APPENDIX.

No. VI.

DETERMINATION

OF THE

LONGITUDE OF VALENTIA IN IRELAND

BY

TRANSMISSION OF CHRONOMETERS.

APPENDIX.

Account of the Measurement of the Astronomical Difference of Longitude on the Arc of Parallel extending from Greenwich to the Island of Valentia in the South-west of Ireland, and Comparison with the Geodetic Difference of Longitude.

For the sake of clearness, this Memoir will be divided into the following Sections:—

Section I.—Introduction, and Selection of Stations.

Section II.—Description of the route selected for the chronometers, of the subdivisions of the arc, of the method of conveying the chronometers, and of the transit-stations.

Section III.—Method of adopting instrumental errors of the transit-instruments; determination of clock-error; and method of using the stationary chronometers.

Section IV.—Transits at Greenwich, personal equations, instrumental errors, places of stars, and results for clock-error at the time of comparison with the travelling chronometers.

Section V.—Transits at Liverpool, and results for the error of the transit-clock at Liverpool.

Section VI.—Transits at Kingstown, personal equations, instrumental errors, catalogue of clock stars, first results for clock-error, and results as amended by the comparison of stationary chronometers.

Section VII.—Transits at Valentia, personal equations, instrumental errors, clock stars, first results for clock-errors, and results as amended by the comparison of stationary chronometers.

Section VIII.—List of travelling chronometers, method of using travelling chronometers, of combining results, and of deducing probable errors.

I.—*Introduction, and Selection of Stations.*

On examining the map of the British Islands, it will be seen that they are very favourably situated for the measure of an extensive arc of parallel. The extreme western points of Ireland are Dunmore Head (the extremity of the Dingle peninsula), and the Island of Valentia (which, from the facility of access to it, may be considered as a part of the mainland). These, or rather the small islands immediately beyond them, are the most westerly parts of Europe. The extreme eastern point of England is in the neighbourhood of Lowestoft, in latitude about twenty minutes of arc north of Dunmore Head. Between Dunmore Head and Lowestoft we have, therefore, an arc of considerable length, very little inclined to a parallel on the Earth's surface. But if, instead of Lowestoft, we adopt Harwich as the eastern termination of the arc, we have a point in almost precisely the same latitude as Valentia. And these two stations, if we look merely to their relative situations on the map, are probably the best that can be selected. The effect, on the geodetic measure of the parallel, of an error in absolute azimuths (the most difficult part of a trigonometrical survey), is here annihilated. Both the stations are easily accessible;

and both are so important as ports that the secondary value of the determination of their longitudes in reference to nautical purposes is considerable. The arc of parallel included between them is about 11°. 40′; and this is little less than the difference of longitude (about 12°. 12′) between the extreme eastern and western points of the British Islands.

In addition to these reasons for selecting the arc from Valentia to Harwich in preference to any other, there exists a special reason for adopting Valentia as the extreme western station in preference to any point on the Dingle peninsula or farther north. From the astronomical advantages of referring all longitudes to Greenwich, and from the practical convenience of carrying chronometers through London, it is almost absolutely necessary to make Greenwich an intermediate point in any determination of differences of longitude: and, therefore, although it is intended that the arc shall ultimately be extended to the eastern coast, Greenwich may be for some time its real eastern termination. It is therefore desirable to choose for the western extremity a point whose latitude is not very different from that of Greenwich: and Valentia, being somewhat north of Greenwich, is therefore more favourably situated than any other place which is still farther north.

For these reasons I had, as long ago as the year 1836, proposed to myself the accurate determination of the longitude of Valentia as an object to be followed up at the first favourable opportunity. Accidental circumstances compelled me to defer it for a time; but I frequently discussed with Mr. Sheepshanks the plan of proceeding most proper for such a determination.

Two advantageous circumstances resulted from this delay. First, that the Ordnance Survey of Ireland, which before had reached only to the higher mountains of Kerry, was carried to the island of Valentia. Secondly, that the formation of the English railways had greatly facilitated the conveyance of chronometers.

In the summer of 1843 I went to Valentia to examine the localities and to select a station. And here I found reasons, of which I was not aware before, for preferring Valentia as a western extremity to the Dingle peninsula or any other part of the coast. The country is for the most part extremely mountainous, even to the edge of the sea. The Dingle peninsula consists of a cluster of mountains about 3000 feet high, the highest of which, Brandon Hill, breaks down very steeply to the sea. The western extremity itself consists of a hill, Mount Eagle, whose height is about 1500 feet. In the valleys among

these mountains, or at their bases, there would be obvious danger of great local disturbance: the only situation which would seem to be reasonably secure is the summit of Mount Eagle, whose elevation, in the humid atmosphere of the west of Ireland, renders it a very unfit place for astronomical observations. The island of Valentia, on the contrary, is at its highest point less than 900 feet high; it is completely separated from the mainland mountains by the sea-channel and the low land about Cahirsaveen; and these mountains are much inferior to those on the Dingle peninsula.

The points of Valentia most accurately determined by the Ordnance Survey are Bry Head (the western extremity of the island) and Feagh Main (the highest point of the island). Of these I selected for the western extremity of the arc of meridian the station of Feagh Main. The grounds of selection were these. First, that the station is nearly in the center of the island as regards the masses east and west of it: those to the west having a slight preponderance. Secondly, that the station commands land in the direction of the meridian, so that a south mark can be fixed at the distance of about two miles within the island, or at a greater distance on the mainland: a power of securing instrumental reference which is sometimes important when a portable transit instrument is placed on a temporary mounting, in a climate so uncertain as that of the west of Ireland.

Colonel Colby, on being made acquainted with my selection of Feagh Main, immediately took measures for determining accurately its latitude. Under his instructions Lieutenant Hornby proceeded with the Ordnance Zenith Sector to that station in the month of August, 1843, and made a number of observations sufficiently great to leave no probable error of perceptible amount.

In the autumn of 1843 I submitted to the Lords Commissioners of the Admiralty a proposal for the determination of the longitude of Feagh Main, by the transmission of chronometers; and immediately received from their Lordships full authority for proceeding with this enterprise. Their Lordships, also, on my representation, requested the Master-General and Board of Ordnance to despatch an officer of the corps of Royal Engineers, with a party of Royal Sappers and Miners, to make the transit observations and transact the general operations at the station of Feagh Main. The Master-General and Board of Ordnance immediately complied with this request; and, the selection of an officer being referred to Colonel Colby, Lieutenant Gosset, a most able and zealous officer, was appointed to this duty. This gentleman, at the first interval of his military

employments, stationed himself at Greenwich for the purpose of making himself acquainted with the routine of operations in circumstances similar to those of his future post, and at a subsequent time acquired additional familiarity with them by observing with Mr. Sheepshanks at Kingstown. The result will show how fortunate for the satisfactory termination of the work was the choice of the Valentia observer.

II.—*Description of the Route selected for the Chronometers, of the Subdivisions of the Arc, of the Method of Conveying the Chronometers, and of the Transit-Stations.*

The Lords of the Admiralty had intimated to me their willingness to employ on this expedition a Government steamer, for the purpose of conveying the chronometers to Valentia from Bristol or any other port which might seem well adapted to this purpose. But upon my representation of the reduction of expense, as well as the more perfect command of time, which might be obtained by using other methods of conveyance, their Lordships were pleased to sanction my proposal for carrying the chronometers across Ireland by land conveyance. It will shortly be seen that this arrangement was attended with the collateral advantages of determining the longitudes of two important ports.

