				
	5098	+29 32	N		23 10·33	−1·71	8·62	N		22 31·72	−1·44	30·28	38·34	s − 38·342	+ 0·104	+ 0·028	− 38·210
	5104	−19 45	S		25 4·24	−2·25	1·99	S		24 25·20	−1·51	23·69	38·30				
	5109	−19 15	S		25 58·19	−2·25	55·94	S		25 19·10	−1·51	17·59	38·35				
	5126	+16 26	N		27 49·37	−1·87	47·50	N		27 10·64	−1·46	9·18	38·32				
	5135	+10 57	S		29 20·51	−1·92	18·59	S		28 41·71	−1·46	40·25	38·34				
	5150	+10 25	S		30 59·92	−1·93	57·99	S		30 21·07	−1·47	19·60	38·39				
				Mean, T_E	15 21 29												
May 5	4886	+ 2 33	S	*I. P. E.*	14 41 34·22	+1·65	35·87	S	*I. P. W.*	14 40 54·08	+1·47	55·55	− 40·32				
	4890	−13 38	S	d c − 1·1	42 56·90	+1·46	58·36	S	d c −1·0	42 16·57	+1·45	18·02	40·34				
	4895	−15 32	S	b − 0·1 a −32·4	44 26·84	+1·43	28·27	S	b +2·5 a −2·5	43 46·50	+1·45	47·95	40·32				
	4905	+19 37	N	s Q + 1·89	46 4·91	+1·87	6·78	N	s Q +1·45	45 24·92	+1·50	26·42	40·36				
	4917	+46 59	N		48 5·20	+2·35	7·55	N		47 25·56	+1·53	27·09	40·46				
	4926	+14 57	S		50 46·87	+1·81	48·68	N		50 6·91	+1·49	8·40	40·28				
	4933	+16 53	N		51 49·50	+1·83	51·33	N		51 9·53	+1·48	11·01	40·32	s − 40·365	+ 0·118	+ 0·031	− 40·216
	4939	− 8 2	S		54 46·31	+1·52	47·83	S		54 5·98	+1·46	7·44	40·39				
	4945	− 7 5	S		55 58·00	+1·54	59·54	S		55 17·72	+1·46	19·18	40·36				
	4946	− 7 21	S		56 19·18	+1·53	20·71	S		55 38·90	+1·46	40·36	40·35				
	4969	+27 26	N		59 32·46	+1·97	34·43	N		58 52·51	+1·50	54·01	40·42				
	4981	+25 21	N		15 2 15·90	+1·95	17·85	N		15 1 35·95	+1·50	37·45	40·40				
	4993	+25 35	N		3 35·99	+1·95	37·94	N		2 56·03	+1·49	57·52	40·42				
				Mean, T_E	14 52 12												

NOTE. $1^d = 0^s{\cdot}0225$.

TABLE VIII. OBSERVATIONS OF TRANSITS WITH LOCAL CLOCKS, AND DEDUCTION

Of the Corrected Difference of Observed Times, M_N.

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m: AND ADEN (W), *Lat.* 12° 46′, *Long.* 3h 0m.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_B = +0^s.074$, $H_N - H_B = +0.006$	M_N
1877		° ′			h m s	s	s			h m s	s	s	s				
May 5	5036	+33 46	N	*I. P. E.*	15 10 58·27	−1·69	56·58	N	*I. P. W.*	15 10 17·57	−1·39	16·18	− 40·40				
	5048	+21 2	N	d c − 1·1	13 19·28	−1·89	17·39	N	d c − 1·0	12 38·43	−1·40	37·03	40·36				
	5067	+13 1	S	b − 0·1 a − 32·4	16 59·50	−1·99	57·51	S	b + 2·5 a − 2·5	16 18·44	−1·41	17·03	40·48				
	5075	+30 44	N	s Q − 1·89	18 33·01	−1·74	31·27	N	s Q − 1·45	17 52 24	−1·39	50·85	40·42				
	5085	+15 52	S		20 30·82	−1·96	28·86	N		19 49·87	−1·41	48·46	40·40				
	5092	+47 30	N		21 34·34	−1·40	32·94	N		20 53·88	−1·37	52·51	40·43				
	5098	+29 32	N		23 11·11	−1·76	9·35	N		22 30·25	−1·39	28·86	40·49	s − 40·414	+ 0·118	+ 0·025	− 40·271
	5104	−19 45	S		25 5·08	−2·39	2·69	S		24 23·77	−1·45	22·32	40·37				
	5109	−19 15	S		25 59·06	−2·39	56·67	S		25 17·73	−1·45	16·28	40·39				
	5120	+16 29	N		26 55·30	−1·95	53·35	N		26 14·39	−1·41	12·98	40·37				
	5126	+16 26	N		27 50·09	−1·95	48·14	N		27 9·22	−1·42	7·80	40·34				
	5135	+10 57	S		29 21·33	−2·02	19·31	S		28 40·26	−1·42	38·84	40·47				
	5150	+10 25	S		30 60·70	−2·02	58·68	S		30 19·63	−1·41	18·22	40·46				
				Mean, T_E	15 22 23												
May 7	4886	+ 2 33	S	*I. P. E.*	14 41 35·60	+1·56	37·16	S	*I. P. E.*	14 40 51·23	+1·57	52·80	− 44·36				
	4890	−13 38	S	d c − 1·1	42 58·39	+1·26	59·65	S	d c − 1·9	42 13·70	+1·56	15·26	44·39				
	4895	−15 32	S	b − 0·5 a −47·9	44 16·94	+1·23	18·17	S	b + 6·7 a − 0·3	43 32·20	+1·56	33·76	44·41				
	4895½*	−15 32	S	s Q + 1·90	44 28·34	+1·23	29·57	S	s Q + 1·47	43 43·69	+1·56	45·25	44·32				
	4905	+19 37	N		46 6·28	+1·87	8·15	N		45 22·22	+1·58	23·80	44·35				
	4926	+14 57	S		50 48·26	+1·79	50·05	N		50 4·15	+1·57	5·72	44·33				
	4933	+16 53	N		51 50·88	+1·82	52·70	N		51 6·85	+1·57	8·42	44·28	s − 44·373	+ 0·104	+ 0·031	− 44·238
	4939	− 8 2	S		54 47·81	+1·37	49·18	S		54 3·24	+1·56	4·80	44·38				
	4945	− 7 5	S		55 59·51	+1·39	60·90	S		55 14·97	+1·57	16·54	44·36				
	4953	+25 30	N		57 6·50	+2·00	8·50	N		56 22·52	+1·58	24·10	44·40				
	4969	+27 26	N		59 33·76	+2·04	35·80	N		58 49·80	+1·58	51·38	44·42				
	4981	+25 21	N		15 2 17·18	+1·99	19·17	N		15 1 33·19	+1·58	34·77	44·40				
	4993	+25 35	N		3 37·29	+2·00	39·29	N		2 53·26	+1·58	54·84	44·45				
				Mean, T_E	14 51 59												

NOTE. 1d = 0s·0225. * This star does not occur in the B. A. C.

Of the Corrected Difference of Observed Times, M_N.

BOMBAY (E), *Lat.* 18° 54′, *Long.* 4h 51m: AND ADEN (W), *Lat.* 12° 46′, *Long.* 3h 0m.

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No. 1*					Transits Observed at W — *By Campbell, with Telescope No. 2*					Difference of Corrected Times (W−E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s{\cdot}074$, $H_N - H_S = +0{\cdot}006$	M_N
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	s				
May 7	5036	+33 46	N	I. P. E.	15 10 59·55	−1·60	57·95	N	I. P. E.	15 10 14·85	−1·34	13·51	−44·44				
	5048	+21 2	N	d	13 20·64	−1·90	18·74	N	d	12 35·74	−1·35	34·39	44·35				
	5061	+30 4	N	c − 1·1	15 30·18	−1·70	28·48	N	c − 1·9	14 45·42	−1·35	44·07	44·41				
	5067	+13 1	S	b − 0·5	16 60·89	−2·05	58·84	S	b + 6·7	16 15·72	−1·35	14·37	44·47				
	5075	+30 44	N	a −47·9	18 34·33	−1·68	32·65	N	a − 0·3	17 49·53	−1·35	48·18	44·47				
	5085	+15 52	S	s	20 32·20	−2·00	30·20	N	s	19 47·18	−1·35	45·83	44·37				
	5092	+47 30	N	Q −1·90	21 35·55	−1·18	34·37	N	Q −1·47	20 51·19	−1·34	49·85	44·52	s −44·417	+0·104	+0·023	−44·290
	5098	+29 32	N		23 12·43	−1·71	10·72	N		22 27·57	−1·35	26·22	44·50				
	5104	−19 45	S		25 6·65	−2·65	4·00	S		24 21·03	−1·38	19·65	44·35				
	5109	−19 15	S		25 60·62	−2·63	57·99	S		25 14·95	−1·38	13·57	44·42				
	5120	+16 29	N		26 56·71	−1·98	54·73	N		26 11·70	−1·35	10·35	44·38				
	5126	+16 26	N		27 51·51	−1·98	49·53	N		27 6·55	−1·35	5·20	44·33				
	5135	+10 57	S		29 22·71	−2·09	20·62	S		28 37·53	−1·35	36·18	44·44				
	5150	+10 25	S		31 2·12	−2·10	0·02	S		30 16·98	−1·35	15·63	44·39				
				Mean, T_E	15 21 54												
May 8	4890	−13 38	S	I. P. W.	14 42 58·75	+1·61	60·36	S	I. P. E.	14 42 12·58	+1·37	13·95	−46·41				
	4895	−15 32	S	d	44 17·27	+1·59	18·86	S	d	43 31·14	+1·36	32·50	46·36				
	4895½*	−15 32	S	c − 1·4	44 28·69	+1·59	30·28	S	c − 1·9	43 42·53	+1·37	43·90	46·38				
	4905	+19 37	S	b + 2·6	46 6·88	+1·93	8·81	N	b − 1·2	45 21·13	+1·36	22·49	46·32				
	4917	+46 59	N	a −24·1	48 7·28	+2·30	9·58	N	a + 0·4	47 21·75	+1·33	23·08	46·50				
	4926	+14 57	S	s	50 48·83	+1·88	50·71	N	s	50 2·99	+1·36	4·35	46·36	s −46·415	+0·098	+0·025	−46·292
	4939	− 8 2	S	Q +1·89	54 48·20	+1·66	49·86	S	Q +1·43	54 2·08	+1·37	3·45	46·41				
	4945	− 7 5	S		55 59·92	+1·67	61·59	S		55 13·78	+1·37	15·15	46·44				
	4953	+25 30	N		57 7·14	+1·99	9·13	N		56 21·36	+1·36	22·72	46·41				
	4962	+27 34	N		58 55·69	+2·01	57·70	N		58 9·93	+1·35	11·28	46·42				
	4969	+27 26	N		59 34·47	+2·01	36·48	N		58 48·65	+1·35	50·00	46·48				
	4981	+25 21	N		15 2 17·87	+1·99	19·86	N		15 1 32·08	+1·36	33·44	46·42				
	4993	+25 35	N		3 37·99	+1·99	39·98	N		2 52·14	+1·35	53·49	46·49				
				Mean, T_E	14 53 3												

NOTE. $1^d = 0^s{\cdot}0225$. * This star does not occur in the B. A. C.

 TABLE VIII. OBSERVATIONS OF TRANSITS WITH LOCAL CLOCKS, AND DEDUCTION

Of the Corrected Difference of Observed Times, M_N.

BOMBAY (E), *Lat. 18° 54′, Long. 4h 51m*: AND ADEN (W), *Lat. 12° 46′, Long. 3h 0m.*

Astronomical Date	Star		Transits Observed at E — *By Heaviside, with Telescope No. 1*					Transits Observed at W — *By Campbell, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s·074$ $H_N - H_S = +0·006$	M_N
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	s				
May 8	5036	+33 46	N	*I. P. W.*	15 10 60·31	−1·69	58·62	N	*I. P. E.*	15 10 13·72	−1·52	12·20	− 46·42				
	5048	+21 2	S	d c − 1·4	13 21·32	−1·84	19·48	N	d c − 1·9	12 34·57	−1·51	33·06	46·42				
	5075	+30 44	N	b + 2·6 a −24·1	18 35·08	−1·73	33·35	N	b − 1·2 a + 0·4	17 48·38	−1·52	46·86	46·49				
	5085	+15 52	S	s Q −1·89	20 32·80	−1·90	30·90	N	s Q −1·43	19 45·99	−1·50	44·49	46·41	s −46·445	+ 0·098	+ 0·007	−46·340
	5092	+47 30	N		21 36·48	−1·48	35·00	N		20 50·05	−1·54	48·51	46·49				
	5098	+29 32	N		23 13·18	−1·75	11·43	N		22 26·44	−1·51	24·93	46·50				
	5109	−19 15	S		25 60·92	−2·23	58·69	S		25 13·74	−1·49	12·25	46·44				
	5126	+16 26	N		27 52·09	−1·89	50·20	N		27 5·32	−1·51	3·81	46·39				
				Mean, T_E	15 20 15												
May 9	4895	−15 32	S	*I. P. W.*	14 44 29·35	+1·44	30·79	S	*I. P. E.*	14 43 41·35	+1·42	42·77	− 48·02				
	4905	+19 37	N	d c − 1·4	46 7·50	+1·87	9·37	N	d c − 1·9	45 19·84	+1·39	21·23	48·14				
	4917	+46 59	N	b − 0·1 a −32·6	48 7·71	+2·36	10·07	N	b 0·0 a + 2·5	47 20·55	+1·33	21·88	48·19				
	4926	+14 57	S	s Q +1·90	50 49·41	+1·81	51·22	N	s Q +1·44	50 1·77	+1·40	3·17	48·05				
	4933	+16 53	N		51 52·02	+1·84	53·86	N		51 4·39	+1·40	5·79	48·07				
	4939	− 8 2	S		54 48·79	+1·53	50·32	S		54 0·83	+1·42	2·25	48·07	s −48·094	+ 0·096	+ 0·021	−47·977
	4945	− 7 5	S		56 0·52	+1·54	2·06	S		55 12·54	+1·42	13·96	48·10				
	4946	− 7 21	S		56 21·64	+1·54	23·18	S		55 33·70	+1·42	35·12	48·06				
	4953	+25 30	N		57 7·67	+1·96	9·63	N		56 20·17	+1·38	21·55	48·08				
	4962	+27 34	N		58 56·26	+1·99	58·25	N		58 8·75	+1·38	10·13	48·12				
	4969	+27 26	N		59 35·00	+1·98	36·98	N		58 47·49	+1·38	48·87	48·11				
	4981	+25 21	N		15 2 18·38	+1·95	20·33	N		15 1 30·84	+1·38	32·22	48·11				
	4993	+25 35	N		3 38·49	+1·96	40·45	N		2 50·97	+1·38	52·35	48·10				
				Mean, T_E	14 54 40												

NOTE. $1^d = 0^s·0225$.

Of the Corrected Difference of Observed Times, M_N.

BOMBAY (E), *Lat. 18° 54′, Long. 4h 51m* : AND ADEN (W), *Lat. 12° 46′, Long. 3h 0m*.

Astronomical Date	Star		Transits Observed at E, *By Heaviside, with Telescope No. 1*					Transits Observed at W, *By Campbell, with Telescope No. 2*					Difference of Corrected Times (W − E)		Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.074$, $H_N - H_S = +0.006$	M_N
	B.A.C. Number	Declination	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	By each Star	Mean of Group			
1877		° ′			h m s	s	s			h m s	s	s	s				
May 9	5036	+33 46	N	*I. P. W.*	15 10 60·87	−1·71	59·16	N	*I. P. E.*	15 10 12·54	−1·52	11·02	− 48·14				
	5048	+21 2	N	d c − 1·4	13 21·87	−1·90	19·97	N	d c − 1·9	12 33·37	−1·50	31·87	48·10				
	5061	+30 4	N	b − 0·1 *a* −32·6	15 31·47	−1·77	29·70	N	b 0·0 *a* + 2·5	14 43·06	−1·51	41·55	48·15				
	5067	+13 1	S	s	16 61·98	−2·01	59·97	S	s	16 13·37	−1·49	11·88	48·09				
	5075	+30 44	N	Q − 1·90	18 35·61	−1·76	33·85	N	Q − 1·44	17 47·21	−1·51	45·70	48·15				
	5085	+15 52	S		20 33·36	−1·98	31·38	N		19 44·82	−1·49	43·33	48·05				
	5092	+47 30	N		21 36·95	−1·42	35·53	N		20 48·81	−1·55	47·26	48·27	s −48·117	+ 0·096	+ 0·025	−47·996
	5098	+29 32	N		23 13·69	−1·78	11·91	N		22 25·24	−1·51	23·73	48·18				
	5104	−19 45	S		25 7·60	−2·42	5·18	S		24 18·60	−1·45	17·15	48·03				
	5109	−19 15	S		25 61·54	−2·42	59·12	S		25 12·58	−1·46	11·12	48·00				
	5126	+16 26	N		27 52·73	−1·97	50·76	N		27 4·14	−1·49	2·65	48·11				
	5135	+10 57	S		29 23·86	−2·04	21·82	S		28 35·16	−1·49	33·67	48·15				
	5150	+10 25	S		31 3·24	−2·04	1·20	S		30 14·58	−1·48	13·10	48·10				
				Mean, T_E	15 21 32												

NOTE. $1^d = 0^s.0225$.

Of the Corrected Difference of Observed Times, M_N.

ADEN (E), *Lat.* 12° 46′, *Long.* 3h 0m: AND SUEZ (W), *Lat.* 29° 58′, *Long.* 2h 10m.