The lines of route between which a selection was to be made were the following:—1. By Bristol to Cork, and thence to Killarney and Valentia. 2. By Pembroke to Waterford, and thence to Killarney and Valentia. 3. By Holyhead to Kingstown, and thence to Dublin, Limerick, Tralee, and Valentia. 4. By Liverpool to Kingstown, and thence (as in the 3rd) to Valentia. The preference would depend, in a great measure, upon the shortness of the land conveyance, and the extent to which it was effected by railway-carriage; but still more upon the frequency and regularity of the steam-boats. In regard to the former of these points only, the route by Bristol and Cork was best; but, in consideration of the latter in conjunction with the former, I determined on adopting the route by Liverpool and Kingstown.

I had proposed to carry the chronometers through the whole length of the line, from Greenwich to Valentia, without any other interruption than was necessary for winding up the chronometers and possibly for comparison with a clock at Kingstown; and this would have been done without any difficulty. But at the representation of Mr. Sheepshanks (to whom, as will be seen, this

expedition is very much more indebted than to myself), it was decided to divide the arc into two parts, making the longitude of Kingstown from Greenwich and that of Valentia from Kingstown the subjects of two separate determinations; and even subdividing the arc from Greenwich to Kingstown by the station of Liverpool, if opportunity should present itself. The principal reason for thus dividing the long arc into shorter arcs was, that, if the chronometer-rates should be gradually changing, the aggregate of the effects of their errors on the small arcs would be less than the single effect on the large arc; there was also the general fear that, in so long a series of arrangements in which accurate attention to every one was necessary for the success of all, the omission of some very small point might for a time entirely interrupt the whole operation. On the other hand there was the danger, in making the different sections of the arc independent, that some constant error might creep in at their junction. To guard against this I made it a fundamental point that the same transit, in the same position, with the same meridian mark, and, if possible, with the same observer, should be employed through the whole series of observations at Kingstown. To remove all difficulties on the last-mentioned head, Mr. Sheepshanks undertook himself, regardless of the personal labour, the confinement, and the private expense thus incurred, to conduct the Kingstown observations as far as possible. Ill health compelled Mr. Sheepshanks at length to desist, but such measures were taken by him for comparison of his methods of observation with that of the person who took his place, that the continuity of the observations may be considered as having been as completely established as if Mr. Sheepshanks had taken every transit himself.

For comparison of the transit-clocks at the different stations thirty pocket-chronometers were used. They were placed in two large flat cases, each case carrying fifteen chronometers. Each chronometer occupied a separate cell, within which it rested upon a wooden support, cut to the form of the chronometer; the support was urged upwards by springs (as is usual in the boxes of pocket-chronometers), while the face of the chronometer was pressed downwards by the padded lid of the large flat case. This arrangement is unobjectionable if the springs are sufficiently strong; but, taking into account the possibility of the springs yielding too much or breaking, I think it might be preferable in general to support the chronometer upon a small padded cushion. The outsides of these flat cases—bottoms, sides, ends, and tops—were covered with a thick padding. This secured the chronometers perfectly from

tremor transmitted through the flat cases; although they were still liable to the effects of internal tremor within their cells produced by very violent motion of their cases.

The general plan of conveyance of the chronometers was this. A great number of strong boxes were constructed, all exactly similar, and of such dimensions that the large flat cases could be thrust easily into any one of them (one flat case upon the other), and could there be held firmly by the pressure of the bottom, sides, and top of the strong box upon the padding of the flat cases. The strong boxes were all furnished with similar locks, which could all be opened by the same key. One of these strong boxes was attached by powerful screws to every one of the railway-carriages, steam-boats, and mail-coaches, which could by any possibility be used for the conveyance of the chronometers; one was wedged by straw-padding into the luggage-box of the Irish car used in one part of the journey; one was appropriated to each short line in which the chronometers were conveyed by carriages used for the occasion; and several were kept in store at the principal stations, ready to be fixed in case of the unexpected substitution of any new carriage or steam-boat in the place of those usually making the journey. At each of the stations where the course of any railway-carriage, steam-boat, mail-coach, or car, began or ended, an agent was stationed, who was furnished with a key which would open any of the locks. Thus the method of conveying the chronometers was as follows:—At the beginning of each section of the line an agent conveyed the flat cases to the carriage or steam-boat, placed them in the strong box, and locked it. The chronometers then travelled through the section, unattended by any guard (except in one part, which will be mentioned); and at the end of that section another agent unlocked the strong box and took the flat cases out of it. The general principle of these operations was suggested by Mr. Sheepshanks, and the details were arranged by me. In no instance did any of these arrangements fail.

The chronometers were conveyed between Greenwich and the Euston-Square Station of the London and Birmingham Railway in one of the large boxes, which was carried in an ordinary four-wheeled spring-carriage or fly, and was accompanied by an Assistant of the Royal Observatory: Mr. J. R. Hind in the first part of the operations, and Mr. E. Dunkin in the latter part.

For facilities in the railway conveyance I am indebted to the kindness of

R. Creed, Esq., Secretary of the London and Birmingham Railway Company; of H. P. Bruyères, Esq., Superintendant of the Railway, and of Captain Huish, Secretary of the Grand Junction Railway. And I can truly say that by the promptitude with which these gentlemen acceded to my requests, and by the co-operation of all the railway officers which they enforced, the railway was made in all respects as available for my purpose as if it had been my own property. Carriages were selected, among the class of those carrying imperials on the roof, which traversed the whole line between London and Liverpool; and in each of these, in that division of the imperial in which it was least probable that parcels would be placed, one of my large boxes was screwed. The trains by which they were conveyed were the day trains, which corresponded most nearly with the night mail-steam-boats between Liverpool and Kingstown.

The conveyance of the chronometers between the railway station at Liverpool and the mail-steamer was managed by Mr. Hartnup, Director of the Liverpool Observatory. On my stating to Mr. Hartnup the nature of the assistance desired at Liverpool, he immediately undertook to be in attendance with one of my large boxes in an easy carriage at the arrival of each of the railway-trains or steam-boats bringing chronometers, and to transfer them carefully to the steam-boat or train which was to carry them on.

Between Liverpool and Kingstown the chronometers were conveyed by the Contract Mail Steam-boats. For the permission to fix my large boxes in these vessels, and to have access to them for depositing and withdrawing the chronometers, I applied to Captain Bevis, R.N., Superintendant (on the part of the Government) of the Liverpool Mail Steamers, and to Charles Williams, Esq., Managing Director of the City of Dublin Steam Company, by whom the steamers for this service are supplied. I am most grateful to these gentlemen for the facilities of every kind which were afforded me, and for the gratuitous and careful conveyance of the boxes in their crowded ships.

From Kingstown to the Mail-coach Office at Dublin the chronometer cases were conveyed (in a large box appropriated to this line) in one of the carriages of the Kingstown Railway, and in a car through the streets of Dublin. Mr. Hind always accompanied them in this part of their journey.

By the good offices of Lieutenant-Colonel Maberly, Secretary of the General Post-office, and of James Cumming, Esq., Inspector of Mail-coaches at Dublin, I was permitted to attach my boxes to the top of the Dublin and Limerick

mail, and to that of the Limerick and Tralee mail. At Limerick, a private of the corps of Royal Sappers and Miners, who had been selected for this service by Colonel Colby, and on whose care I could rely most perfectly, transferred the cases between the box on the Limerick mail and that on the Tralee mail. It was deemed expedient that he should accompany it on the mail between Limerick and Tralee, as this mail carries a greater number of passengers, and has less room for luggage, and there was, therefore, greater fear of violence than when the chronometers travelled by the Limerick mail.

At Tralee another private of the same corps was in attendance, and by these two persons the chronometers were wound up. They had been most carefully instructed in the cautions necessary for winding up chronometers, and a room was specially engaged for this purpose; and I have no doubt that this service was most correctly performed. It was only in this section of the arc that it was necessary to wind up the chronometers upon their journey.

Arrangements had been made with Mr. Bianconi for the supply of a car with four relays of horses for the conveyance of the cases in a box, wedged firmly by straw mats in the car-box, between Tralee and the Cahirsaveen ferry. They were accompanied by the private soldier who was in attendance at the arrival of the Limerick mail-coach at Tralee.

As the arrival at and the departure from Cahirsaveen occurred in the night, it was necessary to make a special arrangement for a boat to cross the channel. On my application to Captain Hornby, R.N., Inspector of the Coast Guard, and Sir James Dombrain, Inspector of the Coast Guard for Ireland, instructions were given to Mr. Quadling, the officer in charge of the force on the Cahirsaveen and Valentia station, to place a boat and the necessary party of men at my command. This service was performed by Mr. Quadling with the utmost good will and the most perfect regularity. The cases were conveyed in one of the large boxes, which was carried unfixed in the boat.

Between the Valentia side of the ferry and the station of Feagh Main (a distance of three miles, with a rise of nearly 900 feet), the large box was carried by two men, by means of two poles fixed in staples, in the manner of a sedan-chair. For about three-fourths of the distance, in which about one-half of the ascent is surmounted, the road is very good; after this the ascent is rather steep, upon grass, with occasionally trifling projections of rock. Some pains, however, had been taken to smooth the path and to make it visible in the night, and the chronometers were carried perfectly well.

In the enumeration of the arrangements for the different sections of the chronometer-route, the process of conveying the chronometers must at first appear very complicated. Yet, in fact, it was not so. Considerable care was necessary in the preliminary arrangements; but, when these had been effected, the whole operation went on in the most orderly and (apparently) in the most simple manner, and there was no failure of any kind in the whole.

I shall now advert to the transit-stations.

Of the Liverpool transit-station it will be sufficient to say that it was the Liverpool Observatory, near the Waterloo Dock.

For the selection of a transit-station at Kingstown, and for the preparation of the small observatory, the pier to support the transit-instrument, &c., I am indebted to the kindness of Captain Larcom, R E., and Lieutenant Leach, R.E., acting under the instructions of Colonel Colby. The place chosen was behind the Harbour-master's house, upon some broken ground above a quarry, at a convenient distance from the Royal Hotel, at which the observers resided during the observations. This point will be preserved by the erection of a small pier, fixed in the place of the transit-pier by the care of Captain Larcom. To the courtesy of Captain Hutchinson, the Harbour-master, we are indebted for facilities of access to the observatory. The observatory itself was a building of wood, 10 feet square and 10 feet high to the ridge; its shutter-opening, 1 foot wide, ran along the ridge and down the ends of the building as far as was necessary (an arrangement which I have repeatedly found convenient). The transit-pier, which was founded on the rock, was built of brick and cement to the height of 20 inches above the floor, and a slab of Portland stone, 8 inches thick, was then laid upon it; to this height the dimensions of the pier were 4 feet in the east-and-west direction, and 2 feet in that north-and-south. Upon this slab were planted two uprights of Portland stone 3 feet high, the base of each being 14 by 16 inches, and the top of each 8 by 10 inches. These uprights carried the transit, an excellent instrument of 42 inches length, the property of Mr. Sheepshanks. From the description which I have given it will appear that the steadiness of the instrument, as dependent upon its mounting, might be considered equal to that in the best permanent observatories. The north meridian line passed nearly over the center of Kingstown Harbour, and the north meridian mark (a small circle of white marble in a black ground) was fixed in the edge of the northernmost part of the N.W. pier of the harbour.

The transit-station in Valentia was 153 feet 9 inches south of the survey-

station, and about 4½ inches east of it. This station had been selected, and a pier of large slate stones had been built from the rock to the surface of the ground, by Lieutenant Hornby, at my request, in the summer of 1843. It was necessary to adopt a position somewhat south of the survey-station, in order to command the low ground of the island, on which it was proposed to plant the meridian mark. The observatory was a panelled hut covered with canvas, of the construction usually adopted by Colonel Colby for the operations of the Trigonometrical Survey. The transit-piers were formed of blocks of slate from the well-known Valentia quarries (which are not far below the station), but I am unable to state their dimensions. The transit-instrument was one of 30 inches length, the property of Mr. Sheepshanks. The meridian mark was a plate of metal, in which was made an aperture, through which the bright surface of the water of the Sound was seen by day and a lamp by night. It was fixed upon a large block of stone, which was placed on the sandy beach of the Sound (where it was guarded by a private of the corps of Royal Sappers and Miners). After this stone had been placed, some alarm was caused by the discovery that the sand was really based upon a peat-bog of unknown depth, which lies so far below the surface of the sand as only to be discovered by probing, and which apparently passes under the seawater of the Sound. But, after very careful examination of all the results of observation, it does not appear that there was the smallest motion of the meridian stone. In mounting the transit and erecting the observatory and neighbouring huts, in fixing the meridian mark, and, indeed, in every operation connected with the island of Valentia, the greatest assistance was given with the utmost kindness by the Knight of Kerry and by Bewicke Blackburn, Esq., the principal residents on the island.

The whole of the operations (including everything relating to the longitudes of Liverpool, Kingstown, and Valentia,) occupied nearly the whole time from the end of June to the end of September, 1844. The following were the courses of the chronometer-journeys :—

The chronometers left Greenwich the first time on the morning of June 27, and reached Kingstown the last time on the morning of July 27, having made nine journeys from Greenwich to Kingstown, and eight journeys from Kingstown to Greenwich.

They then left Kingstown for Liverpool on the evening of July 27, and were returned to Kingstown the last time on the morning of August 4, having made four journeys each way.

They then left Kingstown for Valentia on the evening of August 5, and returned to Kingstown the last time on the morning of September 14, having made ten journeys each way.

After a short delay and transmission to Liverpool, the chronometers left Liverpool for Greenwich on the morning of September 21, and arrived finally in Greenwich on the evening of September 28, having made four journeys from Liverpool to Greenwich, and three from Greenwich to Liverpool.

III.—*Method of adopting Instrumental Errors of the Transit-instruments; Determination of Clock-errors; and Method of Using the Stationary Chronometers.*

The mere operation of observing transits must be so exactly similar in all cases that it would be useless to describe it in reference to these stations. I shall therefore confine my present remarks to those operations which are intermediate between the rough observations and the ultimate clock-error.