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	E: Instrumental Position and Correction Constants	E: Mean Observed Time	E: Total Correction	E: Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	W: Instrumental Position and Correction Constants	W: Mean Observed Time	W: Total Correction	W: Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Difference (W − E): Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s.058$, $H_N - H_S = +0.022$	M_N
1877		° ′			h m s	s	s			h m s	s	s	s				
May 25	5490	+14 19	S	I. P. E.	16 19 49·84	+1·91	51·75	S	I. P. E.	16 19 58·14	−2·08	56·06	+ 4·31	s + 4·337	− 0·073	+ 0·043	+ 4·307
	5674	+15 11	N	d c + 0·7	46 34·34	+1·91	36·25	S	d c − 1·5	46 42·68	−2·08	40·60	4·35				
	5765	+12 55	S	b + 7·3 a + 20·3	59 45·89	+1·93	47·82	S	b −27·4 a −18·6	59 54·25	−2·08	52·17	4·35				
				s Q +1·74					s Q −1·32								
				Mean, T_E	16 42 5												
May 26	5382	−19 8	S	I. P. E.	16 4 57·51	+1·90	59·41	S	I. P. E.	16 5 7·22	−2·53	4·69	+ 5·28	s + 5·284	− 0·068	+ 0·026	+ 5·242
	5490	+14 19	S	d c + 0·7	19 51·11	+1·65	52·76	S	d c − 1·5	19 59·83	−1·81	58·02	5·26				
	5765	+12 55	N	b − 2·4 a + 18·2	59 47·15	+1·67	48·82	S	b − 3·3 a −63·2	59 55·96	−1·83	54·13	5·31				
	5790	+40 41	N	Q + 1s·70	17 3 53·09	+1·40	54·49	N	Q − 1s·31	17 3 60·87	−1·10	59·77	5·28				
	5911	+48 22	N	Q − 1 ·70	23 39·26	−2·10	37·16	N	Q + 1 ·31	23 40·63	+1·82	42·45	5·29				
				Mean, T_E	16 46 26												
May 27	5382	−19 8	S	I. P. E.	16 4 58·75	+1·93	60·68	S	I. P. E.	16 5 9·23	−2·69	6·54	+ 5·86	s + 6·043	− 0·076	+ 0·028	+ 5·995
	5490	+14 19	S	d c + 0·7	19 52·21	+1·69	53·90	S	d c − 1·5	19 61·69	−1·84	59·85	5·95				
	5674	+15 11	N	b − 0·5 a + 17·0	46 36·65	+1·69	38·34	S	b − 1·6 a −73·8	46 46·21	−1·81	44·40	6·06				
	5765	+12 55	S	s Q + 1·70	59 48·24	+1·70	49·94	S	s Q − 1·30	59 57·85	−1·87	55·98	6·04				
	5790	+40 41	N		17 3 54·09	+1·47	55·56	N		17 4 2·68	−0·99	1·69	6·13				
	5911	+48 22	N	Q − 1·70	23 40·22	−2·02	38·20	N	Q + 1·30	23 42·43	+1·99	44·42	6·22				
				Mean, T_E	16 46 30												

NOTE. $1^d = 0^s.0225$.

TABLE VIII. OBSERVATIONS OF TRANSITS WITH LOCAL CLOCKS, AND DEDUCTION

Of the Corrected Difference of Observed Times, M_N.

ADEN (E), *Lat. 12° 46′, Long. 3h 0m*: AND SUEZ (W), *Lat. 29° 58′, Long. 2h 10m.*

Astronomical Date	Star: B.A.C. Number	Star: Declination	Transits Observed at E (By Heaviside, with Telescope No. 1): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Transits Observed at W (By Campbell, with Telescope No. 2): Star's Aspect	Instrumental Position and Correction Constants	Mean Observed Time	Total Correction	Seconds of Corrected Time	Difference of Corrected Times (W − E): By each Star	Mean of Group	Correction for Rate of W Clock	Corrns. for Persl. Equations $C_N - C_S = +0^s{\cdot}058$, $H_N - H_S = +0{\cdot}022$	M_N
1877		° ′			h m s	s	s			h m s	s	s	s				
May 28	5490	+14 19	S	*I. P. W.*	16 19 53·49	+1·64	55·13	S	*I. P. W.*	16 20 3·15	−1·62	1·53	+ 6·40				
	5674	+15 11	N	*d* c − 2·3	46 37·98	+1·64	39·62	S	*d* c − 5·3	46 47·64	−1·62	46·02	6·40				
	5765	+12 55	S	b − 0·4, a − 14·0	59 49·60	+1·63	51·23	S	b − 5·3, a − 9·8	59 59·19	−1·62	57·57	6·34	+ 6·398	− 0·072	+ 0·026	+ 6·353
	5790	+40 41	N	Q + 1s·70	17 3 55·06	+1·81	56·87	N	Q − 1s·32	17 4 4·80	−1·57	3·23	6·36				
	5911	+48 22	N	Q − 1·70	23 40·97	−1·52	39·45	N	Q + 1·32	23 44·87	+1·07	45·94	6·49				
				Mean, T_E	16 54 48												
May 29	5382	−19 8	S	*I. P. W.*	16 5 5·05	−1·95	3·10	S	*I. P. W.*	16 5 11·56	−1·57	9·99	+ 6·89				
	5490	+14 19	S	*d* c − 2·3	19 58·16	−1·80	56·36	S	*d* c − 5·3	20 4·83	−1·54	3·29	6·93				
	5674	+15 11	S	b − 2·0, a − 11·6	46 42·70	−1·79	40·91	S	b − 3·6, a − 4·3	46 49·30	−1·54	47·76	6·85	+ 6·897	− 0·067	+ 0·024	+ 6·854
	5765	+12 55	S	s Q − 1·71	59 54·33	−1·80	52·53	S	s Q − 1·31	59 60·94	−1·54	59·40	6·87				
	5790	+40 41	N		17 3 59·84	−1·67	58·17	N		17 4 6·63	−1·55	5·08	6·91				
	5911	+48 22	N	Q + 1·71	23 39·03	+1·80	40·83	N	Q + 1·31	23 46·70	+1·06	47·76	6·93				
				Mean, T_E	16 46 32												
May 30	5490	+14 19	S	*I. P. W.*	16 19 56·40	+1·62	58·02	S	*I. P. W.*	16 20 6·62	−1·58	5·04	+ 7·02				
	5765	+12 55	S	*d* c − 2·3	59 52·50	+1·62	54·12	S	*d* c − 5·3	17 0 2·76	−1·58	1·18	7·06	+ 7·085	− 0·068	+ 0·018	+ 7·035
	5790	+40 41	N	b − 1·6, a − 11·5	17 3 57·98	+1·76	59·74	N	b − 5·5, a − 3·9	4 8·50	−1·60	6·90	7·16				
	5911	+48 22	N	Q ± 1s·71*	23 44·03	−1·60	42·43	N	Q ∓ 1s·31*	23 48·53	+1·00	49·53	7·10				
				Mean, T_E	16 56 54												

NOTE. $1^d = 0^s{\cdot}0225$. * The sign of *Q* was changed at both stations after the observation of star 5790.

 TABLE IX. TRANSITS OF CLOCK STARS AND DEDUCTION OF THE CLOCK CORRECTION

Measurement; Bombay (E), *and Aden* (W).

TRANSITS AT BOMBAY, *Lat. 18° 54′, by Heaviside with Telescope No. 1.*

Astronomical Date	Star			Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of		Deduced Apparent Clock Correction		Reduction to North Aspect by Equation $H_N - H_S = +0^s.006$	
	Name	Declination	Aspect					Corrected Time	Right Ascension	By each Star	Mean of Group	Correction	Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
April 30	24 Serpentis α	+ 6 49	S	*I. P. E.*	−1.90	15 38 34.78	−2.07	32.71	15.19	− 17.52			
	1 Ophiuchi δ	− 3 23	S	d: c − 1.3, b + 3.0, a − 43.2	+1.90	16 8 12.67	+1.55	14.22	56.56	17.66			
	24 Herculis ω	+ 14 19	S		+1.90	19 62.74	+1.84	64.58	46.76	17.82			
	40 Herculis ζ	+ 31 49	N		+1.90	36 56.92	+2.19	59.11	41.50	17.61			
	49 Herculis	+ 15 11	N		+1.90	46 47.14	+1.86	49.00	31.30	17.70	s −17.643	− 0.005	−17.648
			S		+1.90	46 47.03	+1.86	48.89	31.30	17.59			
	27 Ophiuchi κ	+ 9 34	S		−1.90	52 12.86	−2.04	10.82	53.15	17.67			
	60 Herculis	+ 12 55	S		−1.90	59 62.43	−1.98	60.45	42.86	17.59			
	64 Herculis α¹	+ 14 32	S		−1.90	17 9 24.24	−1.95	22.29	4.64	17.65			
	42 Ophiuchi θ	− 24 53	S		−1.90	14 50.30	−2.63	47.67	30.05	17.62			
					Mean, t_E	16 39 23							
May 1	25 Bootis ρ	+ 30 54	N	*I. P. W.*	+1.90	14 26 50.86	+2.04	52.90	34.64	− 18.26			
	36 Bootis ε²	+ 27 35	N	d: c + 1.0, b + 0.4, a − 18.7	+1.90	39 55.94	+2.01	57.95	39.73	18.22			
	24 Serpentis α	+ 6 49	S	For all stars after 24 Herculis $c = -99^d.0$ owing to a mistake in setting the micrometer.	−1.90	15 38 35.46	−1.96	33.50	15.21	18.29			
	24 Herculis ω	+ 14 19	S		+1.90	16 19 63.34	+1.90	65.24	46.78	18.46			
	40 Herculis ζ	+ 31 49	N		+1.90	36 60.35	−0.54	59.81	41.52	18.29			
	49 Herculis	+ 15 11	N		+1.90	46 50.01	−0.39	49.62	31.32	18.30	s −18.301	− 0.004	−18.305
			S		+1.90	46 50.06	−0.39	49.67	31.32	18.35			
	27 Ophiuchi κ	+ 9 34	S		−1.90	51 75.69	−4.23	71.46	53.18	18.28			
	60 Herculis	+ 12 55	S		−1.90	59 65.36	−4.20	1.16	42.88	18.28			
	64 Herculis α¹	+ 14 32	S		−1.90	17 9 27.24	−4.20	23.04	4.67	18.37			
	42 Ophiuchi θ	− 24 53	S		−1.90	14 52.98	−4.69	48.29	30.08	18.21			
					Mean, t_E	16 19 21							

NOTE. $1^d = 0^s.0225$.

Measurement; Bombay (E), *and Aden* (W).

TRANSITS AT BOMBAY, *Lat. 18° 54′, by Heaviside with Telescope No. 1.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $H_N - H_S = +0^s{\cdot}006$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 2	36 Bootis ϵ^2	+ 27 35	N	*I. P. W.*	−1·90	14 39 60·49	−1·79	58·70	39·73	− 18·97			
	24 Serpentis α	+ 6 49	S	c + 1·0 d	+1·90	15 38 32·27	+1·81	34·08	15·22	18·86			
	1 Ophiuchi δ	− 3 23	S	a − 23·0	−1·90	16 8 17·59	−2·07	15·52	56·59	18·93			
	24 Herculis ω	+ 14 19	S		−1·90	19 67·74	−1·91	65·83	46·80	19·03			
	40 Herculis ζ	+ 31 49	N	b = −0·2 d for first three stars	−1·90	36 62·18	−1·74	60·44	41·53	18·91			
	49 Herculis	+ 15 11	N	b = +0·2 for rest	−1·90	46 52·19	−1·91	50·28	31·34	18·94	s −18·941	− 0·004	−18·945
			S		−1·90	46 52·19	−1·91	50·28	31·34	18·94			
	27 Ophiuchi κ	+ 9 34	S		+1·90	51 70·33	+1·84	72·17	53·20	18·97			
	60 Herculis	+ 12 55	S		+1·90	59 60·00	+1·87	61·87	42·90	18·97			
	64 Herculis α^1	+ 14 32	S		+1·90	17 9 21·78	+1·89	23·67	4·69	18·98			
	42 Ophiuchi θ	− 24 53	S		+1·90	14 47·42	+1·53	48·95	30·10	18·85			
					Mean, t_E	16 28 33							
May 3	25 Bootis ρ	+ 30 54	N	*I. P. W.*	+1·89	14 26 52·25	+2·07	54·32	34·65	− 19·67			
	36 Bootis ϵ^2	+ 27 35	N	c + 1·0 d	+1·89	39 57·36	+2·02	59·38	39·74	19·64			
	24 Serpentis α	+ 6 49	S	a −26·7	−1·89	15 38 36·87	−1·99	34·88	15·23	19·65			
	1 Ophiuchi δ	− 3 23	S		+1·89	16 7 74·65	+1·69	76·34	56·61	19·73			
	24 Herculis ω	+ 14 19	S		+1·89	19 64·74	+1·87	66·61	46·82	19·79			
	21 Ursæ Minoris η	+ 76 2	N	b = +0·2 d for first four stars	+1·89	21 28·21	+4·10	32·31	12·55	19·76	s −19·693	− 0·004	−19·697
	40 Herculis ζ	+ 31 49	N	b = +0·7 for rest	+1·89	36 59·07	+2·09	61·16	41·55	19·61			
	49 Herculis	+ 15 11	N		+1·89	46 49·14	+1·88	51·02	31·36	19·66			
	27 Ophiuchi κ	+ 9 34	S		−1·89	51 74·87	−1·94	72·93	53·22	19·71			
	60 Herculis	+ 12 55	S		−1·89	59 64·45	−1·91	62·54	42·93	19·61			
	64 Herculis α^1	+ 14 32	S		−1·89	17 9 26·33	−1·90	24·43	4·71	19·72			
	42 Ophiuchi θ	− 24 53	S		−1·89	14 52·20	−2·31	49·89	30·13	19·76			
					Mean, t_E	16 16 18							

NOTE. $1^d = 0^s{\cdot}0225$.

Measurement; Bombay (E), *and Aden* (W).

TRANSITS AT BOMBAY, *Lat. 18° 54′, by Heaviside with Telescope No. 1.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $H_N - H_S = +0^s{\cdot}006$: Correction	Reduction to North Aspect by Equation $H_N - H_S = +0^s{\cdot}006$: Clock Correction by North Aspect
		° ′			s	h m s	s	s	s	s			
1877 May 4	36 Bootis ϵ^2	+ 27 35	N	*I. P. W.*	−1·89	14 39 61·90	−1·73	60·17	39·75	− 20·42			
	24 Serpentis α	+ 6 49	S	d c + 1·0 a − 27·6	+1·89	15 38 33·79	+1·82	35·61	15·25	20·36			
	1 Ophiuchi δ	− 3 23	S		−1·89	16 7 79·10	−2·08	77·02	56·63	20·39			
	24 Herculis ω	+ 14 19	S	d b = + 1·4 for first three stars b = + 1·1 for rest	−1·89	19 69·16	−1·90	67·26	46·83	20·43			
	21 Ursæ Minoris η	+ 76 2	N		−1·89	21 32·48	+0·42	32·90	12·58	20·32			
	40 Herculis ζ	+ 31 49	N		−1·89	36 63·53	−1·68	61·85	41·57	20·28	s − 20·383	− 0·004	− 20·387
	49 Herculis	+ 15 11	N		−1·89	46 53·61	−1·89	51·72	31·38	20·34			
			S		−1·89	46 53·62	−1·89	51·73	31·38	20·35			
	27 Ophiuchi κ	+ 9 34	S		+1·89	51 71·84	+1·84	73·68	53·24	20·44			
	60 Herculis	+ 12 55	S		+1·89	59 61·49	+1·87	63·36	42·95	20·41			
	64 Herculis α^1	+ 14 32	S		+1·89	17 9 23·30	+1·90	25·20	4·73	20·47			
					Mean, t_E	16 23 44							
May 5	36 Bootis ϵ^2	+ 27 35	N	*I. P. E.*	+1·89	14 39 58·87	+1·98	60·85	39·75	− 21·10			
	24 Serpentis α	+ 6 49	S	d c − 1·1 b − 0·1 a − 32·4	−1·89	15 38 38·34	−2·06	36·28	15·26	21·02			
	1 Ophiuchi δ	− 3 23	S		+1·89	16 7 76·15	+1·58	77·73	56·64	21·09			
	24 Herculis ω	+ 14 19	S		+1·89	19 66·31	+1·80	68·11	46·85	21·26			
	21 Ursæ Minoris η	+ 76 2	N		+1·89	21 29·61	+4·31	33·92	12·60	21·32			
	40 Herculis ζ	+ 31 49	N		+1·89	36 60·61	+2·04	62·65	41·58	21·07			
	49 Herculis	+ 15 11	N		−1·89	46 54·47	−1·96	52·51	31·40	21·11	s −21·129	− 0·004	−21·133
			S		−1·89	46 54·46	−1·96	52·50	31·40	21·10			
	27 Ophiuchi κ	+ 9 34	S		−1·89	51 76·41	−2·03	74·38	53·26	21·12			
	60 Herculis	+ 12 55	S		−1·89	59 66·03	−1·99	64·04	42·97	21·07			
	64 Herculis α^1	+ 14 32	S		−1·89	17 9 27·89	−1·97	25·92	4·75	21·17			
	42 Ophiuchi θ	− 24 53	S		−1·89	14 53·78	−2·48	51·30	30·18	21·12			
					Mean, t_E	16 28 0							

NOTE. $1^d = 0^s{\cdot}0225$.

Measurement; Bombay (E), *and Aden* (W).

TRANSITS AT BOMBAY, *Lat. 18° 54′, by Heaviside with Telescope No.* 1.

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $H_N - H_S = +0^s{\cdot}006$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 7	12 Bootis *d*	+ 25 41	N	*I. P. E.*	−1·90	14 4 74·43	−1·80	72·63	50·24	− 22·39			
	36 Bootis ϵ^2	+ 27 35	N	d c − 1·1	−1·90	39 63·94	−1·76	62·18	39·76	22·42			
	24 Serpentis α	+ 6 49	S	a −47·9	+1·90	15 38 36·04	+1·63	37·67	15·29	22·38			
	1 Ophiuchi δ	− 3 23	S	b = − 0·5 for first three stars	−1·90	16 7 81·46	−2·35	79·11	56·68	22·43			
	24 Herculis ω	+ 14 19	S	b = − 0·6 for the rest (d)	−1·90	19 71·43	−2·02	69·41	46·88	22·53	− 22·447	− 0·004	− 22·451
	49 Herculis	+ 15 11	N		+1·90	46 52·09	+1·79	53·88	31·44	22·44			
	27 Ophiuchi κ	+ 9 34	S		+1·90	51 74·09	+1·68	75·77	53·30	22·47			
	60 Herculis	+ 12 55	S		+1·90	59 63·66	+1·75	65·41	43·01	22·40			
	64 Herculis α^1	+ 14 32	S		+1·90	17 9 25·48	+1·77	27·25	4·79	22·46			
	42 Ophiuchi θ	− 24 53	S		+1·90	14 51·74	+1·04	52·78	30·23	22·55			
					Mean, t_E	16 11 35							
May 8	93 Virginis τ	+ 2 8	S	*I. P. W.*	+1·89	13 55 47·11	+1·76	48·87	25·87	− 23·00			
	12 Bootis *d*	+ 25 41	N	d c − 1·4	+1·89	14 4 71·29	+1·99	73·28	50·24	23·04			
	16 Bootis α	+ 19 49	N	a −24·1	+1·89	10 26·97	+1·93	28·90	5·84	23·06			
			S		+1·89	10 27·01	+1·93	28·94	5·84	23·10			
	36 Bootis ϵ^2	+ 27 35	N		+1·89	39 60·89	+2·01	62·90	39·77	23·13			
	24 Serpentis α	+ 6 49	S		−1·89	15 38 40·34	−1·98	38·36	15·30	23·06			
	1 Ophiuchi δ	− 3 23	S	b = + 2·6 for first five stars	+1·89	16 7 78·11	+1·71	79·82	56·70	23·12			
	24 Herculis ω	+ 14 19	S	b = + 2·5 for the rest (d)	+1·89	19 68·24	+1·87	70·11	46·90	23·21	− 23·112	− 0·004	− 23·116
	21 Ursæ Minoris η	+ 76 2	N		+1·89	21 32·15	+3·78	35·93	12·69	23·24			
	49 Herculis	+ 15 11	N		−1·89	46 56·42	−1·90	54·52	31·46	23·06			
			S		−1·89	46 56·40	−1·90	54·50	31·46	23·04			
	27 Ophiuchi κ	+ 9 34	S		−1·89	51 78·41	−1·95	76·46	53·32	23·14			
	64 Herculis α^1	+ 14 32	S		−1·89	17 9 29·85	−1·91	27·94	4·81	23·13			
	42 Ophiuchi θ	− 24 53	S		−1·89	14 55·72	−2·29	53·43	30·25	23·18			
	55 Ophiuchi α	+ 12 39	S		−1·89	29 40·97	−1·93	39·04	15·87	23·17			
					Mean, t_E	15 51 23							

NOTE. $1^d = 0^s{\cdot}0225$.

Measurement; Bombay (E), *and Aden* (W).

TRANSITS AT BOMBAY, *Lat. 18° 54′, by Heaviside with Telescope No. 1.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $H_N - H_S = +0^s{\cdot}006$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 9	12 Bootis *d*	+ 25 41	N	*I. P. W.*	−1·90	14 4 75·61	−1·84	73·77	50·24	− 23·53			
	16 Bootis α	+ 19 49	N	d; c − 1·4; a − 32·6	−1·90	10 31·30	−1·92	29·38	5·84	23·54			
			S		−1·90	10 31·25	−1·92	29·33	5·84	23·49			
	24 Serpentis α	+ 6 49	S		+1·90	15 38 37·13	+1·71	38·84	15·31	23·53			
	1 Ophiuchi δ	− 3 23	S		−1·90	16 7 82·51	−2·20	80·31	56·71	23·60			
	24 Herculis ω	+ 14 19	S		−1·90	19 72·58	−1·98	70·60	46·92	23·68			
	21 Ursæ Minoris η	+ 76 2	N		−1·90	21 35·91	+0·55	36·46	12·72	23·74			
	40 Herculis ζ	+ 31 49	N	d; b = −0·1 for first three stars; b = +0·5 for the rest	−1·90	36 66·93	−1·73	65·20	41·65	23·55	s −23·602	− 0·004	−23·606
	49 Herculis	+ 15 11	N		+1·90	46 53·22	+1·83	55·05	31·48	23·57			
	27 Ophiuchi κ	+ 9 34	S		+1·90	51 75·21	+1·76	76·97	53·34	23·63			
	60 Herculis	+ 12 55	S		+1·90	59 64·84	+1·80	66·64	43·05	23·59			
	64 Herculis α^1	+ 14 32	S		+1·90	17 9 26·66	+1·82	28·48	4·83	23·65			
	42 Ophiuchi θ	− 24 53	S		+1·90	14 52·54	+1·31	53·85	30·28	23·57			
	23 Draconis β	+ 52 23	N		+1·90	27 62·99	+2·53	65·52	41·81	23·71			
	55 Ophiuchi α	+ 12 39	S		+1·90	29 37·76	+1·80	39·56	15·91	23·65			
					Mean, t_E	16 14 14							

NOTE. $1^d = 0^s{\cdot}0225$.

Measurement; Bombay (E), *and Aden* (W).

TRANSITS AT ADEN, *Lat. 12° 46′, by Campbell with Telescope No. 2.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $C_N - C_S = +0^s{\cdot}074$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
April 30	51 Virginis θ	− 4 53	S	*I. P. E.*	+1·46	13 3 23·63	+1·52	25·15	37·39	+ 12·24	s +12·288	− 0·019	+12·269
	17 Canum Venat.	+ 39 9	N	d c − 1·9	+1·46	4 13·65	+1·46	15·11	27·35	12·24			
	Ursæ Majoris	+ 60 35	N	b + 3·6	+1·46	23 46·90	+1·38	48·28	60·48	12·20			
	79 Virginis ζ	+ 0 2	S	*a* + 3·1	+1·46	28 14·26	+1·51	15·77	28·12	12·35			
	Canum Venat.	+ 37 49	N		+1·46	29 7·67	+1·46	9·13	21·39	12·26			
	10 Draconis ι	+ 65 20	N		−1·46	47 44·57	−1·57	43·00	55·29	12·29			
	8 Bootis η	+ 19 1	N		−1·46	48 41·51	−1·42	40·09	52·43	12·34			
	93 Virginis τ	+ 2 8	S		−1·46	55 14·91	−1·41	13·50	25·83	12·33			
	11 Bootis	+ 27 59	N		−1·46	55 27·87	−1·44	26·43	38·71	12·28			
	16 Bootis α	+ 19 49	N		−1·46	14 9 54·92	−1·42	53·50	65·81	12·31			
	25 Bootis ρ	+ 30 55	N		−1·46	26 23·77	−1·44	22·33	34·63	12·30			
	36 Bootis ε²	+ 27 35	N		−1·46	39 28·83	−1·43	27·40	39·72	12·32			
					Mean, t_E	13 45 59							
May 1	51 Virginis θ	− 4 53	S	*I. P. W.*	+1·45	13 3 22·41	+1·28	23·69	37·39	+ 13·70	s +13·680	− 0·037	+13·643
	17 Canum Venat.	+ 39 9	N	d c − 1·0	+1·45	4 12·20	+1·49	13·69	27·35	13·66			
	79 Virginis ζ	+ 0 2	S	b − 2·8	+1·45	28 13·13	+1·31	14·44	28·12	13·68			
	Canum Venat.	+ 37 49	N	*a* −11·0	+1·45	29 6·23	+1·48	7·71	21·39	13·68			
					Mean, t_E	13 16 13							
May 2	25 Bootis ρ	+ 30 55	N	*I. P. W.*	+1·43	14 26 18·10	+1·45	19·55	34·64	+ 15·09	s +15·105	0·000	+15·105
	36 Bootis ε²	+ 27 35	N	d c − 1·0	+1·43	39 23·18	+1·44	24·62	39·74	15·12			
				b − 0·2									
				a − 6·5									
					Mean, t_E	14 32 51							

NOTE. $1^d = 0^s{\cdot}0225$.

TABLE IX. TRANSITS OF CLOCK STARS AND DEDUCTION OF THE CLOCK CORRECTION

Measurement; Bombay (E), *and Aden* (W).

Transits at ADEN, *Lat. 12° 46′, by Campbell with Telescope No. 2.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $C_N - C_S = +0^s{\cdot}074$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 3	51 Virginis θ	− 4 53	S	*I. P. W.*	+1·46	13 3 19·58	+1·39	20·97	37·39	+ 16·42			
	17 Canum Venat.	+ 39 9	N	d c − 1·0	+1·46	4 9·45	+1·52	10·97	27·34	16·37			
	Ursæ Majoris	+ 60 35	N	b 0·0	+1·46	23 42·44	+1·67	44·11	60·45	16·34			
	79 Virginis ζ	+ 0 2	S	a − 8·0	+1·46	28 10·30	+1·39	11·69	28·12	16·43			
	Canum Venat.	+ 37 49	N		+1·46	29 3·43	+1·52	4·95	21·38	16·43	s +16·422	− 0·015	+16·407
	10 Draconis ι	+ 65 20	N		−1·46	47 40·13	−1·18	38·95	55·25	16·30			
	8 Bootis η	+ 19 1	N		−1·46	48 37·43	−1·46	35·97	52·44	16·47			
	11 Bootis	+ 27 59	N		−1·46	55 23·65	−1·43	22·22	38·71	16·49			
	12 Bootis	+ 25 41	N		−1·46	14 4 35·22	−1·44	33·78	50·23	16·45			
	16 Bootis α	+ 19 49	N		−1·46	9 50·77	−1·46	49·31	65·83	16·52			
					Mean, t_E	13 37 27							
May 4	51 Virginis θ	− 4 53	S	*I. P. W.*	+1·45	13 3 18·14	+1·43	19·57	37·39	+ 17·82			
	17 Canum Venat.	+ 39 9	N	d c − 1·0	+1·45	4 7·98	+1·48	9·46	27·33	17·87			
	Ursæ Majoris	+ 60 35	N	b + 0·5	+1·45	23 41·04	+1·53	42·57	60·43	17·86			
	79 Virginis ζ	+ 0 2	S	a − 3·2	+1·45	28 8·80	+1·42	10·22	28·12	17·90			
	Canum Venat.	+ 37 49	N		+1·45	29 2·03	+1·48	3·51	21·38	17·87			
	10 Draconis ι	+ 65 20	N		−1·45	47 38·73	−1·35	37·38	55·24	17·86			
	8 Bootis η	+ 19 1	N		−1·45	48 36·01	−1·45	34·56	52·45	17·89	s +17·890	− 0·017	+17·873
	93 Virginis τ	+ 2 8	S		−1·45	55 9·44	−1·48	7·96	25·85	17·89			
	11 Bootis	+ 27 59	N		−1·45	55 22·27	−1·45	20·82	38·72	17·90			
	12 Bootis	+ 25 41	N		−1·45	14 4 33·76	−1·45	32·31	50·23	17·92			
	16 Bootis α	+ 19 49	N		−1·45	9 49·35	−1·45	47·90	65·83	17·93			
	25 Bootis ρ	+ 30 55	N		−1·45	26 18·16	−1·44	16·72	34·65	17·93			
	36 Bootis ϵ^2	+ 27 35	N		−1·45	39 23·26	−1·44	21·82	39·75	17·93			
					Mean, t_E	13 47 9							

Note. $1^d = 0^s{\cdot}0225$.

Measurement; Bombay (E), *and Aden* (W).

TRANSITS AT ADEN, *Lat.* 12° 46′, *by Campbell with Telescope No.* 2.

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $C_N - C_S = +0^s{\cdot}074$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 5	51 Virginis θ	− 4 53	S	*I. P. W.*	+1·45	13 3 16·75	+1·46	18·21	37·39	+ 19·18			
	17 Canum Venat.	+ 39 9	N	d c − 1·0	+1·45	4 6·57	+1·52	8·09	27·33	19·24			
	Canum Venat.	+ 37 49	N	b + 2·5 a − 2·5	+1·45	29 0·62	+1·51	2·13	21·38	19·25			
	10 Draconis ι	+ 65 20	N		−1·45	46 37·35	−1·31	36·04	55·23	19·19			
	8 Bootis η	+ 19 1	N		−1·45	48 34·60	−1·41	33·19	52·45	19·26	s +19·258	−0·013	+19·245
	93 Virginis τ	+ 2 8	S		−1·45	55 8·00	−1·43	6·57	25·86	19·29			
	11 Bootis	+ 27 59	N		−1·45	55 20·85	−1·39	19·46	38·72	19·26			
	12 Bootis	+ 25 41	N		−1·45	14 4 32·36	−1·40	30·96	50·23	19·27			
	16 Bootis α	+ 19 49	N		−1·45	9 47·98	−1·40	46·58	65·83	19·25			
	25 Bootis ρ	+ 30 55	N		−1·45	26 16·73	−1·39	15·34	34·66	19·32			
	36 Bootis ϵ^2	+ 27 35	N		−1·45	39 21·81	−1·39	20·42	39·75	19·33			
					Mean, t_E	13 51 6							
May 6	51 Virginis θ	− 4 53	S	*I. P. W.*	+1·44	13 3 15·28	+1·44	16·72	37·39	+ 20·67			
	17 Canum Venat.	+ 39 9	N	d c − 1·0	+1·44	4 5·09	+1·55	6·64	27·32	20·68			
	Ursæ Majoris	+ 60 35	N	b + 3·1 a − 5·2	+1·44	23 38·06	+1·66	39·72	60·41	20·69	s +20·706	−0·030	+20·676
	79 Virginis ζ	+ 0 2	S		+1·44	28 5·92	+1·45	7·37	28·12	20·75			
	Canum Venat.	+ 37 49	N		+1·44	28 59·09	+1·55	60·64	21·38	20·74			
					Mean, t_E	13 17 37							
May 7	51 Virginis θ	− 4 53	S	*I. P. E.*	+1·47	13 3 13·92	+1·56	15·48	37·38	+ 21·90			
	17 Canum Venat.	+ 39 9	N	d c − 1·9	+1·47	4 3·86	+1·59	5·45	27·31	21·86			
	Ursæ Majoris	+ 60 35	N	b + 6·7 a − 0·3	+1·47	23 36·97	+1·59	38·56	60·40	21·84			
	79 Virginis ζ	+ 0 2	S		+1·47	28 4·60	+1·57	6·17	28·13	21·96			
	Canum Venat.	+ 37 49	N		+1·47	28 57·94	+1·59	59·53	21·37	21·84			
	8 Bootis η	+ 19 1	N		−1·47	48 31·85	−1·35	30·50	52·45	21·95	s +21·927	−0·020	+21·907
	93 Virginis τ	+ 2 8	S		−1·47	55 5·23	−1·36	3·87	25·86	21·99			
	11 Bootis	+ 27 59	N		−1·47	55 18·13	−1·34	16·79	38·72	21·93			
	12 Bootis	+ 25 41	N		−1·47	14 4 29·62	−1·34	28·28	50·24	21·96			
	16 Bootis α	+ 19 49	N		−1·47	9 45·22	−1·35	43·87	65·84	21·97			
	36 Bootis ϵ^2	+ 27 35	N		−1·47	39 19·12	−1·35	17·77	39·77	22·00			
					Mean, t_E	13 43 41							

NOTE. $1^d = 0^s{\cdot}0225$.

 TABLE IX. TRANSITS OF CLOCK STARS AND DEDUCTION OF THE CLOCK CORRECTION

Measurement; Bombay (E), *and Aden* (W).

TRANSITS AT ADEN, *Lat. 12° 46′, by Campbell with Telescope No. 2.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $C_N - C_S = +0^s{\cdot}074$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 8	51 Virginis θ	− 4 53	S	*I. P. E.*	+1·43	13 3 12·76	+1·37	14·13	37·38	+ 23·25			
	17 Canum Venat.	+ 39 9	N	d c − 1·9	+1·43	4 2·71	+1·34	4·05	27·31	23·26			
	79 Virginis ζ	+ 0 2	S	b − 1·2 a + 0·4	+1·43	28 3·45	+1·36	4·81	28·13	23·32			
	Canum Venat.	+ 37 49	N		+1·43	28 56·72	+1·34	58·06	21·37	23·31			
	10 Draconis ι	+ 65 20	N		+1·43	47 30·57	+1·27	31·84	55·20	23·36			
	8 Bootis η	+ 19 1	N		+1·43	48 27·78	+1·36	29·14	52·45	23·31	s +23·304	− 0·020	+23·284
	93 Virginis τ	+ 2 8	S		+1·43	55 1·19	+1·37	2·56	25·87	23·31			
	12 Bootis	+ 25 41	N		+1·43	14 4 25·57	+1·36	26·93	50·24	23·31			
	16 Bootis α	+ 19 49	N		+1·43	9 41·20	+1·36	42·56	65·84	23·28			
	25 Bootis ρ	+ 30 55	N		−1·43	26 12·86	−1·52	11·34	34·67	23·33			
	36 Bootis ε²	+ 27 35	N		−1·43	39 17·98	−1·51	16·47	39·77	23·30			
					Mean, t_E	13 48 38							
May 9	51 Virginis θ	− 4 53	S	*I. P. E.*	+1·44	13 3 11·43	+1·42	12·85	37·38	+ 24·53			
	17 Canum Venat.	+ 39 9	N	d c − 1·9	+1·44	4 1·51	+1·35	2·86	27·30	24·44			
	Ursæ Majoris	+ 60 35	N	b 0·0 a + 2·5	+1·44	23 34·62	+1·27	35·89	60·37	24·48			
	79 Virginis ζ	+ 0 2	S		+1·44	28 2·28	+1·41	3·69	28·13	24·44			
	Canum Venat.	+ 37 49	N		+1·44	28 55·50	+1·36	56·86	21·37	24·51			
	10 Draconis ι	+ 65 20	N		−1·44	47 32·38	−1·66	30·72	55·19	24·47			
	8 Bootis η	+ 19 1	N		−1·44	48 29·48	−1·50	27·98	52·46	24·48	s +24·486	− 0·019	+24·467
	93 Virginis τ	+ 2 8	S		−1·44	55 2·84	−1·48	1·36	25·88	24·52			
	11 Bootis	+ 27 59	N		−1·44	55 15·73	−1·51	14·22	38·72	24·50			
	12 Bootis	+ 25 41	N		−1·44	14 4 27·24	−1·50	25·74	50·24	24·50			
	16 Bootis α	+ 19 49	N		−1·44	9 42·88	−1·50	41·38	65·84	24·46			
	25 Bootis ρ	+ 30 55	N		−1·44	26 11·68	−1·51	10·17	34·67	24·50			
					Mean, t_E	13 42 52							

NOTE. $1^d = 0^s{\cdot}0225$.

Measurement; Aden (E), *and Suez* (W).

TRANSITS AT ADEN, *Lat. 12° 46′, by Heaviside with Telescope No. 1.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $H_N - H_S = +0^s.022$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 25	1 Ophiuchi δ	− 3 23	S	*I. P. E.*	+1·74	16 7 59·49	+2·04	61·53	56·92	− 4·61			
	20 Herculis γ	+ 19 27	S	d	+1·74	16 35·20	+1·88	37·08	32·53	4·55			
			N	c + 0·7 b + 7·3 a + 20·3	+1·74	16 35·24	+1·88	37·12	32·53	4·59			
	21 Scorpii α	− 26 10	S		+1·74	21 57·59	+2·22	59·81	55·31	4·50			
	10 Ophiuchi λ	+ 2 15	S		+1·74	24 48·08	+2·01	50·09	45·55	4·54			
	13 Ophiuchi ζ	− 10 19	S		+1·74	30 28·67	+2·09	30·76	26·06	4·70			
	27 Ophiuchi κ	+ 9 34	N		+1·74	51 56·21	+1·95	58·16	53·59	4·57	s − 4·572	− 0·017	− 4·589
			S		+1·74	51 56·22	+1·95	58·17	53·59	4·58			
	64 Herculis α¹	+ 14 32	N		−1·74	17 9 11·22	−1·56	9·66	5·12	4·54			
			S		−1·74	9 11·23	−1·56	9·67	5·12	4·55			
	42 Ophiuchi θ	− 24 53	S		−1·74	14 36·46	−1·26	35·20	30·63	4·57			
	49 Ophiuchi σ	+ 4 15	S		−1·74	20 33·62	−1·49	32·13	27·57	4·56			
					Mean, t_E	16 42 59							
May 25	55 Ophiuchi α	+ 12 39	N	*I. P. E.*	−1·74	17 29 22·38	−1·55	20·83	16·21	− 4·62			
			S	d c + 0·7 a + 20·3	−1·74	29 22·37	−1·55	20·82	16·21	4·61			
	86 Herculis μ	+ 27 47	N		−1·74	41 47·58	−1·67	45·91	41·37	4·54			
	13 Sagittarii μ	− 21 5	S		−1·74	18 6 33·41	−1·30	32·11	27·53	4·58			
	58 Serpentis η	− 2 56	S		−1·74	15 5·52	−1·43	4·09	59·41	4·68			
	10 Lyræ β¹	+ 33 13	N	d b = + 7·3 for first three stars b = + 7·6 for the rest	+1·74	45 37·52	+1·76	39·28	34·67	4·61	s − 4·635	− 0·010	− 4·645
	13 Aquilæ ε	+ 14 54	N		+1·74	54 7·54	+1·92	9·46	4·82	4·64			
			S		+1·74	54 7·54	+1·92	9·46	4·82	4·64			
	17 Aquilæ ζ	+ 13 41	S		+1·74	59 50·59	+1·93	52·52	47·76	4·76			
			N		+1·74	59 50·56	+1·93	52·49	47·76	4·73			
	18 Lyræ ι	+ 35 55	N		+1·74	19 2 59·92	+1·73	61·65	57·07	4·58			
					Mean, t_E	18 25 20							

NOTE. $1^d = 0^s.0225$.