The methods of reduction of the observations made at Greenwich are fully explained in the printed Greenwich Obervations. Here I have only to remark that the error of collimation of the middle wire of the transit is determined by repeated reversions, and by observation, at each reversion, of a collimator mounted for the occasion; that from this, by the intervals of the wires ascertained from observations of Polaris, the error of collimation of the mean of the wires is found; that all imperfect transits are reduced by the same intervals to the mean of the wires; that a correction for the error of collimation is applied to every transit by means of a table of factors, of which the argument is the polar distance of the object observed; that the level is usually applied once each week, and, in the latter part of these observations, more frequently (each application consisting of twelve readings of the level in reversed positions), and that a correction for this error is applied to every transit by means of a table of factors, of which the argument is the polar distance of the object; that then, by a comparison of the corrected transits of any principal clock-star and a circumpolar star, or of the upper and lower transits of the same circumpolar star (Polaris and δ Ursæ Minoris being the only circumpolar stars employed), the error of azimuth is ascertained, and that corrections for this are applied to every transit by means of another table of factors. Some parts of these operations imply confidence in the extreme steadiness of the instrument as regards

collimation and level error, of which I have no doubt; and I fully believe that the true clock-transits of the objects are obtained thus with all practicable accuracy. The clock-errors are found by comparing the transits thus obtained with the right ascensions of the principal stars of the Nautical Almanac list, using the mean places of the Greenwich Catalogue of 1439 Stars. The clock-error at any other time (as for the time of the comparison of chronometers) is found by simple interpolation between the means of the errors given by the nearest groups of clock-stars, or by applying the ascertained rate to the nearest group. No attempt is made to improve this determination, but absolute reliance is placed on the steadiness of the clock's rate.

Of the method of determining the clock-errors at Liverpool I cannot give a complete account. The following particulars, however, taken in combination with the well-known skill of the observer and the excellence of the transit-instrument, will be perfectly satisfactory.

The method of correcting or determining the error of collimation has not been explained to me; but on every evening (excepting only two) on which transits were observed for the clock-errors entering into these operations, part were observed with the illuminated end East and part with the illuminated end West, and thus the effect of error of collimation was practically eliminated. Of the determination of level-errors, or errors of azimuth, I have no account.

The error of the transit-clock was found by comparing the observed transits with the places of the stars in the Nautical Almanac, 1844, corrected for the difference between the mean places in the Nautical Almanac of 1844 and that of 1845; or, in some instances, with the places of smaller stars determined by means of the Nautical Almanac stars. The error was then carried forward to the time of comparison of chronometers: first, by the rate of the transit-clock; secondly, by means of the mean-time-clock, which was compared with the transit-clock; thirdly, by means of three chronometers, which were compared with the transit-clock; and the mean result was adopted. The principle of this combination will be explained more fully in speaking of the reductions at Kingstown and Valentia.

The observations at Kingstown and at Valentia were planned by Mr. Sheepshanks; their arrangement was guided in some degree by the considerations that the instruments were not permanently mounted, that the telescopes were scarcely sufficient for observation of stars in the day time, and that the climate is uncertain. A catalogue of stars near the equator was selected, and another catalogue

of stars near the pole (some of which would be observed above and some below the pole); and it was intended that the places of these stars should be determined by subsequent observations at Greenwich; and they were accordingly so determined. Observations of the transits of these stars were made as often as possible, the transit being reversed in the middle of almost every group of observations, and some of the circumpolar stars, as well as stars near the equator, being included in each group. The level was applied several times in each group. During the day (at Kingstown), and in the day and the night (at Valentia), the meridian mark was repeatedly observed in reversed positions of the transit, and a drawing of its appearance, as seen under the central wire, was usually made.

The reduction of these observations was effected under my direction, and, I believe, in the manner originally contemplated by Mr. Sheepshanks, except so far as regards the error of collimation.

The first step was to complete the imperfect transits. For the Kingstown transit-instrument, all the complete transits, from June 24 to August 20, 264 in number, were collected, and by means of these the equatoreal intervals of wires were found. With these intervals all the imperfect observations were reduced to the mean of the seven wires. For the Valentia transit-instrument, the complete transits were so few that I thought it best to use intervals previously determined by Mr. Sheepshanks, which appeared (so far as I could judge) to be sufficiently accurate. With these the transits were in all cases reduced to the middle wire.

Mr. Sheepshanks had proposed, in reference to the determination of error of collimation, first to apply to each transit the correction for the level-error (as given by a proper table of factors), and then to determine the error of collimation, either by those slowly-moving stars whose transits were observed partly in one position of the transit and partly in the reversed position, or by so adjusting the numerical values of the error of collimation and the azimuthal error, that the results of the two series of observations in reversed positions should harmonize. This method is, in my opinion, not proper for use when observations of a meridian mark can be obtained. It appears to me unsafe to use, for the determination of the relation between an optical axis and a mechanical axis, with which neither the diameters of pivots, nor the fundamental places of stars, nor the steadiness of clock-rates, have any connexion whatever, a method which is vitiated by errors in the diameters of the pivots, or in the

fundamental places of the stars, or in the rate of the clock; and this when there does exist a method immediately and naturally related to the object sought, and totally free from the effects of all those errors. As long ago as 1828 (as is recorded in the first volume of the Cambridge Observations) I had endeavoured to obtain instrumental errors by observations of well-known stars with the firmly-mounted transit-instrument of the Cambridge Observatory, and I gave up the method in disgust. At Kingstown and Valentia, where there were numerous and excellent observations of a meridian mark, I thought it imprudent to attempt to use that method, except for those observations of slowly-moving stars, partly in one position of the transit and partly in the reversed position, which presented results almost at sight. The method employed, therefore, was this. From linear measure and distance of the meridian mark its angular breadth was computed. With this, and with the drawings of the appearance of the mark under the wire, a numerical value was assigned to the error of collimation of the middle wire. (I may remark that this value was always consistent; whereas those given by stars, as is above mentioned, were not consistent.) For the Kingstown transit-instrument this was corrected so as to apply to the mean of the seven wires. In both cases the effect of diurnal aberration was combined with the error of collimation. Corrections were applied to the transits, by the use of a proper table, for the determined errors of collimation. The difference of diameters of the pivots having been ascertained by frequent levellings, the proper alteration was applied to the results of each levelling during a group of observations, and the level-error so altered was used for the second correction of the transits. Then by comparing the clock-errors given by circumpolar stars above and below the pole, or by comparing those given by circumpolar stars and by equatoreal stars, an azimuthal error was obtained for each group. But this azimuthal error was not immediately applied to the transits. In combination with the error of collimation, and with the recorded appearance of the meridian mark, it gave an azimuth of the meridian mark: the mean of all the separate results of this kind through the whole series of observations gave a very accurate azimuth of the meridian mark; and then this azimuth, with the error of collimation at any time, and the recorded appearance of the meridian mark, gave an azimuthal error of the transit-instrument for that time. Corrections found from this error by a proper table of factors were applied to all the transits.

The clock-error was found by comparing the transit thus corrected with

the star's apparent right ascension (formed by applying the ordinary star-corrections to the mean places determined by subsequent Greenwich observations), and the mean of all for each group was adopted for the mean time of that group; and no alteration was made in this adopted error.