Measurement; Aden (E), *and Suez* (W).

TRANSITS AT ADEN, *Lat. 12° 46′, by Heaviside with Telescope No. 1.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $H_N - H_S = +0^s\cdot022$: Correction	Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 26	1 Ophiuchi δ	− 3 23	S	*I. P. E.*	+1·70	16 8 0·75	+1·78	2·53	56·93	− 5·60			
	20 Herculis γ	+ 19 27	S	d	+1·70	16 36·49	+1·61	38·10	32·54	5·56			
			N	c + 0·7 b − 2·4 a + 18·2	+1·70	16 36·48	+1·61	38·09	32·54	5·55			
	21 Scorpii α	− 26 10	S		+1·70	21 58·82	+1·96	60·78	55·33	5·45			
	10 Ophiuchi λ	+ 2 15	S		+1·70	24 49·23	+1·74	50·97	45·56	5·41	s − 5·540	− 0·018	− 5·558
	13 Ophiuchi ζ	− 10 19	S		+1·70	30 29·85	+1·83	31·68	26·07	5·61			
	64 Herculis α¹	+ 14 32	N		−1·70	17 9 12·45	−1·75	10·70	5·13	5·57			
			S		−1·70	9 12·46	−1·75	10·71	5·13	5·58			
	42 Ophiuchi θ	− 24 53	S		−1·70	14 37·66	−1·45	36·21	30·65	5·56			
	49 Ophiuchi σ	+ 4 15	S		−1·70	20 34·78	−1·68	33·10	27·59	5·51			
					Mean, t_E	16 41 13							
May 26	55 Ophiuchi α	+ 12 39	N	*I. P. E.*	−1·70	17 29 23·58	−1·74	21·84	16·22	− 5·62			
			S	d c + 0·7 a + 18·2	−1·70	29 23·56	−1·74	21·82	16·22	5·60			
	86 Herculis μ	+ 27 47	N		−1·70	41 48·77	−1·86	46·91	41·38	5·53			
	89 Herculis	+ 26 4	N		−1·70	50 37·55	−1·85	35·70	30·15	5·55			
	72 Ophiuchi	+ 9 33	N		−1·70	18 1 41·13	−1·69	39·44	33·81	5·63			
			S	d b = − 2·4 for first four stars b = − 1·4 for the rest	−1·70	1 41·09	−1·69	39·40	33·81	5·59			
	13 Sagittarii μ	− 21 5	S		−1·70	6 34·65	−1·46	33·19	27·56	5·63			
	58 Serpentis η	− 2 56	S		−1·70	15 6·74	−1·60	5·14	59·43	5·71	s − 5·663	− 0·009	− 5·672
	10 Lyræ β¹	+ 33 13	N		+1·70	45 38·87	+1·51	40·38	34·69	5·69			
	13 Lyræ	+ 43 47	N		+1·70	51 42·19	+1·39	43·58	37·84	5·74			
	13 Aquilæ ε	+ 14 54	N		+1·70	54 8·89	+1·67	10·56	4·84	5·72			
			S		+1·70	54 8·97	+1·67	10·64	4·84	5·80			
	17 Aquilæ ζ	+ 13 41	N		+1·70	59 51·92	+1·68	53·60	47·79	5·81			
			S		+1·70	59 51·84	+1·68	53·52	47·79	5·73			
	18 Lyræ ι	+ 35 55	N		+1·70	19 3 1·21	+1·49	2·70	57·10	5·60			
					Mean, t_E	18 21 39							

NOTE. $1^d = 0^s\cdot0225$.

Measurement; Aden (E), *and Suez* (W).

Transits at ADEN, *Lat. 12° 46′, by Heaviside with Telescope No. 1.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $H_N - H_S = +0^s{\cdot}022$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
		° ′			s	h m s	s	s	s	s			
1877 May 27	1 Ophiuchi δ	− 3 23	S	*I. P. E.*	+1·70	16 7 61·85	+1·81	63·66	56·95	− 6·71			
	20 Herculis γ	+ 19 27	S	d	+1·70	16 37·54	+1·66	39·20	32·55	6·65			
			N	c + 0·7 b − 0·5 a +17·0	+1·70	16 37·53	+1·66	39·19	32·55	6·64			
	21 Scorpii α	− 26 10	S		+1·70	21 59·97	+1·98	61·95	55·34	6·61			
	10 Ophiuchi λ	+ 2 15	S		+1·70	24 50·43	+1·77	52·20	45·57	6·63			
	13 Ophiuchi ζ	− 10 19	S		+1·70	30 31·00	+1·86	32·86	26·08	6·78	s − 6·649	− 0·017	− 6·666
	27 Ophiuchi κ	+ 9 34	N		+1·70	51 58·55	+1·73	60·28	53·62	6·66			
			S		+1·70	51 58·53	+1·73	60·26	53·62	6·64			
	64 Herculis α¹	+ 14 32	N		−1·70	17 9 13·49	−1·71	11·78	5·15	6·63			
			S		−1·70	9 13·44	−1·71	11·73	5·15	6·58			
	42 Ophiuchi θ	− 24 53	S		−1·70	14 38·74	−1·43	37·31	30·67	6·64			
	49 Ophiuchi σ	+ 4 15	S		−1·70	20 35·85	−1·63	34·22	27·60	6·62			
					Mean, t_E	16 43 1							
May 27	55 Ophiuchi α	+ 12 39	N	*I. P. E.*	−1·70	17 29 24·64	−1·70	22·94	16·24	− 6·70			
			S	d c + 0·7 a +17·0	−1·70	29 24·61	−1·70	22·91	16·24	6·67			
	86 Herculis μ	+ 27 47	N		−1·70	41 49·81	−1·80	48·01	41·40	6·61			
	89 Herculis	+ 26 4	N		−1·70	50 38·55	−1·79	36·76	30·17	6·59			
	72 Ophiuchi	+ 9 33	N		−1·70	18 1 42·13	−1·67	40·46	33·83	6·63			
			S	d b = − 0·5 for first four stars b = − 0·4 for the rest	−1·70	1 42·15	−1·67	40·48	33·83	6·65			
	13 Sagittarii μ	− 21 5	S		−1·70	6 35·72	−1·46	34·26	27·58	6·68			
	58 Serpentis η	− 2 56	S		−1·70	14 67·76	−1·59	66·17	59·45	6·72	s − 6·717	− 0·009	− 6·726
	10 Lyræ β¹	+ 33 13	N		+1·70	45 39·94	+1·55	41·49	34·72	6·77			
	13 Lyræ	+ 43 47	N		+1·70	51 43·24	+1·44	44·68	37·87	6·81			
	13 Aquilæ ε	+ 14 54	N		+1·70	54 10·00	+1·69	11·69	4·87	6·82			
			S		+1·70	54 9·95	+1·69	11·64	4·87	6·77			
	17 Aquilæ ζ	+ 13 41	N		+1·70	59 52·94	+1·70	54·64	47·81	6·83			
			S		+1·70	59 52·89	+1·70	54·59	47·81	6·78			
	18 Lyræ ι	+ 35 55	N		+1·70	19 2 62·31	+1·53	63·84	57·12	6·72			
					Mean, t_E	18 22 4							

Note. $1^d = 0^s{\cdot}0225$.

 TABLE IX. TRANSITS OF CLOCK STARS AND DEDUCTION OF THE CLOCK CORRECTION

Measurement; Aden (E), *and Suez* (W).

TRANSITS AT ADEN, *Lat. 12° 46′, by Heaviside with Telescope No. 1.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $H_N - H_S = +0^s{\cdot}022$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 28	21 Scorpii α	− 26 10	S	*I. P. W.*	+1·70	16 21 61·75	+1·41	63·16	55·36	− 7·80			
	10 Ophiuchi λ	+ 2 15	S	d c − 2·3	+1·70	24 51·84	+1·58	53·42	45·59	7·83			
	13 Ophiuchi ζ	− 10 19	S	b − 0·4 a − 14·0	+1·70	30 32·57	+1·51	34·08	26·09	7·99			
	27 Ophiuchi κ	+ 9 34	N		+1·70	51 59·95	+1·62	61·57	53·64	7·93	s − 7·863	− 0·017	− 7·880
			S		+1·70	51 59·89	+1·62	61·51	53·64	7·87			
	64 Herculis α¹	+ 14 32	N		−1·70	17 9 14·80	−1·75	13·05	5·16	7·89			
			S		−1·70	9 14·73	−1·75	12·98	5·16	7·82			
	42 Ophiuchi θ	− 24 53	S		−1·70	14 40·48	−1·98	38·50	30·69	7·81			
	49 Ophiuchi σ	+ 4 15	S		−1·70	20 37·25	−1·80	35·45	27·62	7·83			
					Mean, t_E	16 52 48							
May 28	55 Ophiuchi α	+ 12 39	N	*I. P. W.*	−1·70	17 29 25·94	−1·76	24·18	16·26	− 7·92			
			S	d c − 2·3	−1·70	29 25·91	−1·76	24·15	16·26	7·89			
	60 Ophiuchi β	+ 4 37	S	a − 14·0	−1·70	37 36·26	−1·78	34·48	26·60	7·88			
	86 Herculis μ	+ 27 47	N		−1·70	41 50·92	−1·68	49·24	41·42	7·82			
	72 Ophiuchi	+ 9 33	N		−1·70	18 1 43·48	−1·75	41·73	33·85	7·88			
			S		−1·70	1 43·48	−1·75	41·73	33·85	7·88			
	13 Sagittarii μ	− 21 5	S	d b = − 0·4 for first four stars b = + 0·8 for the rest	−1·70	6 37·38	−1·93	35·45	27·61	7·84	s − 7·905	− 0·012	− 7·917
	58 Serpentis η	− 2 56	S		−1·70	14 69·22	−1·82	67·40	59·48	7·92			
	10 Lyræ β¹	+ 33 13	N		+1·70	47 40·91	+1·78	42·69	34·74	7·95			
	13 Aquilæ ε	+ 14 54	N		+1·70	54 11·16	+1·67	12·83	4·89	7·94			
			S		+1·70	54 11·17	+1·67	12·84	4·89	7·95			
	17 Aquilæ ζ	+ 13 41	S		+1·70	59 54·17	+1·67	55·84	47·84	8·00			
	18 Lyræ ι	+ 35 55	N		+1·70	19 2 63·25	+1·80	65·05	57·15	7·90			
					Mean, t_E	18 15 35							

NOTE. $1^d = 0^s{\cdot}0225$.

Measurement; Aden (E), *and Suez* (W).

TRANSITS AT ADEN, *Lat. 12° 46′, by Heaviside with Telescope No.* 1.

Astronomical Date	Star			Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of		Deduced Apparent Clock Correction		Reduction to North Aspect by Equation $H_N - H_S = +0^s{\cdot}022$	
	Name	Declination	Aspect					Corrected Time	Right Ascension	By each Star	Mean of Group	Correction	Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 29	1 Ophiuchi δ	− 3 23	S	I. P. W.	−1·71	16 7 67·95	−1·87	66·08	56·97	− 9·11			
	20 Herculis γ	+ 19 27	S	d; c − 2·3	−1·71	16 43·46	−1·78	41·68	32·56	9·12			
			N	b − 2·0; a −11·6	−1·71	16 43·43	−1·78	41·65	32·56	9·09			
	21 Scorpii α	− 26 10	S		−1·71	21 66·38	−1·99	64·39	55·37	9·02			
	10 Ophiuchi λ	+ 2 15	S		−1·71	24 56·50	−1·85	54·65	45·60	9·05			
	13 Ophiuchi ζ	− 10 19	S		−1·71	30 37·25	−1·90	35·35	26·10	9·25	s − 9·148	− 0·017	− 9·165
	27 Ophiuchi κ	+ 9 34	N		−1·71	51 64·68	−1·82	62·86	53·65	9·21			
			S		−1·71	51 64·59	−1·82	62·77	53·65	9·12			
	64 Herculis α¹	+ 14 32	N		+1·71	17 9 12·83	+1·61	14·44	5·18	9·26			
			S		+1·71	9 12·79	+1·61	14·40	5·18	9·22			
	42 Ophiuchi θ	− 24 53	S		+1·71	14 38·44	+1·43	39·87	30·71	9·16			
	49 Ophiuchi σ	+ 4 15	S		+1·71	20 35·23	+1·57	36·80	27·63	9·17			
					Mean, t_E	16 43 5							
May 29	55 Ophiuchi α	+ 12 39	N	I. P. W.	+1·71	17 29 23·95	+1·61	25·56	16·27	− 9·29			
			S	d; c − 2·3	+1·71	29 23·93	+1·61	25·54	16·27	9·27			
	86 Herculis μ	+ 27 47	N	a − 11·6	+1·71	41 48·95	+1·67	50·62	41·43	9·19			
	89 Herculis	+ 26 4	N		+1·71	50 37·71	+1·66	39·37	30·20	9·17			
	72 Ophiuchi	+ 9 33	N		+1·71	18 1 41·58	+1·59	43·17	33·87	9·30			
			S	d; b = − 2·0 for first four stars; b = − 2·2 for the rest	+1·71	1 41·46	+1·59	43·05	33·87	9·18			
	13 Sagittarii μ	− 21 5	S		+1·71	6 35·39	+1·45	36·84	27·63	9·21	s − 9·273	− 0·009	− 9·282
	58 Serpentis η	− 2 56	S		+1·71	14 67·28	+1·53	68·81	59·50	9·31			
	10 Lyræ β¹	+ 33 13	N		−1·71	45 45·74	−1·71	44·03	34·76	9·27			
	13 Lyræ	+ 43 47	N		−1·71	51 48·91	−1·65	47·26	37·92	9·34			
	13 Aquilæ ε	+ 14 54	N		−1·71	54 16·02	−1·80	14·22	4·92	9·30			
			S		−1·71	54 16·01	−1·80	14·21	4·92	9·29			
	17 Aquilæ ζ	+ 13 41	N		−1·71	59 59·04	−1·80	57·24	47·86	9·38			
			S		−1·71	59 59·02	−1·80	57·22	47·86	9·36			
	18 Lyræ ι	+ 35 55	N		−1·71	19 2 68·10	−1·70	66·40	57·17	9·23			
					Mean, t_E	18 21 42							

NOTE. $1^d = 0^s{\cdot}0225$.

 TABLE IX. TRANSITS OF CLOCK STARS AND DEDUCTION OF THE CLOCK CORRECTION

Measurement; Aden (E), *and Suez* (W).

TRANSITS AT ADEN, *Lat. 12° 46′, by Heaviside with Telescope No.* 1.

Astronomical Date	Star			Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of		Deduced Apparent Clock Correction		Reduction to North Aspect by Equation $H_N - H_S = +0^s\cdot022$	
	Name	Declination	Aspect					Corrected Time	Right Ascension	By each Star	Mean of Group	Correction	Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 30	1 Ophiuchi δ	− 3 23	S	*I. P. W.*	+1·71	16 7 66·18	+1·55	67·73	56·98	− 10·75			
	20 Herculis γ	+ 19 27	S	d c − 2·3	+1·71	16 41·65	+1·65	43·30	32·57	10·73			
			N	b − 1·6 a −11·5	+1·71	16 41·63	+1·65	43·28	32·57	10·71			
	21 Scorpii α	− 26 10	S		+1·71	21 64·61	+1·44	66·05	55·38	10·67			
	10 Ophiuchi λ	+ 2 15	S		+1·71	24 54·69	+1·57	56·26	45·61	10·65			
	13 Ophiuchi ζ	− 10 19	S		+1·71	30 35·43	+1·52	36·95	26·11	10·84	s −10·764	− 0·017	−10·781
	27 Ophiuchi ε	+ 9 34	S		+1·71	51 62·84	+1·61	64·45	53·66	10·79			
			N		+1·71	51 62·89	+1·61	64·50	53·66	10·84			
	64 Herculis α[1]	+ 14 32	N		−1·71	17 9 17·80	−1·79	16·01	5·19	10·82			
			S		−1·71	9 17·76	−1·79	15·97	5·19	10·78			
	42 Ophiuchi θ	− 24 53	S		−1·71	14 43·47	−1·97	41·50	30·73	10·77			
	49 Ophiuchi σ	+ 4 15	S		−1·71	20 40·31	−1·84	38·47	27·65	10·82			
					Mean, t_E	16 43 6							
May 30	55 Ophiuchi α	+ 12 39	N	*I. P. W.*	−1·71	17 29 28·98	−1·80	27·18	16·29	− 10·89			
	86 Herculis μ	+ 27 47	N	d c − 2·3	−1·71	41 53·97	−1·73	52·24	41·45	10·79			
	89 Herculis	+ 26 4	N	b − 1·6 a −11·5	−1·71	50 42·75	−1·74	41·01	30·22	10·79			
	72 Ophiuchi	+ 9 33	N		−1·71	18 1 46·53	−1·81	44·72	33·89	10·83			
			S		−1·71	1 46·51	−1·81	44·70	33·89	10·81			
	13 Sagittarii μ	− 21 5	S		−1·71	6 40·43	−1·96	38·47	27·65	10·82			
	58 Serpentis η	− 2 56	S		−1·71	14 72·30	−1·86	70·44	59·52	10·92	s −10·883	− 0·008	−10·891
	10 Lyræ β[1]	+ 33 13	N		+1·71	45 43·97	+1·71	45·68	34·78	10·90			
	13 Lyræ	+ 43 47	N		+1·71	51 47·07	+1·78	48·85	37·94	10·91			
	13 Aquilæ ε	+ 14 54	N		+1·71	54 14·27	+1·63	15·90	4·94	10·96			
			S		+1·71	54 14·23	+1·63	15·86	4·94	10·92			
	17 Aquilæ ζ	+ 13 41	S		+1·71	59 57·23	+1·62	58·85	47·88	10·97			
			N		+1·71	59 57·27	+1·62	58·89	47·88	11·01			
	18 Lyræ ι	+ 35 55	N		+1·71	19 2 66·31	+1·73	68·04	57·20	10·84			
					Mean, t_E	18 25 28							

NOTE. $1^d = 0^s\cdot0225$.

Measurement; Aden (E), *and Suez* (W).

TRANSITS AT SUEZ, *Lat.* 29° 58′, *by Campbell with Telescope No.* 2.

Astronomical Date	Star			Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of		Deduced Apparent Clock Correction		Reduction to North Aspect by Equation $C_N - C_S = +0^s{\cdot}058$	
	Name	Declination	Aspect					Corrected Time	Right Ascension	By each Star	Mean of Group	Correction	Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 25	27 Libræ β	− 8 56	S	I. P. E.	+1·32	15 10 34·42	+0·54	34·96	26·19	− 8·77			
	9 Serpentis τ¹	+ 15 52	S	d	+1·32	20 16·21	+0·56	16·77	8·05	8·72			
	5 Coronæ α	+ 27 8	S	c − 1·5	+1·32	29 39·94	+0·57	40·51	31·75	8·76			
	24 Serpentis α	+ 6 49	S	b −27·4	+1·32	38 23·68	+0·54	24·22	15·47	8·75	s − 8·789	− 0·041	− 8·830
	1 Ophiuchi δ	− 3 23	S	a −18·6	−1·32	16 7 67·88	−2·10	65·78	56·92	8·86			
	14 Draconis η²	+ 61 47	N		−1·32	22 34·33	−2·03	32·30	23·49	8·81			
	40 Herculis ζ	+ 31 49	N		−1·32	36 52·79	−2·07	50·72	41·87	8·85			
					Mean, t_E	15 49 30							
May 25	27 Ophiuchi κ	+ 9 34	S	I. P. E.	−1·32	16 51 64·61	−2·09	62·52	53·59	− 8·93			
	64 Herculis α¹	+ 14 32	S	d	−1·32	17 9 16·10	−2·09	14·01	5·12	8·89			
	23 Draconis β	+ 52 23	N	c − 1·5	+1·32	27 50·62	+0·59	51·21	42·14	9·07	s − 8·996	− 0·035	− 9·031
	55 Ophiuchi α	+ 12 39	S	b −27·4	+1·32	29 24·62	+0·55	25·17	16·21	8·96			
	33 Draconis γ	+ 51 30	N	a −18·6	+1·32	53 56·25	+0·60	56·85	47·72	9·13			
					Mean, t_E	17 22 31							
May 26	27 Libræ β	− 8 56	S	I. P. E.	+1·31	15 10 36·49	+0·31	36·80	26·19	− 10·61			
	9 Serpentis τ¹	+ 15 52	S	d	+1·31	20 17·80	+0·84	18·64	8·05	10·59			
	5 Coronæ α	+ 27 8	S	c − 1·5	+1·31	29 41·32	+1·11	42·43	31·75	10·68			
	24 Serpentis α	+ 6 49	S	b − 3·3	+1·31	38 25·48	+0·63	26·11	15·47	10·64	s −10·663	− 0·041	−10·704
	1 Ophiuchi δ	− 3 23	S	a −63·2	−1·31	16 7 69·83	−2·19	67·64	56·93	10·71			
	14 Draconis η²	+ 61 47	N		−1·31	22 34·10	+0·07	34·17	23·49	10·68			
	40 Herculis ζ	+ 31 49	N		−1·31	36 53·99	−1·38	52·61	41·88	10·73			
					Mean, t_E	15 49 31							
May 26	27 Ophiuchi κ	+ 9 34	S	I. P. E.	−1·31	16 51 66·33	−1·91	64·42	53·61	− 10·81			
	23 Draconis β	+ 52 23	N	d c − 1·5	+1·31	17 27 51·05	+2·02	53·07	42·15	10·92	s −10·923	− 0·029	−10·952
	55 Ophiuchi α	+ 12 39	S	b − 3·3 a −63·2	+1·31	29 26·37	+0·76	27·13	16·22	10·91			
	33 Draconis γ	+ 51 30	N		+1·31	53 56·81	+1·98	58·79	47·74	11·05			
					Mean, t_E	17 25 50							

NOTE. $1^d = 0^s{\cdot}0225$.

 TABLE IX. TRANSITS OF CLOCK STARS AND DEDUCTION OF THE CLOCK CORRECTION

Measurement; Aden (E), *and Suez* (W).

TRANSITS AT SUEZ, *Lat. 29° 58′, by Campbell with Telescope No. 2.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $C_N - C_S = +0^s{\cdot}058$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 27	27 Libræ β	− 8 56	S	*I. P. E.*	+1·30	15 10 38·38	+0·19	38·57	26·20	− 12·37			
	9 Serpentis τ^1	+ 15 52	S	d c − 1·5	+1·30	20 19·63	+0·81	20·44	8·05	12·39			
	5 Coronæ α	+ 27 8	S	b − 1·6 a − 73·8	+1·30	29 43·10	+1·13	44·23	31·75	12·48			
	24 Serpentis α	+ 6 49	S		+1·30	38 27·39	+0·57	27·96	15·48	12·48	s −12·510	−0·041	−12·551
	1 Ophiuchi δ	− 3 23	S		−1·30	16 7 71·80	−2·29	69·51	56·95	12·56			
	14 Draconis η^2	+ 61 47	N		−1·30	22 35·74	+0·41	36·15	23·50	12·65			
	40 Herculis ζ	+ 31 49	N		−1·30	36 55·86	−1·33	54·53	41·89	12·64			
					Mean, t_E	15 49 33							
May 27	27 Ophiuchi κ	+ 9 34	S	*I. P. E.*	−1·30	16 51 68·26	−1·96	66·30	53·62	− 12·68			
	64 Herculis α^1	+ 14 32	S	d c − 1·5	−1·30	17 9 19·65	−1·84	17·81	5·15	12·66	s −12·735	−0·044	−12·779
	55 Ophiuchi α	+ 12 39	S	b − 1·6 a − 73·8	+1·30	29 28·25	+0·73	28·98	16·24	12·74			
	33 Draconis γ	+ 51 30	N		+1·30	53 58·44	+2·18	60·62	47·76	12·86			
					Mean, t_E	17 21 14							
May 28	27 Libræ β	− 8 56	S	*I. P. W.*	+1·32	15 10 39·38	+0·96	40·34	26·20	− 14·14			
	9 Serpentis τ^1	+ 15 52	S	d c − 5·3	+1·32	20 21·09	+1·02	22·11	8·06	14·05			
	5 Coronæ α	+ 27 8	S	b − 5·3 a − 9·8	+1·32	29 44·81	+1·04	45·85	31·76	14·09			
	24 Serpentis α	+ 6 49	S		+1·32	38 28·66	+1·00	29·66	15·49	14·17	s − 14·149	− 0·041	− 14·190
	1 Ophiuchi δ	− 3 23	S		−1·32	16 7 72·84	−1·66	71·18	56·96	14·22			
	14 Draconis η^2	+ 61 47	N		−1·32	22 39·18	−1·54	37·64	23·50	14·14			
	40 Herculis ζ	+ 31 49	N		−1·32	36 57·72	−1·59	56·13	41·90	14·23			
					Mean, t_E	15 49 35							
May 28	27 Ophiuchi κ	+ 9 34	S	*I. P. W.*	−1·32	16 51 69·57	−1·63	67·94	53·64	− 14·30			
	64 Herculis α^1	+ 14 32	S	d c − 5·3	−1·32	17 9 21·07	−1·62	19·45	5·16	14·29	s − 14·348	− 0·044	− 14·392
	23 Draconis β	+ 52 23	N	b − 5·3 a − 9·8	+1·32	27 55·49	+1·08	56·57	42·18	14·39			
	55 Ophiuchi α	+ 12 39	S		+1·32	29 29·66	+1·01	30·67	16·26	14·41			
					Mean, t_E	17 14 44							

NOTE. $1^d = 0^s{\cdot}0225$.

Measurement; Aden (E), *and Suez* (W).

Transits at SUEZ, *Lat. 29° 58′, by Campbell with Telescope No. 2.*

Astronomical Date	Star: Name	Star: Declination	Star: Aspect	Instrumental Position and Correction Constants	Pen Equation Q	Mean Observed Time	Total Correction	Seconds of: Corrected Time	Seconds of: Right Ascension	Deduced Apparent Clock Correction: By each Star	Deduced Apparent Clock Correction: Mean of Group	Reduction to North Aspect by Equation $C_N - C_S = +0^s{\cdot}058$: Correction	Reduction to North Aspect: Clock Correction by North Aspect
1877		° ′			s	h m s	s	s	s	s			
May 29	27 Libræ β	− 8 56	S	*I. P. W.*	+1·31	15 10 41·03	+1·07	42·10	26·21	− 15·89			
	9 Serpentis τ^1	+ 15 52	S	d; c − 5·3	+1·31	20 22·81	+1·08	23·89	8·06	15·83			
	5 Coronæ α	+ 27 8	S	b − 3·6	+1·31	29 46·56	+1·08	47·64	31·76	15·88			
	24 Serpentis α	+ 6 49	S	a − 4·3	+1·31	38 30·34	+1·08	31·42	15·50	15·92	s −15·920	− 0·041	−15·961
	1 Ophiuchi δ	− 3 23	S		−1·31	16 7 74·50	−1·55	72·95	56·97	15·98			
	14 Draconis η^2	+ 61 47	N		−1·31	22 40·98	−1·60	39·38	23·50	15·88			
	40 Herculis ζ	+ 31 49	N		−1·31	36 59·51	−1·54	57·97	41·91	16·06			
					Mean, t_E	15 49 37							
May 29	27 Ophiuchi κ	+ 9 34	S	*I. P. W.*	−1·31	16 51 71·26	−1·54	69·72	53·65	− 16·07			
	64 Herculis α^1	+ 14 32	S	d; c − 5·3	−1·31	17 9 22·82	−1·54	21·28	5·18	16·10			
	23 Draconis β	+ 52 23	N	b − 3·6	+1·31	27 57·33	+1·06	58·39	42·20	16·19	s −16·168	− 0·035	−16·203
	55 Ophiuchi α	+ 12 39	S	a − 4·3	+1·31	29 31·35	+1·08	32·43	16·27	16·16			
	33 Draconis γ	+ 51 30	N		+1·31	53 63·06	+1·06	64·12	47·80	16·32			
					Mean, t_E	17 22 37							
May 30	5 Coronæ α	+ 27 8	S	*I. P. W.*	+1·31	15 29 48·39	+1·03	49·42	31·77	− 17·65			
	1 Ophiuchi δ	− 3 23	S	d; c − 5·3	−1·31	16 7 76·31	−1·59	74·72	56·98	17·74	s −17·705	− 0·029	−17·734
	14 Draconis η^2	+ 61 47	N	b − 5·5	−1·31	22 42·86	−1·69	41·17	23·51	17·66			
	40 Herculis ζ	+ 31 49	N	a − 3·9	−1·31	36 61·28	−1·59	59·69	41·92	17·77			
					Mean, t_E	16 9 27							
May 30	27 Ophiuchi κ	+ 9 34	S	*I. P. W.*	−1·31	16 51 73·13	−1·58	71·55	53·66	− 17·89			
	64 Herculis α^1	+ 14 32	S	d; c − 5·3	−1·31	17 9 24·63	−1·58	23·05	5·19	17·86			
	23 Draconis β	+ 52 23	N	b − 5·5	+1·31	27 59·16	+0·98	60·14	42·21	17·93	s −17·922	− 0·035	−17·957
	55 Ophiuchi α	+ 12 39	S	a − 3·9	+1·31	29 33·22	+1·04	34·26	16·29	17·97			
	33 Draconis γ	+ 51 30	N		+1·31	53 64·79	+0·99	65·78	47·82	17·96			
					Mean, t_E	17 22 39							

Note. $1^d = 0^s{\cdot}0225$.

TABLE X. DEDUCTION OF CLOCK RATE CORRECTIONS

By the Combination of Star Observations with Clock Comparisons.

Measurement and Approximate Difference of Longitude, ΔL	Astronomical Date	BOMBAY, or E, Clock					ADEN, or W, Clock					Relative Hourly Rate Correction by Clock Comparisons	Adopted Hourly Rate Corrections r_E and r_W $2r_E = r_e - R + r_w$ $2r_W = r_w + R + r_e$		Correction to Observed Difference of Times of Transit for Rate of W Clock $= r_W \times \Delta L$
		Observed Clock Correction	Time	Hourly Rate Correction by: Clock Stars	Longitude Stars	Mean r_e	Observed Clock Correction	Time	Hourly Rate Correction by: Clock Stars	Longitude Stars	Mean r_w	R	r_E	r_W	
	1877	s	h m	s	s	s	s	h m	s	s	s	s	s	s	s
Bombay (E), and Aden (W) $\Delta L = 1^h\ 51^m$	April 30	−17·648	16 39	−0·025	−0·028	−0·027	+12·269	13 46	+0·059	+0·056	+0·058	+ 0·097	− 0·033	+ 0·064	+ 0·118
	May 1	18·305	16 19	·027	·028	·028	13·643	13 16	·058	·057	·058	·090	·030	·060	·111
	" 2	18·945	16 29	·029	·028	·029	15·105	14 33	·057	·058	·058	·090	·030	·060	·111
	" 3	19·697	16 16	·030	·030	·030	16·407	13 37	·058	·058	·058	·089	·030	·059	·109
	" 4	20·387	16 24	·030	·030	·030	17·873	13 47	·059	·058	·059	·084	·028	·056	·104
	" 5	21·133	16 28	·029	·029	·029	19·245	13 51	·059	·056	·058	·099	·035	·064	·118
	" 6	...	...	...	...	...	20·676	13 18	·056	...	...	...	...	...	...
	" 7	22·451	16 12	·028	·028	·028	21·907	13 44	·054	·056	·055	·086	·030	·056	·104
	" 8	23·116	15 51	·024	·024	·024	23·284	13 49	·053	·053	·053	·076	·023	·053	·098
	" 9	23·606	16 14	·020	·020	·020	24·467	13 43	·052	·050	·051	·074	·022	·052	·096
		ADEN, or E, Clock					SUEZ, or W, Clock								
Aden (E), and Suez (W) $\Delta L = 0^h\ 50^m$	May 25	− 4·617	17 34	−0·039	−0·038	−0·039	− 8·931	16 36	−0·083	−0·089	−0·086	− 0·051	− 0·037	− 0·088	− 0·073
	" 26	5·615	17 31	·043	·044	·044	10·828	16 38	·078	·081	·079	·040	·042	·082	·068
	" 27	6·696	17 33	·047	·050	·049	12·665	16 35	·073	·073	·073	·060	·031	·091	·076
	" 28	7·899	17 34	·053	·054	·054	14·291	16 32	·071	·071	·071	·047	·039	·086	·072
	" 29	9·224	17 32	·061	·061	·061	16·082	16 36	·075	·075	·074	·025	·055	·080	·067
	" 30	10·836	17 34	·068	·068	·068	17·846	16 46	·077	·079	·078	·017	·065	·082	·068

TABLE XI. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL, FROM OBSERVATIONS OF TRANSITS WITH LOCAL CLOCKS, COMBINED BY CLOCK COMPARISONS.

BOMBAY (E), AND ADEN (W)

Astronomical Date		Instrumental Position at E	Instrumental Position at W	Epoch by E Clock, T_E	Corrected Difference of Observed Times at Epoch T_E reduced to Stars of North Aspect, M_N	Deduced Clock Difference, D at Epoch T_E	Apparent Difference of Longitude, $\delta L_N = D + M_N$
						h m 1 51	h m 1 51
1877				h m s	s	s	s
April	30	I.P.E.	I.P.E.	14 53 38	− 29·761	49·740	19·979
"	"	"	"	15 21 31	29·867	49·785	19·918
May	1	I.P.W.	I.P.W.	15 25 12	31·973	51·917	19·944
"	2	"	"	14 51 27	33·877	53·917	20·040
"	"	"	"	15 20 29	33·998	53·961	19·963
"	3	"	"	14 55 59	36·053	55·988	19·935
"	"	"	"	15 21 50	36·020	56·027	20·007
"	4	"	"	14 54 15	38·223	58·109	19·886
"	"	"	"	15 21 29	38·210	58·147	19·937
"	5	I.P.E.	"	14 52 12	40·216	60·195	19·979
"	"	"	"	15 22 23	40·271	60·244	19·973
"	7	"	I.P.E.	14 51 59	44·238	64·407	20·169
"	"	"	"	15 21 54	44·290	64·450	20·160
"	8	I.P.W.	"	14 53 3	46·292	66·348	20·056
"	"	"	"	15 20 15	46·340	66·382	20·042
"	9	"	"	14 54 40	47·977	68·129	20·152
"	"	"	"	15 21 32	47·996	68·163	20·167
						Mean	20·018

Mean δL_N = 1h 51m 20s·018; Whence δL_S = 1h 51m 19s·950

Correction for Relative Personal Equation: $H_N - C_N$ = − 0·030 $H_S - C_S$ = + 0·026

Ditto of Transcribing = 0·000* ... ... = 0·000*

ΔL_N = 1 51 19·988 ΔL_S = 1 51 19·976

Whence

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 1^h\ 51^m\ 19^s{\cdot}982$$

ADEN (E), AND SUEZ (W)

Astronomical Date		Instrumental Position at E	Instrumental Position at W	Epoch by E Clock, T_E	Corrected Difference of Observed Times at Epoch T_E Reduced to Stars of North Aspect, M_N	Deduced Clock Difference, D at Epoch T_E	Apparent Difference of Longitude, $\delta L_N = D + M_N$
						h m 0 49	h m 0 49
1877				h m s	s	s	s
May	25	I.P.E.	I.P.E.	16 42 5	+ 4·307	38·320	42·627
"	26	"	"	16 46 26	5·242	37·480	42·722
"	27	"	"	16 46 30	5·995	36·822	42·817
"	28	I.P.W.	I.P.W.	16 54 48	6·352	36·249	42·601
"	29	"	"	16 46 32	6·854	35·891	42·745
"	30	"	"	16 56 54	7·035	35·687	42·722
						Mean	42·706

Mean δL_N = 0h 49m 42s·706; Whence δL_S = 0h 49m 42s·670

Correction for Relative Personal Equation: $H_N - C_N$ = − 0·030 $H_S - C_S$ = + 0·026

Ditto of Transcribing = − 0·011† ... ... = − 0·011†

ΔL_N = 0 49 42·665 ΔL_S = 0 49 42·685

Whence

$$\Delta L = \tfrac{1}{2}(\Delta L_N + \Delta L_S) = 0^h\ 49^m\ 42^s{\cdot}675$$

* The records at both stations were transcribed by the same person. † Each Observer transcribed his own records of transits.

TABLE XII. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL, FROM THE DETERMINATION OF LOCAL CLOCK CORRECTIONS, COMBINED BY CLOCK COMPARISONS.