A clock error was thus obtained, at certain hours of the night, when the sky was clear, to which no objection could be made, and which, at any rate, was the only foundation for any clock-errors that were to be used in the comparison of the transit-clock with the travelling chronometers. But these travelling chronometers, under the most favourable circumstances, would be compared with the transit-clock at an interval of some hours from the transits, and when the sky was clouded there might be an interval of some days. It was doubtful whether absolute reliance could be placed on the steadiness of rate of the transit-clock during such an interval. This consideration induced Mr. Sheepshanks to adopt a method of preserving a good indication of time, which, so far as I know, is novel, and which is admirably adapted to these and similar circumstances. Several box-chronometers and one clock (in addition to the transit-clock) were carried to the stations. Some of these box-chronometers went solar time nearly, and some went sidereal time nearly. A solar chronometer admits of being compared with a sidereal transit-clock to an almost inconceivable accuracy by coincidence of beats. For, upon listening to the mingled beats of the clock and chronometer, the ear will soon be struck by a recurrence of double beats at which the sidereal clock follows the solar chronometer by a small fraction of a second; by the successive gains of the sidereal clock upon the solar chronometer their beats will at length coincide; and a good ear, with a little practice, can certainly fix on the time when the beats coincide within less than the hundredth part of a second. In like manner the sidereal chronometers can be compared with the solar chronometer, &c., and thus a complete intercomparison of the whole system of clocks and chronometers may be obtained. This intercomparison was most scrupulously made at the time of every group of transit-observations (giving clock-error), and at the time of every comparison with travelling chronometers (when application of clock-error was required). It is evident that it gave the means, under proper treatment, of correcting the unsteadiness of the transit-clock if the chronometers were perfectly steady, or of combining their presumed partial steadiness with that of the transit-clock, so as to diminish the probable effects of the unsteadiness of the latter. The

method by which they were treated for this purpose, as arranged by me, was as follows. By means of the transit-clock-error on sidereal time, as found from groups of transits, and assuming the uniformity of transit-clock-rate between one group and another, a transit-clock-error was interpolated for every comparison with a solar chronometer; and applying this to the transit-clock-time at comparison, the sidereal time was found. This sidereal time was converted into solar time, just as if it had been Greenwich sidereal time, by means of the Mean Solar Time of Transit of the first point of Aries in the Nautical Almanac, and the tables given in the Appendix to the Greenwich Observations, 1837. This solar time differs from the solar time at the place by $\frac{1}{366 \cdot 25}$ of its longitude; but as this correction is constant its effects may be everywhere neglected. The solar time thus found is compared with the time indicated by the solar chronometer, and thus the error of the latter on solar time (subject to the correction just mentioned) is found, and its rate is found. For the comparison of the next sidereal clock or chronometer with this solar chronometer, the error of the solar chronometer (subject to the correction) is interpolated and applied to the solar-chronometer-time at comparison, and thus the true solar time at comparison (subject to the correction) is found. This is converted into sidereal time, by the Sidereal Time at Mean Noon, and the equivalents for mean solar hours, minutes, and seconds in the Nautical Almanac, just as if it was Greenwich solar time: and thus the true sidereal time at the place (free from the correction) is found. Comparing this with the time indicated by the sidereal clock or chronometer, its error on sidereal time is found. This process was continued through all the stationary clocks and chronometers, and thus their errors on their respective kinds of time were found, at the time of every group of transit-observations, and at the time of every comparison with the travelling chronometers: the former as certain as transits could give them, the latter relying entirely on the steadiness of the transit-clock, and (sensibly) on nothing else. Now, for each clock or chronometer, assuming its error at the time of groups of transits to be certain, and its rate from group to group to be uniform, its error was computed for the time of comparison of travelling chronometers, and this error was compared with the error as above found on the supposition that the transit-clock's rate from group to group was uniform. If the former was greater (the error being always estimated positive when the clock was slow) it indicated that, as far as reliance could be placed on this

clock or chronometer, the transit-clock-error for the time of comparison with travelling chronometers required increase. Using all in this manner, and using the transit-clock among them as indicating a correction 0, and giving such weights as the general steadiness of rate seemed to justify, a correction to the transit-clock-error at times of comparison with travelling chronometers was found.

In some instances the rate of the chronometer, &c., evidently underwent a gradual and regular change; and in the instance of the second clock at Kingstown (which, abstracting from this circumstance, appeared to go remarkably well,) the change of rate was very considerable. In these cases it was necessary to introduce second differences into the interpolation of the errors. This was effected by the following formula. The rate between two transit-groups being supposed to be the true rate at the time midway between these groups, the comparison of successive rates gave at once the daily increase of rate. Call this i. And let T be the whole interval between one transit-group and the next, and t the interval between the first transit-group and the travelling-chronometer-comparison under consideration. Then, the clock-error at the travelling-chronometer-comparison having been interpolated on the supposition of uniform rate between the transit groups, it requires the further correction

$$-\frac{t \cdot \overline{T-t}}{2} \cdot i.$$

The evaluation of the probable error of the transit-clock as adopted, after correction by means of the other chronometers, would be a matter of some difficulty. I shall only express my belief that it scarcely exceeds the probable error as obtained directly from the transits; and that the latter is very small.

IV.—*Transits at Greenwich, Personal Equations, Instrumental Errors, Places of Stars, and Results for Clock Error at the Time of Comparison with the Travelling Chronometers.*

In this Memoir it is not possible to give every step of the multitudinous calculations leading to the ultimate result. For some I shall refer to the printed Greenwich Observations, and others I shall totally omit.

The transits over individual wires, and the corrections for imperfect transits, will be found in the Greenwich Observations.

Although the greater number of the transits at Greenwich were taken by Mr. Henry (H.) and Mr. Ellis (E.), a few were also taken by Mr. Main (M.), Mr. Rogerson (R.), and Mr. Hind (J. H.). The determination of their personal equations will be found in the Introductions to the Greenwich Observations; the result is that to reduce the values of "Clock Slow," given by their observations, to those which would have been given by Mr. Henry's observations, the following corrections must be applied: M. $-0^s{\cdot}05$; E. $-0^s{\cdot}30$; R. $-0^s{\cdot}14$; J. H. $0^s{\cdot}00$.* These are applied in the tabular statement which follows; and thus all the clock-errors are reduced to Mr. Henry's method of observing.

The determinations of instrumental error will be found in the Greenwich Observations.

During the whole of these observations the illuminated end of the Transit was East.

The following are the mean places for Jan. 1, 1844, of the stars observed:—

	h m s		h m s
α Andromedæ ..	0. 0. 19·97	α Serpentis	15. 36. 35·14
γ Pegasi	0. 5. 12·43	β^1 Scorpii.....	15. 56. 22·52
β Ceti	0. 35. 45·25	δ Ophiuchi	16. 6. 10·45
Polaris.	1. 3. 17·60	Antares	16. 19. 51·07
α Arietis	1. 58. 23·47	α Herculis.....	17. 7. 32·05
γ Ceti	2. 35. 13·33	α Ophiuchi.....	17. 27. 41·60
α Ceti	2. 54. 7·84	μ Sagittarii	18. 4. 26·03
α Persei.....	3. 13. 12·89	δ Ursæ Minoris .	18. 22. 39·75
Rigel	5. 7. 2·49	α Lyræ	18. 31. 39·32
β Tauri	5. 16. 26·05	β Lyræ	18. 44. 19·16
δ Orionis	5. 24. 2·30	ζ Aquilæ	18. 58. 14·31
α Orionis	5. 46. 43·57	δ Aquilæ	19. 17. 37·84
Sirius	6. 38. 16·58	γ Aquilæ	19. 38. 50·53
Procyon.....	7. 31. 7·91	α Aquilæ	19. 43. 10·15
Pollux	7. 35. 45·63	β Aquilæ	19. 47. 38·89
Regulus.....	10. 0. 3·49	α^2 Capricorni...	20. 9. 23·61
Spica.....	13. 16. 58·84	ζ Cygni.....	21. 6. 17·90
Arcturus	14. 8. 32·78	ϵ Pegasi.....	21. 36. 31·35
ϵ Bootis.....	14. 38. 10·37	ζ Pegasi	22. 33. 40·94
α Libræ.....	14. 42. 15·44	α Pegasi	22. 56. 59·52
β Libræ.....	15. 8. 37·19	ι Piscium	23. 31. 55·61
α Coronæ.....	15. 28. 4·95		

* This is sufficiently accurate for the few instances in which Mr. Hind observed transits at Greenwich. For the more important application to the longitude of Kingstown as depending on Mr. Hind's observations, a different value is subsequently adopted.