BOMBAY (E), AND ADEN (W)

Astronomical Date	Epoch T_E	E Clock: Instrumental Position	E Clock: Correction as by Stars of North Aspect	E Clock: Time	E Clock: Hourly Rate Correction r_E	W Clock: Instrumental Position	W Clock: Correction as by Stars of North Aspect	W Clock: Time (by E Clock)	W Clock: Hourly Rate Correction r_W	Deduced Clock Corrections at Epoch T_E: for E Clock ΔT_E	Deduced Clock Corrections at Epoch T_E: for W Clock ΔT_W	Difference of Clocks D, at Epoch T_E	Apparent Difference of Longitude δL_N = $D + \Delta T_E - \Delta T_W$
1877	h m s		s	h m s	s		s	h m s	s	s	s	h m s	h m s
April 30	16 8 36	*I. P. E.*	−17·648	16 39 23	−0·033	*I. P. E.*	+12·269	15 37 49	+0·064	−17·631	+12·302	1 51 49·861	1 51 19·928
May 1	15 43 43	*I. P. W.*	18·305	16 19 21	·030	*I. P. W.*	13·643	15 8 5	·060	18·287	13·679	51·944	19·978
„ 2	16 26 39	„	18·945	16 28 33	·030	„	15·105	16 24 45	·060	18·944	15·107	54·059	20·008
„ 3	15 52 51	„	19·697	16 16 18	·030	„	16·407	15 29 23	·059	19·685	16·430	56·073	19·958
„ 4	16 1 26	„	20·387	16 23 44	·028	„	17·873	15 39 7	·056	20·377	17·894	58·203	19·932
„ 5	16 5 33	*I. P. E.*	21·133	16 28 0	·035	„	19·245	15 43 6	·064	21·120	19·269	60·315	19·926
„ 7	15 53 40	„	22·451	16 11 35	·030	*I. P. E.*	21·907	15 35 45	·056	22·442	21·924	64·495	20·129
„ 8	15 46 4	*I. P. W.*	23·116	15 51 23	·023	„	23·284	15 40 44	·053	23·114	23·289	66·415	20·012
„ 9	15 54 37	„	23·606	16 14 14	·022	„	24·467	15 35 0	·052	23·599	24·484	68·203	20·120
												Mean	1 51 19·999

	North	South
	Mean δL_N = 1h 51m 19s·999	Whence δL_S = 1h 51m 19s·931
Correction for Relative Personal Equation	$H_N - C_N$ = − 0·030	$H_S - C_S$ = + 0·026
Ditto Transcribing Equation	= 0·000*	… = 0·000*
	ΔL_N = 1 51 19·969	ΔL_S = 1 51 19·957

Whence $\Delta L = \frac{1}{2}(\Delta L_N + \Delta L_S)$ = 1h 51m 19s·963

Value deduced in Table XI = 1 51 19·982

Final value of ΔL, Bombay-Aden, being the mean of the above = 1h 51m 19s·973

* The records at both stations were transcribed by the same person.

TABLE XII. DEDUCTION OF THE DIFFERENCE OF LONGITUDE, ΔL, FROM THE DETERMINATION OF LOCAL CLOCK CORRECTIONS, COMBINED BY CLOCK COMPARISONS.

ADEN (E), AND SUEZ (W)

Astronomical Date	Epoch T_E	E Clock				W Clock				Deduced Clock Corrections at Epoch T_E		Difference of Clocks D, at Epoch T_E	Apparent Difference of Longitude δL_N = $D + \Delta T_E - \Delta T_W$
		Instru-mental Position	Correction as by Stars of North Aspect	Time	Hourly Rate Correction r_E	Instru-mental Position	Correction as by Stars of North Aspect	Time (by E Clock)	Hourly Rate Correction r_W	for E Clock ΔT_E	for W Clock ΔT_W		
1877	h m s		s	h m s	s		s	h m s	s	s	s	h m s	h m s
May 25	16 41 4	*I. P. E.*	− 4·589	16 42 59	− 0·037	*I. P. E.*	− 8·830	16 39 8	− 0·088	− 4·588	− 8·833	0 49 38·321	0 49 42·566
"	18 18 45	"	4·645	18 25 20		"	9·031	18 12 9		4·641	9·041	38·238	42·638
" 26	16 40 11	"	5·558	16 41 13	·042	"	10·704	16 39 8	·082	5·557	10·705	37·484	42·632
"	18 18 33	"	5·672	18 21 39		"	10·952	18 15 27		5·670	10·956	37·419	42·705
" 27	16 41 6	"	6·666	16 43 1	·031	"	12·551	16 39 10	·091	6·665	12·554	36·828	42·717
"	18 16 28	"	6·726	18 22 4		"	12·779	18 10 51		6·723	12·788	36·732	42·797
" 28	16 46 0	*I. P. W.*	7·880	16 52 48	·039	*I. P. W.*	14·190	16 39 11	·086	7·876	14·200	36·256	42·580
"	18 9 58	"	7·917	18 15 35		"	14·392	18 4 20		7·913	14·400	36·191	42·678
" 29	16 41 9	"	9·165	16 43 5	·055	"	15·961	16 39 13	·080	9·163	15·964	35·893	42·694
"	18 16 58	"	9·282	18 21 42		"	16·203	18 12 13		9·278	16·209	35·853	42·784
" 30	16 51 5	"	10·781	16 43 6	·065	"	17·734	16 59 3	·082	10·790	17·723	35·689	42·622
"	18 18 52	"	10·891	18 25 28		"	17·957	18 12 15		10·884	17·966	35·664	42·746
												Mean	0 49 42·680

Mean δL_N = 0h 49m 42s·680	Whence δL_S = 0h 49m 42s·644
Correction for Relative Personal Equation, $H_N - C_N$ = −0·030	$H_S - C_S$ = + 0·026
Ditto Transcribing Equation = −0·011*	... = − 0·011*
ΔL_N = 0 49 42·639	ΔL_S = 0 49 42·659

Whence $\Delta L = \frac{1}{2}(\Delta L_N + \Delta L_S)$ = 0h 49m 42s·649

Value deduced in Table XI = 0 49 42·675

Final value of ΔL, Aden-Suez, being the mean of the above = 0h 49m 42s·662

* Each Observer transcribed his own records of transits.

PART II.

APPENDIX.

PART II.

APPENDIX.

1.

Situations of the Longitude Stations at Bombay, Aden and Suez.

The longitude station at Bombay was the same as that used for the Indian Electro-telegraphic Longitude Operations, and its geodetic elements by the Great Trigonometrical Survey of India are given in *Table C* of the Appendix to Part I of this volume.

The station at Aden was situated a few yards to the north of the Offices of the Eastern Telegraph Company at Telegraph Bay. Its latitude was determined by star observations, and a base-line was measured, and a triangulation executed in order to connect it with some of the prominent land marks of Aden, as well as with two important points, *viz.*, that at which Pendulum Observations were made by Captain Heaviside, R.E., in 1873, and that used by Lord Lindsay's party for Chronometric Determinations of longitude, in connection with his Transit of Venus expedition in 1874. All necessary particulars of this triangulation, with the results obtained, will be found in the next section, in *Tables a, b, c* and *d*, and in Plate VI.

The station at Suez was the same as that occupied by Mr. Hunter for observations of the Transit of Venus in 1874, and its longitude, east of Greenwich, was electrically determined at that time as $2^h\ 10^m\ 13^s{\cdot}17$, *vide* the *Account of Observations of the Transit of Venus*, 1874, *British observations*, page 346. The station was situated on an artificial mound on which a building known as the Khedive's Chalet stands, with a flag-staff alongside of it. The exact position of the station was identified by the measurement of the following distances which were given by Mr. Hunter to fix it, *viz*:—

from station to S.E. corner of Chalet 91 feet 9 inches
" " Flag-staff 49 " 3 "

The pillars marking a point used for Lord Lindsay's chronometric longitude observations at Suez were found, and connected with the longitude station by a traverse, the result of which showed them to be $0^s{\cdot}025$ west of the latter point.

2.

Survey Operations at Aden.

The Aden Survey Operations were conducted by Messrs. J. Bond and E. J. Connor, Assistant Surveyors, under Captain Heaviside's supervision. A short base-line was laid out along the road running across the flat bottom of the valley between the cantonment at Steamer Point, and the Telegraph Company's Offices at Telegraph Bay. The measurement was made with a steel tape of 50 feet length, which had previously been compared for this purpose with a standard 10-foot bar and found practically errorless. The results of two measurements made by different persons, one in the early morning and the other in the evening, gave the length as 1317·67 and 1317·57 feet respectively, the mean of which, 1317·62 feet was adopted. The site of the base-line was only a very few feet above sea level, and no reduction was required on that account.

A triangulation was extended from the base-line, all the angles being observed with a 10-inch theodolite; and full particulars, with the results obtained, will be found in *Tables b, c* and *d* and in Plate VI.

Referring to the Chart in Plate VI, stations I and II are the north and south ends of the Base-Line; they were not marked in a permanent manner. III is the point used as the latitude station. IV was originally selected to afford a meridional referring mark for the transit instrument. V, VII and VIII were chosen on convenient hills merely for the extension of the triangulation, and were of no importance in themselves. VI is Lord Lindsay's longitude station, standing in the vicinity of Captain Heaviside's pendulum station. IX is the most conspicuous hill peak of Aden; X and XI were introduced for the purpose of fixing the Marshag Light-house. Of these only stations III, IV, VI and IX require description here.

Station III, or the latitude station, was on a point laid down 18 feet due east of the longitude station. The latter was the central point between the two pillars supporting the transit telescope, which were built on the hill slope above, and about 50 yards north of, the Telegraph Office. These pillars were left standing after the completion of the observations. Station III was marked by a circle and dot engraved on a stone which was embedded in a masonry pillar flush with the surface of the ground. Star observations for latitude were made at station III by Captain Heaviside, using a 10-inch theodolite. An abstract of these will be found in *Table a*, and the result, *viz.* 12° 46′ 27″, was adopted as the initial latitude for the triangulation. The scale of the chart on Plate VI is too small to admit of the longitude station being shown distinct from station III.

Station IV, was situate on a low spur of the Sham-sham hill range, running westward to within a short distance of the coast. It was marked by a rectangular pillar of masonry, 4 feet 3 inches high, with a dot and circle engraved on its upper surface almost exactly on the meridian of the longitude station. The azimuth of station IV from station III was determined by observations of Polaris taken at the latter point, as 179° 19′ 1″, which was adopted as the initial azimuth for the triangulation.

Station VI, or Lord Lindsay's longitude station. At the time of these operations—May 1877—this point was marked by an old cannon embedded in the ground nearly opposite the middle building of the "Prince of Wales' Crescent", but the Aden Municipality were then preparing a stone for the purpose of marking the site. The outer wall of the room in which Captain Heaviside took his Pendulum Observations in 1873, is 86 feet distant from station VI, measured in a direction 27° west of south from that point.

Station IX, or Sham-sham station, was situated on the most conspicuous peak in Aden, within a few feet of the signalling flag-staff. It was marked by a masonry pillar 3 feet in diameter, with two mark-stones—having a dot and circle engraved on each—one flush with the surface of the ground, and the other 18 inches below it. The signalling flag-staff was fixed as an intersected point, *vide Table d*, but the scale of the chart in Plate VI does not allow of its being shown distinct from station IX.

3.

Results of the Triangulation.

In *Table b* the observed and corrected angles, and the log feet of the computed sides are given. *Table c* contains the latitudes, longitudes and azimuths of the stations of the triangulation deduced from the data afforded in *Table b*. *Table d* gives the latitudes and longitudes of a few prominent points fixed by intersection from the stations of the triangulation.

4.

Right Ascensions of Clock Stars.

The mean right ascensions of all the clock stars observed for the determination of the differential longitudes Bombay-Aden and Aden-Suez, as deduced from the different Catalogues employed, for 1st January 1877 are given in *Table e*. In the last column the right ascensions adopted for use are entered. The method followed is described in Sections 12 and 13, Chapter II, Part II.

TABLE a. ADEN TRIANGULATION. ABSTRACT OF STAR OBSERVATIONS FOR THE LATITUDE OF STATION NO. III.

Star's Name	Aspect	Approximate Zenith Distance	Date of Observation	Latitude by a Single Observation	Mean by each Star	Mean by each Pair
		° ′	1877	° ′ ″	° ′ ″	° ′ ″
α Boötis	N	7 3	May 24th	12 46 27	12 46 29	
"	"	"	" 31st	12 46 31		12 46 29
υ Leonis	S	12 55	" 31st	12 46 29	12 46 29	
ε³ Boötis	N	14 49	May 31st	12 46 25	12 46 25	
δ Ophiuchi	S	16 9	" 31st	12 46 17	12 46 28	12 46 27
"	"	"	June 1st	12 46 39		
ξ Herculis	N	19 3	June 1st	12 46 29	12 46 29	
β Libræ	S	21 42	May 31st	12 46 11	12 46 19	12 46 24
"	"	"	June 1st	12 46 27		
Polaris	N	76 2	May 23rd	12 46 30		
"	"	"	" 24th	12 46 32	12 46 29	12 46 29
"	"	"	" 24th	12 46 26		
					Mean Resulting Latitude ...	12 46 27

TABLE b. ADEN TRIANGULATION. COMPUTATION OF TRIANGLES.

No. of Triangle	Names of Stations	Observed Angles	Corrections	Corrected Angles	Distance in Log feet	Remarks
		° ′ ″	″	° ′ ″		
1	Station II	104 15 23	− 6	104 15 17	3·4033198	
	„ I	45 26 48	− 6	45 26 42	3·2697336	
	„ IV	30 18 6	− 5	30 18 1	3·1197902	Base-line 1317·62 feet
	Sums ...	180 0 17	−17	180 0 0		
2	Station II	91 5 4	− 4	91 5 0	3·7881828	
	„ I	76 31 43	− 4	76 31 39	3·7761419	
	„ VII	12 23 25	− 4	12 23 21	3·1197902	Ditto.
	Sums ...	180 0 12	−12	180 0 0		
3	Station II	67 49 11	− 5	67 49 6	3·4783393	
	„ I	88 15 25	− 6	88 15 19	3·5115309	
	„ V	23 55 40	− 5	23 55 35	3·1197902	Ditto.
	Sums ...	180 0 16	−16	180 0 0		
4	Station I	42 48 38	+ 4	42 48 42	3·3159801	
	„ V	56 11 53	+ 5	56 11 58	3·4033228	
	„ IV	80 59 15	+ 5	80 59 20	3·4783393	From triangle No. 3
	Sums ...	179 59 46	+14	180 0 0		
5	Station I	16 44 1	0	16 44 1	3·1861593	
	„ IV	134 55 31	0	134 55 31	3·5769345	
	„ III	28 20 28	0	28 20 28	3·4033213	Mean value from triangles Nos. 1 and 4
	Sums ...	180 0 0	0	180 0 0		
6	Station III	94 23 29	+ 4	94 23 33	3·7883547	
	„ I	47 48 57	+ 4	47 49 1	3·6594523	
	„ VII	37 47 22	+ 4	37 47 26	3·5769345	From triangle No. 5
	Sums ...	179 59 48	+12	180 0 0		
7	Station I	11 43 42	− 8	11 43 34	3·5123740	
	„ V	157 26 42	− 8	157 26 34	3·7882639	
	„ VII	10 50 0	− 8	10 49 52	3·4783393	From triangle No. 3
	Sums ...	180 0 24	−24	180 0 0		

TABLE b. ADEN TRIANGULATION. COMPUTATION OF TRIANGLES—(*Continued*).

No. of Triangle	Names of Stations	Observed Angles	Corrections	Corrected Angles	Distance in Log feet	Remarks
		° ′ ″		° ′ ″		
8	Station VII	65 52 45	− 4	65 52 41	3·7491564	
	„ I	27 3 45	− 3	27 3 42	3·4468019	
	„ VIII	87 3 41	− 4	87 3 37	3·7882671	Mean value from triangles Nos. 2, 6 and 7
	Sums ...	180 0 11	−11	180 0 0		
9	Station II	23 15 53	− 7	23 15 46	3·5122564	
	„ V	133 31 3	− 7	133 30 56	3·7761660	
	„ VII	23 13 24	− 6	23 13 18	3·5115309	From triangle No. 8
	Sums ...	180 0 20	−20	180 0 0		
10	Station VII	55 2 46	− 1	55 2 45	3·4510394	
	„ V	54 15 12	− 1	54 15 11	3·4467766	
	„ VIII	70 42 6	− 2	70 42 4	3·5123152	Mean value from triangles Nos. 7 and 9
	Sums ...	180 0 4	− 4	180 0 0		
11	Station VII	114 58 53	− 3	114 58 50	3·8954746	
	„ VIII	46 12 0	− 2	46 11 58	3·7965191	
	„ IX	18 49 14	− 2	18 49 12	3·4467893	Mean value from triangles Nos. 8 and 10
	Sums ...	180 0 7	− 7	180 0 0		
12	Station III	22 28 24	− 1	22 28 23	3·7967957	
	„ VII	141 21 0	− 2	141 20 58	4·0100298	
	„ IX	16 10 40	− 1	16 10 39	3·6594523	From triangle No. 6
	Sums ...	180 0 4	− 4	180 0 0		
13	Station V	47 41 6	+ 2	47 41 8	3·8954700	
	„ VIII	116 54 6	+ 3	116 54 9	3·9768112	
	„ IX	15 24 41	+ 2	15 24 43	3·4510394	From triangle No. 10
	Sums ...	179 59 53	+ 7	180 0 0		
14	Station IX	124 29 36	+ 2	124 29 38	4·1980560	
	„ VIII	31 15 43	+ 1	31 15 44	3·9971607	
	„ X	24 14 37	+ 1	24 14 38	3·8954723	Mean value from triangles Nos. 11 and 13
	Sums ...	179 59 56	+ 4	180 0 0		

TABLE b. ADEN TRIANGULATION. COMPUTATION OF TRIANGLES—(*Continued*).

No. of Triangle	Names of Stations	Observed Angles	Correc-tions	Corrected Angles	Distance in Log feet	REMARKS
		° ′ ″		° ′ ″		
15	Station IX	36 40 10	− 5	36 40 5	3·9702602	
	" X	103 53 18	− 5	103 53 13	4·1812733	
	" XI	39 26 47	− 5	39 26 42	3·9971607	From triangle No. 14
	Sums ...	180 0 15	−15	180 0 0		
16	Station VIII	151 3 59	− 6	151 3 53	3·9989785	
	" IX	6 31 38	− 5	6 31 33	3·3698675	
	" VI	22 24 40	− 6	22 24 34	3·8954723	Mean value from triangles Nos. 11 and 13
	Sums ...	180 0 17	−17	180 0 0		
17	Station VIII	34 9 53	− 4	34 9 49	3·2004370	
	" V	56 3 0	− 5	56 2 55	3·3698649	
	" VI	89 47 21	− 5	89 47 16	3·4510394	From triangle No. 10
	Sums ...	180 0 14	−14	180 0 0		
18	Station IX	8 53 3	+ 3	8 53 6	3·2003700	
	" V	103 44 6	+ 4	103 44 10	3·9989751	
	" VI	67 22 40	+ 4	67 22 44	3·9768112	From triangle No. 13
	Sums ...	179 59 49	+11	180 0 0		

TABLE c. ADEN TRIANGULATION. LATITUDES, LONGITUDES AND AZIMUTHS OF STATIONS.

Name of Station		Latitude North			Longitude East of Greenwich			Azimuth					
		°	′	″	°	′	″			°	′	″	
Longitude Station		12	46	27·00	44	58	57·45*	Of Station	III	270	0	0	Observed
Latitude Station	III	12	46	27·00†	44	58	57·65	„	IV	179	19	1 ‡	
Station	I	12	46	59·74	44	58	39·14	„	III	330	58	29	
„	IV	12	46	42·23	44	58	57·47	„	III	359	19	1	
„	II	12	46	46·67	44	58	39·21	„	I	179	41	10	
„	V	12	46	59·00	44	59	9·54	„	I	91	25	53	
„	VI	12	47	14·70	44	59	10·61	„	V	3	41	32	
„	VII	12	46	45·87	44	59	39·59	„	III	65	22	15	
„	VIII	12	47	13·12	44	59	34·21	„	I	76	5	58	
„	IX	12	46	30·82	45	0	41·02	„	III	87	50	52	
„	X	12	47	8·80	45	2	13·65	„	VIII	91	35	17	
„	XI	12	45	54·37	45	3	9·86	„	X	143	27	38	

* Determined as under

		h	m	s
Longitude of Suez Longitude Station, East of Greenwich, *vide* page (109) ...	=	2	10	13·17
„ Aden „ East of Suez, *Table XII*	=	0	49	42·66
Whence, Longitude of Aden Longitude Station, East of Greenwich, = 44° 58′ 57″·45	=	2	59	55·83

† Determined by star observations, *vide Table a.* ‡ Determined by observations of Polaris.

TABLE d. ADEN TRIANGULATION. LATITUDES AND LONGITUDES OF INTERSECTED POINTS.

Name of Point	Latitude North			Longitude East of Greenwich		
	°	′	″	°	′	″
Harbour Light Ship	12	47	20·5	44	58	17·6
Renny's Flag-staff	12	47	3·5	44	58	41·7
Saluting pier „	12	47	20·9	44	58	57·5
Residency „	12	46	45·1	44	58	28·2
Sham-sham „	12	46	30·3	45	0	40·9
Marshag Light-house	12	45	43·0	45	3	18·8

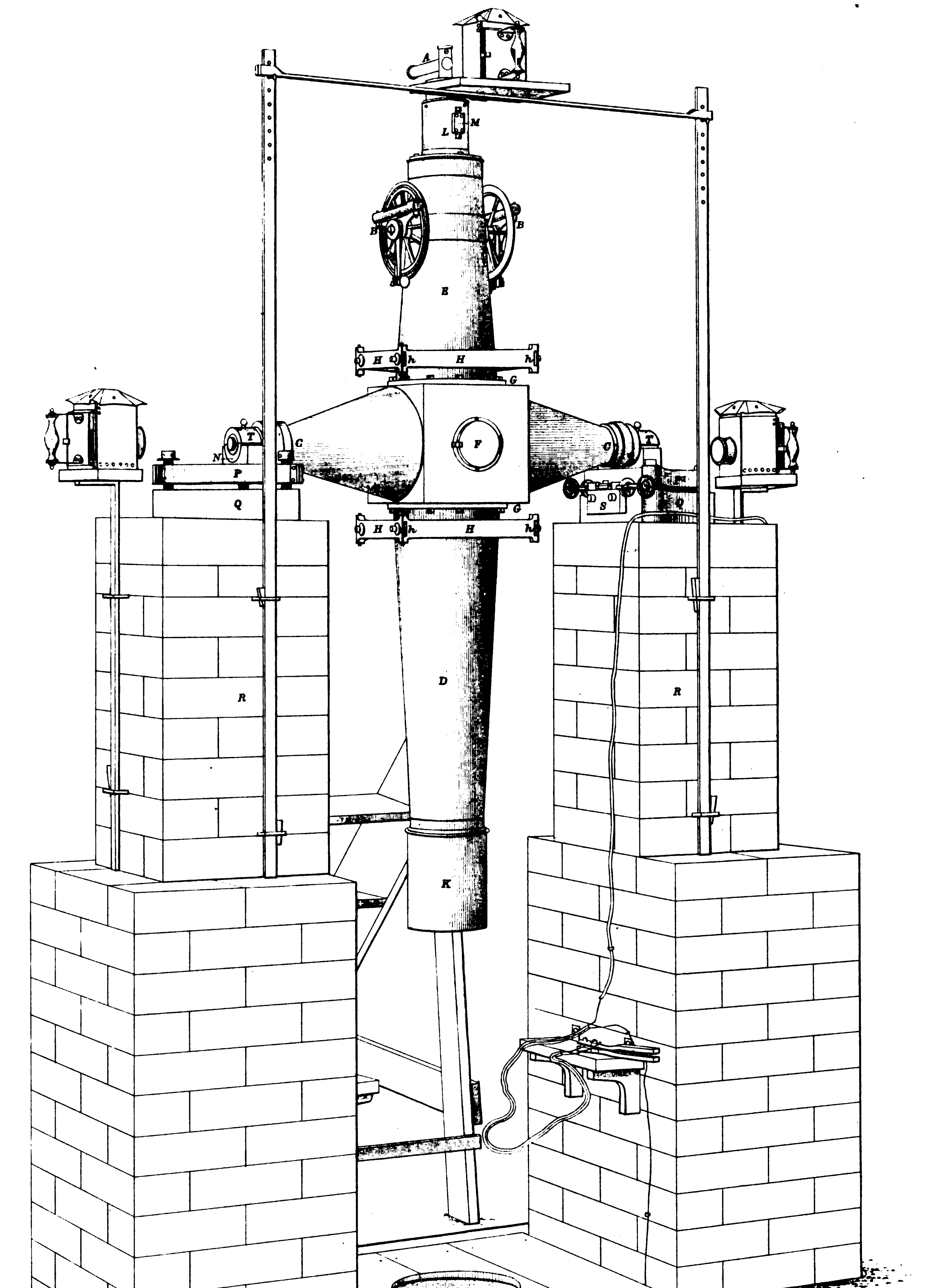
TABLE e. DEDUCTION OF THE MEAN RIGHT ASCENSIONS OF CLOCK STARS, ON JANUARY 1, 1877.

Name of Star	Mean R. A. on 1877·0 as Deduced from each Catalogue Employed												Final Value of Mean R. A. for 1877·0 Adopted
	Greenwich Catalogues									United States Naval Observatory Catalogue for 1860·0			
	Seven-Year for 1860			Seven-Year for 1864			Nine-Year for 1872						
	No. of Star	No. of Observations	Seconds of R. A.	No. of Star	No. of Observations	Seconds of R. A.	No. of Star	No. of Observations	Seconds of R. A.	No. of Star	No. of Observations	Seconds of R. A.	
			s			s			s			s	h m s
51 Virginis θ	1039	29	34·912	1549	18	34·898	1213	39	34·934	5470	120	34·942	13 3 34·932
17 Canum Venat.	...	...	...	1554	4	24·212	1217	1	24·251	...	...	...	13 4 24·220
Ursæ Majoris	...	...	...	...	...	...	1236	5	56·124	...	...	...	13 23 56·124
79 Virginis ζ	1083	60	25·592	1589	84	25·564	1245	91	25·579	5595	91	25·608	13 28 25·586
Canum Venat.	1085	2	18·389	...	...	...	...	...	...	5600	5	18·238	13 29 18·281
10 Draconis ι	1119	3	50·437	1614	5	50·399	1272	7	50·425	5743	3	50·491	13 47 50·431
8 Boötis η	1121	57	49·711	1615	62	49·690	1275	70	49·687	5747	251	49·699	13 48 49·697
93 Virginis τ	1124	50	23·248	1623	34	23·224	1280	29	23·241	5796	59	23·245	13 53 23·241
11 Boötis	...	...	...	1624	6	35·855	1281	5	35·816	5799	3	35·858	13 55 35·842
12 Boötis d	...	...	...	1637	6	47·374	1293	3	47·357	5862	6	47·413	14 4 47·386
16 Boötis α	1141	130	3·101	1647	105	3·065	1304	164	3·064	5889	368	3·095	14 10 3·085
25 Boötis ρ	1153	62	31·755	1665	35	31·727	1322	28	31·720	6000	34	31·709	14 26 31·733
36 Boötis ε²	1170	72	36·913	1679	64	36·907	1335	66	36·901	6078	222	36·888	14 39 36·897
27 Libræ β	1216	63	23·316	1719	43	23·299	1368	46	23·339	6276	225	23·300	15 10 23·307
9 Serpentis τ¹	...	...	...	1738	12	5·158	...	...	...	6352	5	5·213	15 20 5·174
5 Coronæ α	1238	92	28·847	1752	79	28·813	1391	92	28·805	6421	227	28·803	15 29 28·813
24 Serpentis α	1251	86	12·600	1764	52	12·589	1405	74	12·586	6487	237	12·586	15 38 12·589
14 Scorpii ν	1295	1	50·877	1830	15	50·868	1457	7	50·904	6694	25	50·839	16 4 50·858
1 Ophiuchi δ	1304	71	53·979	1837	34	53·970	1461	75	54·007	6716	183	53·979	16 7 53·984
20 Herculis γ	1317	35	29·687	1855	35	29·645	1476	36	29·654	6774	2	29·807	16 16 29·665
24 Herculis ω	1326	3	44·135	...	...	...	1483	4	44·373	...	...	...	16 19 44·271
21 Ursæ Minoris η	1332	3	7·414	1866	1	7·245	1486	3	7·228	6805	3	7·274	16 21 7·314
21 Scorpii α	1330	50	52·045	1864	30	52·030	1487	31	52·040	6802	194	52·049	16 21 52·046
14 Draconis η²	1334	39	19·933	1868	12	19·733	1491	20	19·694	6807	22	19·808	16 22 19·826
10 Ophiuchi λ	1340	16	42·671	1873	15	42·628	1495	16	42·611	...	...	...	16 24 42·637
13 Ophiuchi ζ	1347	36	23·197	1884	26	23·190	1506	30	23·196	6849	55	23·179	16 30 23·189
40 Herculis ζ	1355	40	39·022	1891	39	39·033	1521	51	39·005	6906	34	38·985	16 36 39·012
49 Herculis	...	...	...	1905	6	28·893	...	...	...	...	...	...	16 46 28·893
27 Ophiuchi κ	1371	62	50·729	1913	31	50·756	1539	66	50·771	7031	91	50·771	16 51 50·759
60 Herculis	1382	3	40·514	1922	4	40·511	...	...	...	7093	4	40·469	16 59 40·497

TABLE e. DEDUCTION OF THE MEAN RIGHT ASCENSIONS OF CLOCK STARS, ON JANUARY 1, 1877—(*Continued*).

Name of Star	Mean R. A. on 1877·0 as Deduced from each Catalogue Employed												Final Value of Mean R. A. for 1877·0 Adopted
	Greenwich Catalogues									United States Naval Observatory Catalogue for 1860·0			
	Seven-Year for 1860			Seven-Year for 1864			Nine-Year for 1872						
	No. of Star	No. of Observations	Seconds of R. A.	No. of Star	No. of Observations	Seconds of R. A.	No. of Star	No. of Observations	Seconds of R. A.	No. of Star	No. of Observations	Seconds of R. A.	
			s			s			s			s	h m s
35 Ophiuchi η	1384	49	19·457	1925	30	19·443	1562	32	19·459	7106	38	19·424	17 3 19·446
64 Herculis α¹	1395	57	2·347	1936	37	2·324	1573	60	2·331	7155	222	2·304	17 9 2·317
42 Ophiuchi θ	1405	43	27·357	1942	19	27·354	1584	30	27·368	7197	66	27·332	17 14 27·348
49 Ophiuchi σ	1410	68	24·718	1950	31	24·708	1595	55	24·714	7248	5	24·766	17 20 24·716
23 Draconis β	1415	45	39·279	1955	12	39·198	1603	39	39·211	7305	26	39·169	17 27 39·226
55 Ophiuchi α	1416	105	13·456	1957	89	13·453	1604	135	13·472	7315	250	13·404	17 29 13·437
60 Ophiuchi β	1428	73	23·731	1968	53	23·744	1617	101	23·754	7382	19	23·751	17 37 23·745
86 Herculis μ	1433	54	38·701	1975	47	38·708	1626	109	38·693	7421	77	38·687	17 41 38·695
89 Herculis	1438	10	27·512	1982	30	27·474	1634	18	27·472	7537	3	27·407	17 50 27·476
33 Draconis γ	1445	83	44·999	1985	19	45·043	1639	59	44·965	7573	94	44·999	17 53 44·994
72 Ophiuchi	1460	69	31·068	2000	76	31·070	1660	114	31·094	7649	2	31·113	18 1 31·080
13 Sagittarii μ	1464	81	24·361	2010	51	24·377	1666	71	24·430	7695	237	24·377	18 6 24·383
58 Serpentis η	1479	47	56·685	2025	24	56·689	1678	21	56·710	7771	13	56·701	18 14 56·693
10 Lyræ β¹	1518	124	32·311	2071	64	32·294	1721	79	32·314	7999	256	32·261	18 45 32·285
13 Lyræ	1536	32	35·507	2090	13	35·448	1731	34	35·511	...	...	...	18 51 35·499
13 Aquilæ ε	1538	67	2·321	2094	69	2·328	1734	84	2·365	8072	3	2·299	18 54 2·339
17 Aquilæ ζ	1545	117	45·300	2102	73	45·313	1744	103	45·375	8123	235	45·264	18 59 45·300
18 Lyræ ι	...	...	...	2109	5	54·797	1748	15	54·787	8164	2	54·764	19 2 54·787

TRANSIT TELESCOPE BY MESSRS T. COOKE & SONS, YORK.



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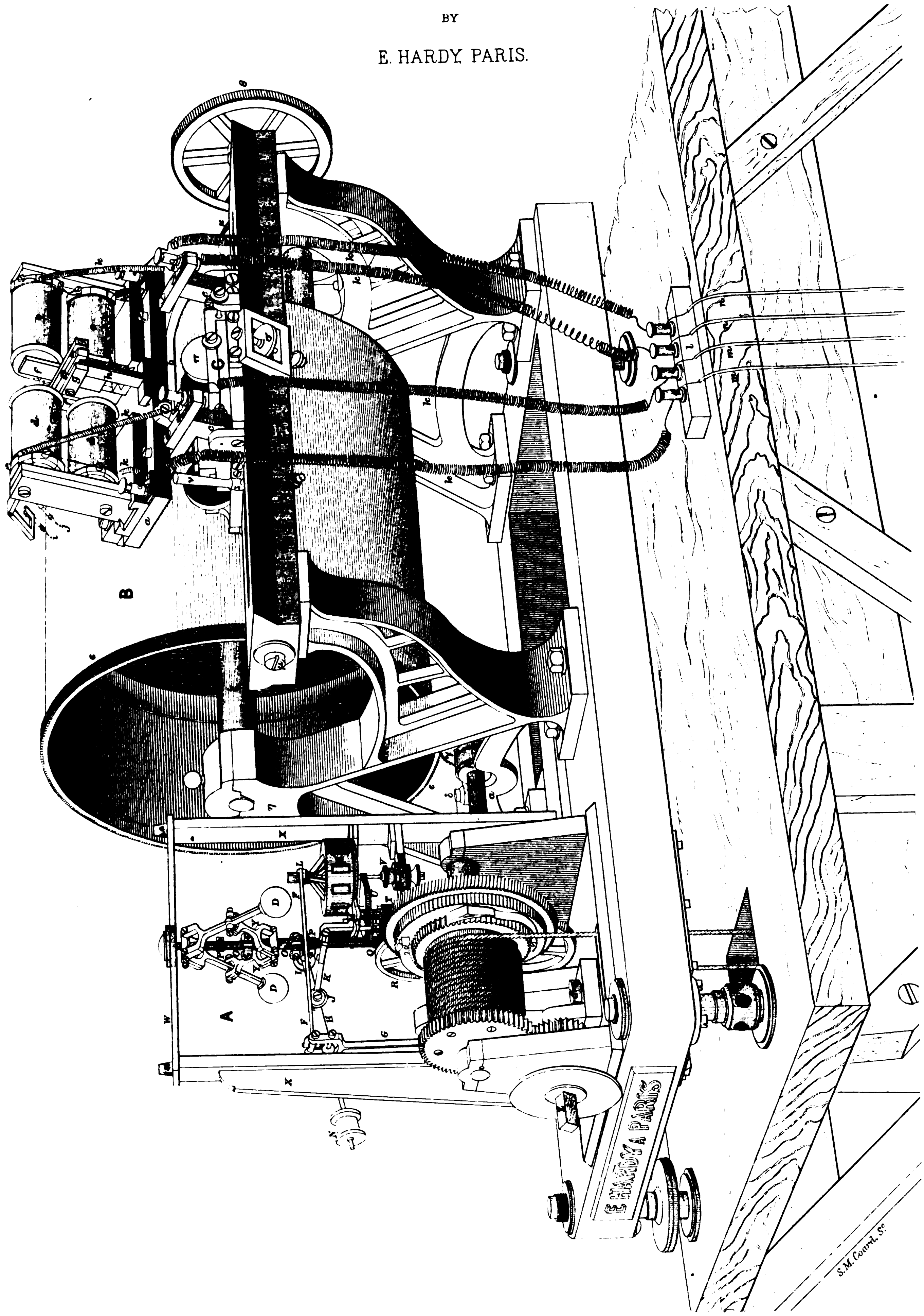
S.M. Coard. Sc.