TRANSITS OBSERVED AT GREENWICH.

Month and Day, 1844.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation Found. (Mean of Wires *West*)	Error of Collimation Used. (Mean of Wires *West*)	Error of Level Found. (West Pivot *High.*)	Error of Level Used. (West Pivot *High*)
			h m s	″	″	″	″
June 7				+0·67			
June 21						+3·21	
June 24	Polaris S.P...	3	13. 3.17·23		+0·67		+3·21
	Spica	7	13.16.52·75				
	β Libræ	7	15. 8.31·67				
	α Coronæ ...	7	15.27.59·16				
	α Serpentis ..	7	15.36.29·62				
June 26							
June 27	Arcturus	7	14. 8.23·99			+2·70	+2·70
	ϵ Bootis	7	14.38. 1·71				
	β Libræ	4	15. 8.29·04				
	α Coronæ ...	7	15.27.56·22				
	α Serpentis ..	7	15.36.26·95				
June 28	α Herculis ...	7	17. 7.23·21				+1·67
	Polaris	5	1. 3.22·27			+1·67	
June 29	α Coronæ ...	7	15.27.54·18				
	α Serpentis...	7	15.36.24·80				
June 30	δ Aquilæ.....	7	19.17.26·94			+2·12	+2·12
July 3	Antares	7	16.19.37·63			+1·20	+1·31
	α Herculis ...	7	17. 7.17·76			+1·43	
July 6						+0·68	
July 7						+0·82	
July 8	Polaris S.P...	2	13. 3.13·06				+0·91
	Spica	2	13.16.38·09				
	α Coronæ ...	5	15.27.44·43				
	α Serpentis...	7	15.36.14·90				
July 9	α Ophiuchi...	7	17.27,20·94				
	μ Sagittarii ..	7	18. 4. 5·96				
	δ Ursæ Minoris	5	18.22.21·71				
	α Lyræ	7	18.31.18·36				
	Polaris	2	1. 3.18·70				
	α Persei	7	3.12.50·25				
July 10							
July 11	Procyon	7	7.30.42·91			+1·00	
	Polaris S.P...	2	13. 3.13·95				

TRANSITS OBSERVED AT GREENWICH.

Error of Azimuth Found. (West Pivot *South.*)	Error of Azimuth Used. (West Pivot *South.*)	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Travelling Chronometers.	Clock Slow used for Comparison with Trav. Chron.
″	″	s	s	s		s	h m	s
+5·85	+5·85	18·83	27·40	8·57	H			
		53·25	1·83	8·58	H			
		32·16	40·78	8·62	H			
		59·61	8·08	8·47	H			
		30·09	38·58	8·49	H			
							1. 20	10·48
	+5·73	24·41	35·63	11·22	E	−0·30		
		2·12	13·30	11·18	E	−0·30		
		29·50	40·77	11·27	E	−0·30		
		56·64	8·06	11·42	E	−0·30		
		27·39	38·57	11·18	E	−0·30		
		23·65	35·61	11·96	H			
+5·73		18·65	31·57	12·92	E	−0·30		
		54·53	8·05	13·52	E	−0·30		
		25·20	38·56	13·36	E	−0·30	17. 30	13·23
		27·36	41·68	14·32	H			
							1. 50	14·61
		38·11	55·42	17·31	M	−0·05		
		18·11	35·62	17·51	M	−0·05	17. 30	17·40
							2. 25	17·82
							17. 40	20·85
							2. 50	22·44
+3·90	+3·90	15·93	39·20	23·27	E	−0·30		
		38·40	1·68	23·28	E	−0·30		
		44·66	7·96	23·30	E	−0·30		
		15·16	38·51	23·35	E	−0·30		
	+2·83	21·16	45·25	24·09	H			
+2·83		6·22	30·53	24·31	H			
		21·47	45·79	24·32	H			
		18·55	42·79	24·24	H			
+4·47	+4·47	15·45	40·58	25·13	J H			
		50·43	15·64	25·21	E	−0·30		
							17. 50	25·50
							3. 0	25·99
	+3·06	43·14	9·31	26·17	H			
+3·06		15·46	41·96	26·50	H			

TRANSITS OBSERVED AT GREENWICH.

Month and Day, 1844.		Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation Found. (Mean of Wires *West*)	Error of Collimation Used. (Mean of Wires *West*)	Error of Level Found. (West Pivot *High.*)	Error of Level Used. (West Pivot *High*)
				h m s	″	″	″	″
July	11	α Coronæ ...	7	15. 27. 41 ·10		+0 ·67		+0 ·91
		α Serpentis...	7	15. 36. 11 ·65				
		β^1 Scorpii ...	7	15. 55. 59 ·52				
		δ Ophiuchi...	7	16. 5. 47 ·16				
		Antares	4	16. 19. 28 ·32				
July	13						+1 ·68	
July	14	Rigel	7	5. 6. 32 ·41				+1 ·45
		α Orionis	5	5. 46. 13 ·95				
		Sirius.....	4	6. 37. 46 ·08				
		Procyon	7	7. 30. 37 ·89			+1 ·21	
July	15	Polaris S.P...	3	13. 3. 12 ·08				
		δ Ursæ Minoris	4	18. 22. 13 ·58				
		β Lyræ.....	5	18. 43. 50 ·63				
		ζ Aquilæ.....	5	18. 57. 46 ·07				
		δ Aquilæ	7	19. 17. 9 ·85				
		γ Aquilæ	7	19. 38. 22 ·20				
		α Aquilæ	7	19. 42. 42 ·04				
		β Aquilæ	7	19. 47. 10 ·91				
July	16	α Herculis ...	7	17. 7. 2 ·71				+0 ·20
		α Ophiuchi...	7	17. 27. 12 ·30				
		δ Ursæ Minoris	4	18. 22. 14 ·99				
		α Lyræ.....	7	18. 31. 9 ·90				
		β Lyræ.....	5	18. 43. 49 ·77				
		α^2 Capricorni .	7	20. 8. 54 ·99				
		Polaris	5	1. 3. 12 ·28			+0 ·04	
July	17	β Tauri.....	7	5. 15. 53 ·43				
		α Orionis	7	5. 46. 10 ·52				
		Sirius.....	7	6. 37. 42 ·63				
		Procyon	4	7. 30. 34 ·55				
July	18	α Herculis .	7	17. 7. 0 ·18				
		α Ophiuchi...	7	17. 27. 9 ·95			+0 ·35	
July	19	α Herculis ...	7	17. 6. 58 ·43				+0 ·32
		α Ophiuchi...	7	17. 27. 8 ·19				
		μ Sagittarii ..	7	18. 3. 53 ·45				
		δ Ursæ Minoris	3	18. 22. 6 ·94				
		α Lyræ	7	18. 31. 5 ·61				
		Polaris	5	1. 3. 13 ·18			+0 ·32	
July	20	Antares	7	16. 19. 17 ·26				
		α Herculis ...	7	17. 6. 57 ·56				
		α Ophiuchi...	7	17. 27. 7 ·26				
		μ Sagittarii ..	7	18. 3. 52 ·33				
		δ Ursæ Minoris	4	18. 22. 5 ·79				

TRANSITS OBSERVED AT GREENWICH.