CHRONOGRAPH

BY

E. HARDY, PARIS.



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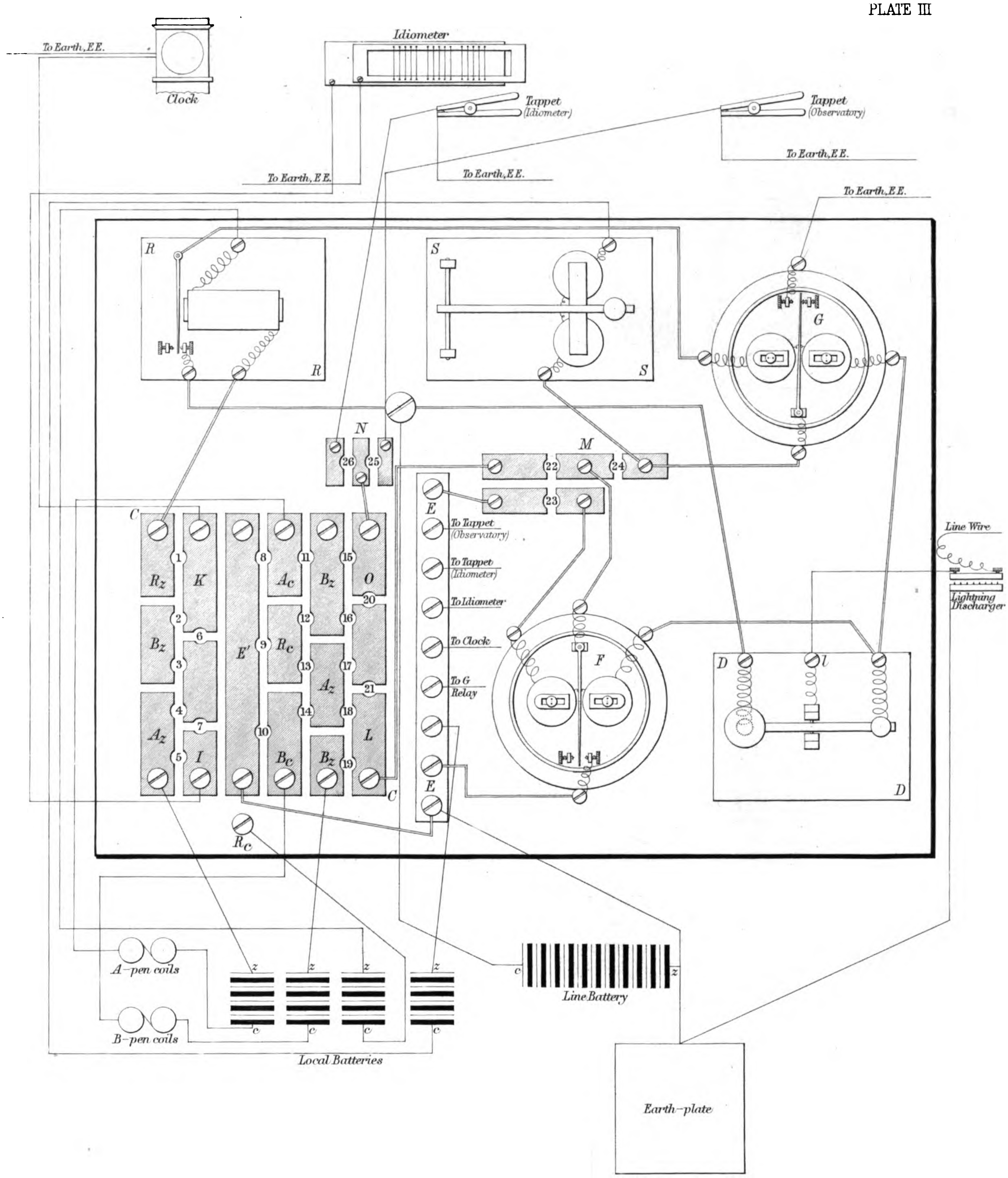
COMMUTATOR BOARD

Scale about ⅓ real size.

PLATE III



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T.B. Rodger Sc.

IDIOMETER.

DESIGNED BY

LT-COLONEL W. M. CAMPBELL, R. E.

Scale about ⅛ real size.

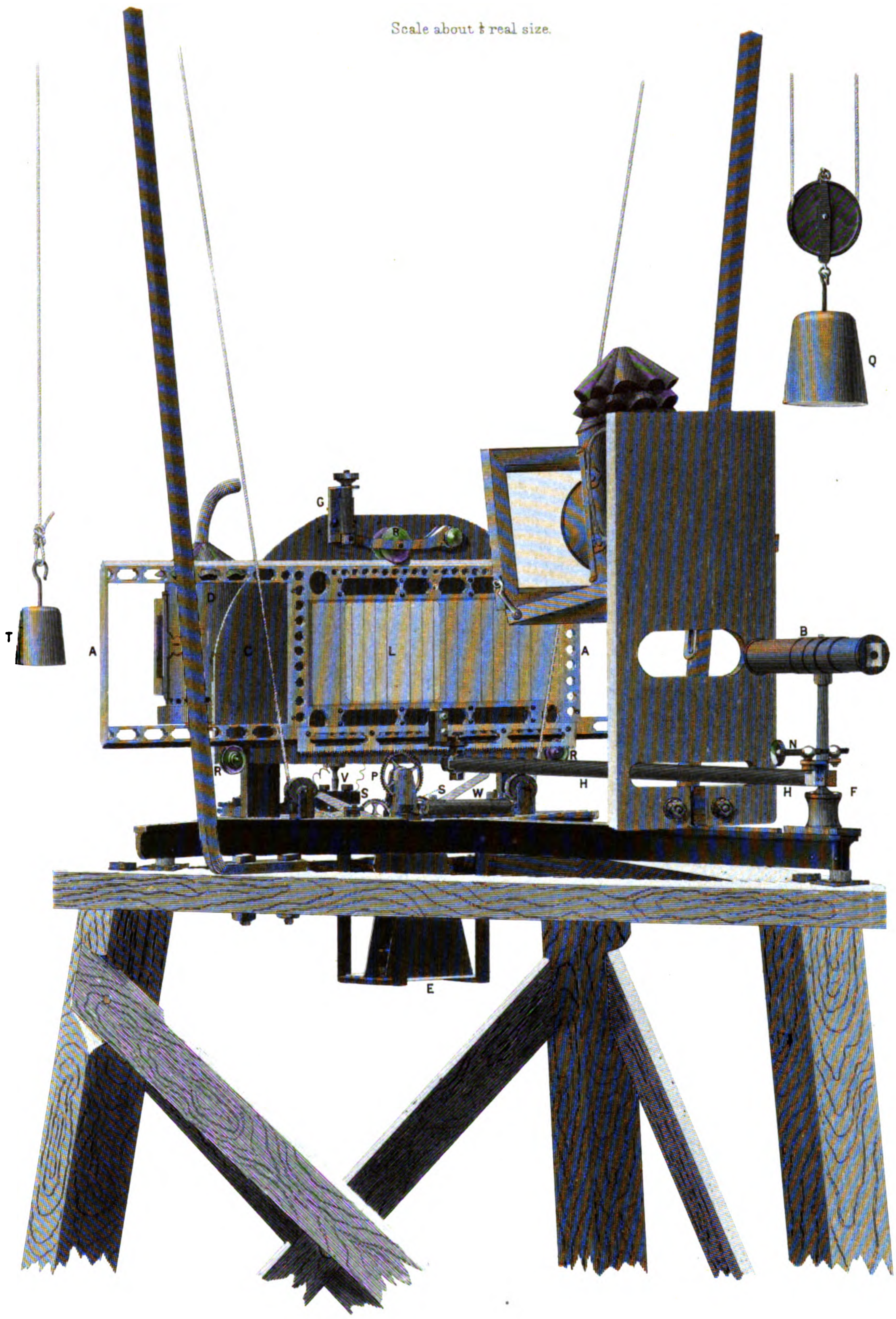

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PLATE V.

BELLARY CONNECTION. FIGURES 1 AND 2

Fig: 1.

Scale 1 Inch = 4 Miles

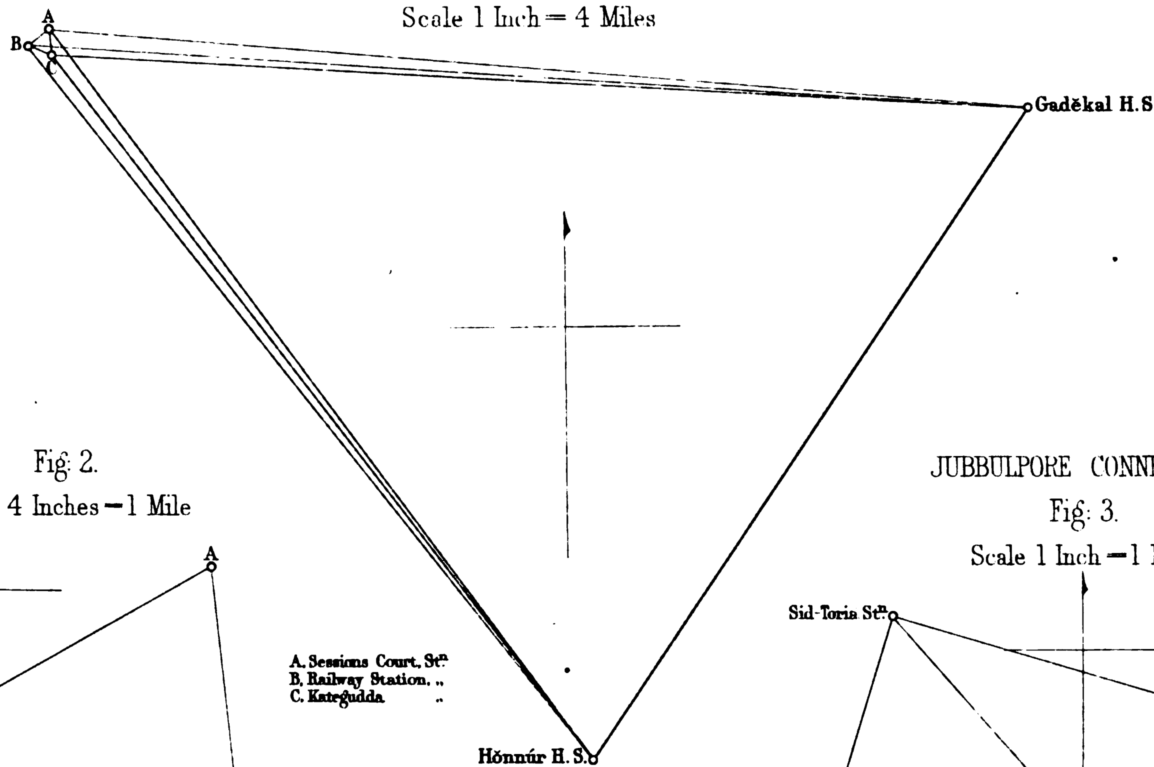
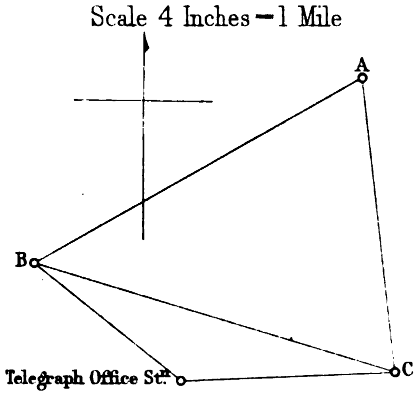


Fig: 2.

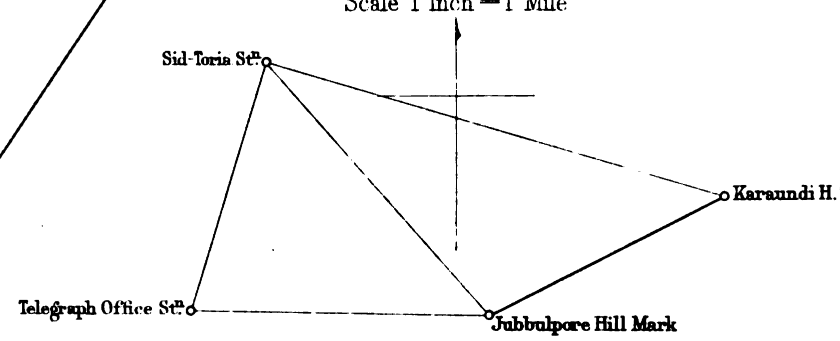
Scale 4 Inches = 1 Mile



JUBBULPORE CONNECTION

Fig: 3.

Scale 1 Inch = 1 Mile



AGRA CONNECTION

Fig: 4.

Scale 1 Inch = 5 Miles

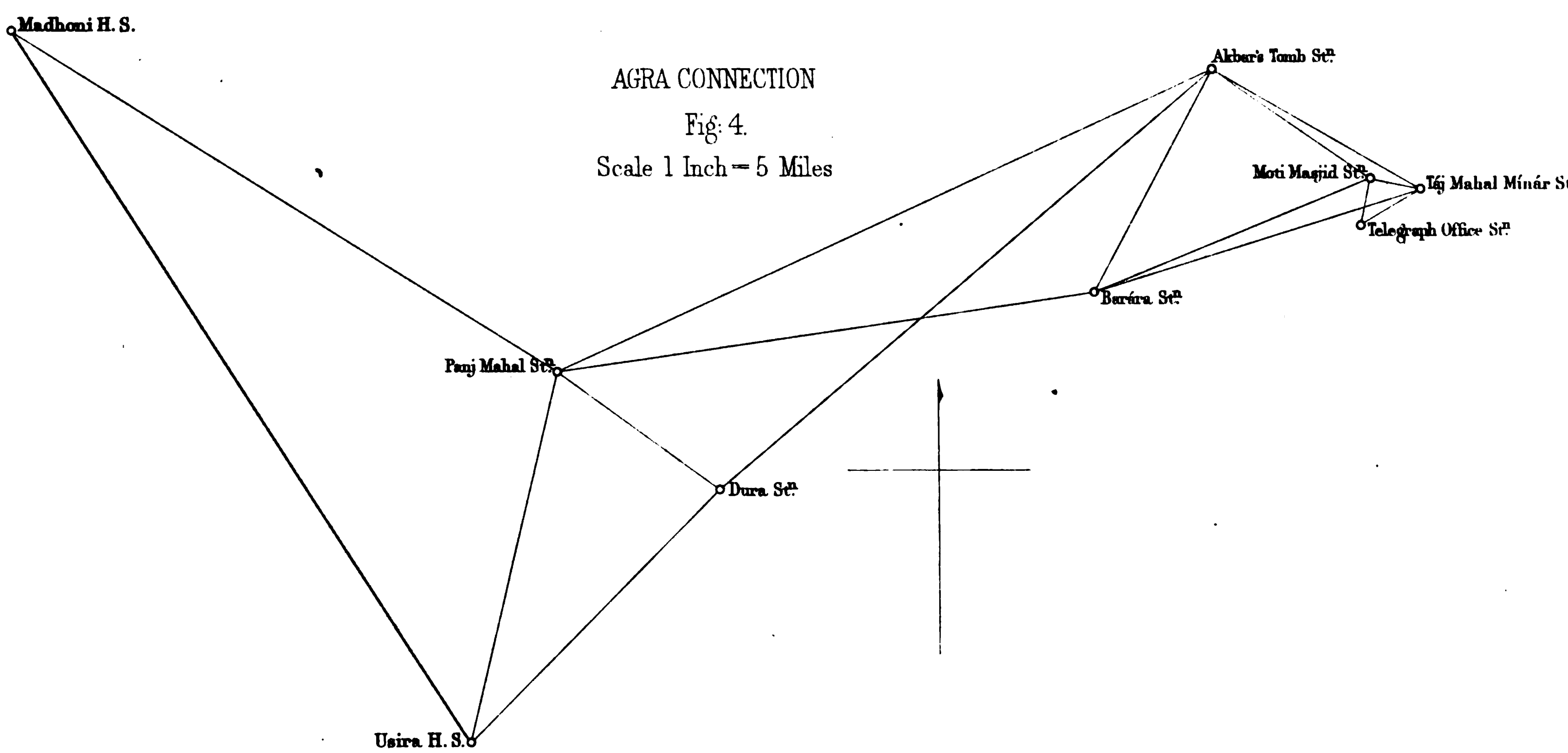


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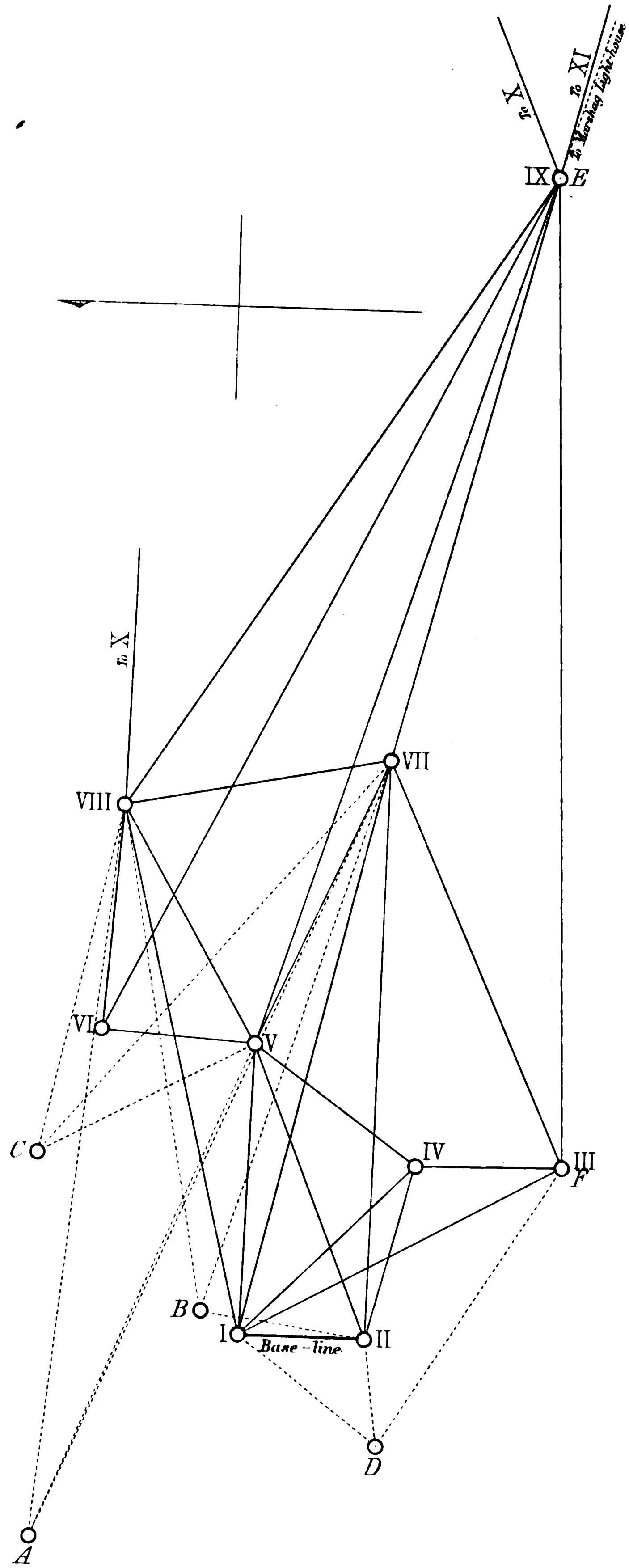
CHART OF THE TRIANGULATION AT ADEN.

Scale 1 Inch = 3 Miles



REFERENCES

A. *Harbour Light-Ship*
B. *Renny's .... Flag-Staff*
C. *Saluting Pier ....*
D. *Residency ....*
E. *Sham-Sham ....*
F. *Longitude Station*

The Scale does not admit of E and F being shown distinct from Stations IX and III respectively.

Engraved at the Surveyor General's Office, Calcutta, February 1883.

T. B. Rodger Sc.

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February, 1883.