Error of Azimuth Found. (West Pivot *South.*)	Error of Azimuth Used. (West Pivot *South.*)	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Travelling Chronometers.	Clock Slow used for Comparison with Trav. Chron.
″	″	s	s	s		s	h m	s
	+3·06	41·30	7·92	26·62	H			
		11·87	38·48	26·61	H			
		59·79	26·52	26·73	H			
		47·40	14·12	26·72	H			
		28·60	55·40	26·80	H			
							18. 0	29·24
							3. 20	30·71
	+4·11	32·74	3·90	31·16	E	−0·30		
		14·25	45·21	30·96	E	−0·30		
		46·44	17·57	31·13	E	−0·30		
		38·20	9·34	31·14	E	−0·30		
+3·93								
		14·25	45·38	31·13	E	−0·30		
+4·29		13·00	44·68	31·68	E	−0·30		
		50·89	22·71	31·82	E	−0·30		
		46·37	18·13	31·76	E	−0·30		
		10·16	41·84	31·68	E	−0·30		
		22·50	54·42	31·92	E	−0·30		
		42·34	14·08	31·74	E	−0·30		
		11·22	42·84	31·62	E	−0·30		
	+6·42	3·03	35·58	32·55	H			
		12·64	45·23	32·59	H			
+6·42		11·77	44·47	32·70	H			
		10·10	42·78	32·68	H			
		50·00	22·72	32·72	H			
	+0·60	55·09	27·90	32·81	H			
+0·60		13·45	46·50	33·05	D			
	+1·76	53·54	28·20	34·66	H		18. 10	33·98
		10·65	45·27	34·62	H			
		42·80	17·61	34·81	H			
		34·68	9·38	34·70	H			
		0·31	35·57	35·26	H			
		10·09	45·23	35·14	H			
							3. 30	35·86
		58·57	35·57	37·00	E	−0·30		
		8·34	45·23	36·89	E	−0·30		
		53·63	30·56	36·93	E	−0·30		
+0·70		6·19	43·91	37·72	E	−0·30		
		5·73	42·78	37·05	E	−0·30		
+2·81		12·84	48·67	35·83	D			
	+1·44	17·42	55·34	37·92	H			
		57·69	35·56	37·87	H			
		7·39	45·22	37·83	H			
		52·49	30·56	38·07	H			
+1·44		5·64	43·74	38·10	H			

TRANSITS OBSERVED AT GREENWICH.

Month and Day, 1844.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation Found. (Mean of Wires *West*)	Error of Collimation Used. (Mean of Wires *West*)	Error of Level Found. (West Pivot *High.*)	Error of Level Used. (West Pivot *High*)
			h m s	″	″	″	″
July 20	α Lyræ.....	7	18. 31. 4·77		+0·67		+0·32
July 21	Spica	7	13. 16. 21·57				
	Polaris	2	1. 3. 10·34				
	Rigel	4	5. 6. 23·78				+1·27
	β Tauri.....	5	5. 15. 47·87				
	δ Orionis	7	5. 23. 23·54				
	α Orionis	7	5. 46. 4·86				
	δ Ursæ Min. S.P.	3	6. 22. 0·76				
	Sirius.....	7	6. 37. 37·13				
	Procyon	7	7. 30. 28·86				
	Pollux	4	7. 35. 6·82				
July 22	Regulus	5	9. 59. 24·51				
	Polaris S.P...	4	13. 3. 7·06				
	Spica	7	13. 16. 20·61				
	α Herculis ...	7	17. 6. 54·44				
	μ Sagittarii ..	4	18. 3. 49·33				
	δ Ursæ Minoris	5	18. 22. 2·92				
						+1·27	
July 23	Polaris S.P...	4	13. 3. 2·42				
	ε Bootis	7	14. 37. 30·37				
	α Libræ	7	14. 41. 36·03				
	β Libræ	5	15. 7. 57·80				
	α Coronæ....	7	15. 27. 25·17				
	α Serpentis ..	7	15. 35. 55·70				
	β¹ Scorpii....	7	15. 55. 43·49				
	δ Ophiuchi...	4	16. 5. 31·26				
	Antares	7	16. 19. 12·41				
	γ Aquilæ	7	19. 38. 11·81				
	α² Capricorni .	7	20. 8. 45·14				
	Sirius.....	7	6. 37. 34·50				+0·77
	Procyon	7	7. 30. 26·39				
	Pollux	5	7. 35. 4·27				
July 24	α Coronæ....	7	15. 27. 24·34				
	δ Ophiuchi...	7	16. 5. 30·47				
	Antares	7	16. 19. 11·58				
	α Herculis ...	7	17. 6. 52·08				
	δ Ursæ Minoris	4	18. 21. 59·56				
	α Andromedæ	4	23. 59. 39·51				
	γ Pegasi.....	7	0. 4. 31·68				
	Polaris	4	1. 3. 10·61				
	Sirius.....	7	6. 37. 33·17			+0·79	
July 25						+0·75	
July 26	α Ophiuchi...	7	17. 26. 59·49		+0·45		
	μ Sagittarii ..	7	18. 3. 44·67				

TRANSITS OBSERVED AT GREENWICH.

Error of Azimuth Found. (West Pivot *South.*)	Error of Azimuth Used. (West Pivot *South.*)	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observers.	Correction for Personal Equation.	Clock Time of Comparison with Travelling Chronometers.	Clock Slow used for Comparison with Trav. Chron.
″	″	s	s	s			h m	s
	+1·44	4·89	42·77	37·88	H			
	+3·91	21·86	1·54	39·68	E	−0·30		
+3·01		6·76	50·28	43·52	P			
		24·09	4·06	39·97	H			
		48·13	28·31	40·18	H			
		23·83	4·00	40·17	H			
		5·14	45·36	40·22	H			
+4·81		1·91	43·49	41·58	H			
		37·46	17·68	40·22	H			
		29·15	9·43	40·28	H			
		7·08	47·42	40·34	H			
		24·80	5·21	40·41	H			
+3·01		9·25	50·72	41·47	H			
		20·93	1·53	40·60	H			
		54·72	35·55	40·83	H			
		49·68	30·55	40·87	H			
+4·81		2·31	43·38	41·07	H		18. 40	40·86
							3. 30	41·31
+6·90	+6·90	9·44	51·58	42·14	E	−0·30		
+6·90		30·72	12·95	42·23	E	−0·30		
		36·54	18·77	42·23	E	−0·30		
		58·28	40·56	42·28	E	−0·30		
		25·52	7·76	42·24	E	−0·30		
		56·12	38·37	42·25	E	−0·30		
		44·02	26·42	42·40	E	−0·30		
		31·72	14·02	42·30	E	−0·30		
		12·98	55·31	42·33	E	−0·30		
		12·22	54·48	42·26	E	−0·30		
		45·65	27·98	42·33	E	−0·30		
	+2·55	34·74	17·71	42·97	H			
		26·59	9·46	42·87	H			
		4·45	47·45	43·00	H			
		24·52	7·75	43·23	H			
		30·68	14·01	43·33	H			
+2·55		11·82	55·30	43·48	H			
+2·55		52·27	35·53	43·26	H			
		59·38	42·94	43·56	H			
	+3·29	39·71	23·63	43·92	E	−0·30		
		31·91	15·94	44·03	E	−0·30		
+3·29		8·86	52·94	44·08	E	−0·30		
+3·29		33·45	17·73	44·28	E	−0·30		
							3. 30	44·91
		59·70	45·18	45·48	H			
		44·94	30·55	45·61	H			

TRANSITS OBSERVED AT GREENWICH.

Month and Day. 1844.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation Found. (Mean of Wires *West*)	Error of Collimation Used. (Mean of Wires *West*)	Error of Level Found. (West Pivot *High.*)	Error of Level Used. (West Pivot *High*)
			h m s	″	″	″	″
August 9				+0·45			
						−0·29	
						−0·09	
						−0·43	
						−0·40	
						−0·04	
Sept. 15 to 20						−0·42	
						−0·20	
						−0·41	
						−0·06	
						+0·18	
						−0·19	
September 20	α^2 Capricorni .	7	20. 8. 35·64		+0·45		−0·21
	Polaris	4	1. 3. 38·11				
	Regulus	5	9. 59. 12·77				
September 21	β Aquilæ	7	19. 46. 49·05				
	ϵ Pegasi	7	21. 35. 42·00				
	γ Pegasi	7	0. 4. 23·24				
September 22						0·22	
						−0·39	
September 23	Regulus	7	9. 59. 8·99		−0·91	−0·28	−0·19
September 24	Polaris S.P. . .	7	13. 3. 25·29				
	Arcturus.	4	14. 7. 37·57				
	γ Aquilæ	7	19. 37. 56·89				
	α Aquilæ	7	19. 42. 16·50				
	β Aquilæ	7	19. 46. 45·29				
	ζ Pegasi	7	22. 32. 47·86				
	α Pegasi	6	22. 56. 6·49				
	γ Pegasi	6	0. 4. 19·11				
	β Ceti.	4	0. 34. 52·22				
	Polaris	3	1. 3. 29·78				
	α Arietis	7	1. 57. 30·50			−0·21	
September 25	Polaris S.P. . .	4	13. 3. 26·24				
	Arcturus.	7	14. 7. 35·93			+0·02	
	δ Ursæ Minoris	4	18. 21. 24·94				
	β Lyræ.	4	18. 43. 22·90				
	δ Aquilæ.	4	19. 16. 42·62				
	α Aquilæ	7	19. 42. 14·80				
	β Aquilæ	7	19. 46. 43·60				
	α Andromedæ	7	23. 59. 25·60				
	γ Pegasi	7	0. 4. 17·93			+0·01	
	β Ceti.	7	0. 34. 50·45				
	Polaris	4	1. 3. 34·51			−0·16	
September 26	Polaris S.P. . .	3	13. 3. 24·96				
	Arcturus.	7	14. 7. 34·71				

TRANSITS OBSERVED AT GREENWICH.

Error of Azimuth Found. (West Pivot *South.*)	Error of Azimuth Used. (West Pivot *South.*)	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Travelling Chronometers.	Clock Slow used for Comparison with Trav. Chron.
″	″	s	s	s		s	h m	s
	+2·70	35·83	27·79	51·96	E	−0·30		
} +2·70		34·74	26·99	52·25	E	−0·30		
		12·91	5·70	52·79	R	−0·14		
		49·20	42·57	53·37	R	−0·14	20. 15	53·22
		42·14	35·48	53·34	R	−0·14		
		23·37	16·97	53·60	R	−0·14		
							7. 40	55·23
	−0·40	8·90	5·75	56·85	M	−0·05		
−0·40		27·29	27·71	60·42	M	−0·05		
		37·48	34·48	57·00	M	−0·05		
		56·80	54·02	57·22	M	−0·05		
		16·41	13·73	57·32	M	−0·05		
		45·20	42·52	57·32	M	−0·05		
		47·77	45·26	57·49	M	−0·05	20. 5	57·28
		6·40	3·91	57·51	M	−0·05		
		19·02	16·99	57·97	J H			
		52·12	49·64	57·52	J H			
−0·40		27·72	27·80	60·08	J H			
		30·41	28·26	57·85	J H			
							7. 55	58·17
−0·40		29·53	27·89	58·36	E	−0·30		
		35·87	34·47	58·60	E	−0·30		
	+0·92	23·16	20·69	57·53	E	−0·30		
		22·84	21·73	58·89	E	−0·30		
		42·60	41·36	58·76	E	−0·30		
		14·77	13·71	58·94	E	−0·30		
		43·57	42·50	58·93	E	−0·30		
		25·55	24·72	59·17	E	−0·30		
		17·90	17·00	59·10	E	−0·30		
		50·45	49·65	59·20	E	−0·30		
+0·92		30·46	28·00	57·54	E	−0·30		
+0·92		29·09	28·12	59·03	R	−0·14		
		34·67	34·46	59·79	R	−0·14		

TRANSITS OBSERVED AT GREENWICH.

Month and Day. 1844.	Star's Name.	Number of Wires observed	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation Found. (Mean of Wires *West*)	Error of Collimation Used. (Mean of Wires *West*)	Error of Level Found. (West Pivot *High.*)	Error of Level Used. (West Pivot *High*)
			h m s	″	″	″	″
September 26	δ Ursæ Minoris	3	18. 21. 21 ·57		−0 ·91		−0 ·19
	β Lyræ.....	7	18. 43. 21 ·61				
	δ Aquilæ.....	7	19. 16. 41 ·04				
	α Aquilæ.....	7	19. 42. 13 ·48				
	β Aquilæ	7	19. 46. 42 ·30				
	ζ Cygni	7	21. 5. 21 ·24				
	γ Pegasi.....	4	0. 4. 16 ·54				
	Polaris	3	1. 3. 30 ·74				
September 27	Polaris S.P...	4	13. 4. 20 ·17				
	Arcturus	7	14. 8. 33 ·31				
	δ Ursæ Minoris	3	18. 22. 20 ·40				
	β Lyræ.....	7	18. 44. 20 ·04				
	δ Aquilæ.....	4	19. 17. 39 ·80				
	α Aquilæ	7	19. 43. 12 ·01				
	β Aquilæ	7	19. 47. 40 ·84				
	α^2 Capricorni .	7	20. 9. 26 ·04				
	α Andromedæ	7	0. 0. 22 ·84				
	γ Pegasi.....	7	0. 5. 15 ·19				
	β Ceti	7	0. 35. 47 ·80				
	Polaris	4	1. 4. 26 ·85				
	Regulus	6	10. 0. 3 ·83			−0 ·29	
September 28	Polaris S.P...	5	13. 4. 21 ·34				
	Arcturus	7	14. 8. 32 ·34				
	δ Ursæ Minoris	5	18. 22. 19 ·19				
	α Lyræ.....	7	18. 31. 39 ·29				
	β Lyræ.....	7	18. 44. 19 ·33				
	ζ Aquilæ.....	7	18. 58. 15 ·06				
	δ Aquilæ.....	7	19. 17. 38 ·88				
	γ Aquilæ.....	7	19. 38. 51 ·44				
	α Aquilæ.....	7	19. 43. 11 ·24				
	β Aquilæ.....	7	19. 47. 40 ·02				
	α^2 Capricorni .	7	20. 9. 25 ·19				
	ι Piscium	7	23. 31. 57 ·65				
	α Andromedæ	7	0. 0. 22 ·40				
	γ Pegasi.....	7	0. 5. 14 ·46				
	β Ceti.....	7	0. 35. 47 ·10				
	Polaris	4	1. 4. 28 ·40				
September 29	γ Ceti.....	7	2. 35. 13 ·70				
	α Ceti.....	7	2. 54. 8 ·32				
October 21				−0 ·91			

TRANSITS OBSERVED AT GREENWICH.

Error of Azimuth Found. (West Pivot *South.*)	Error of Azimuth Used. (West Pivot *South.*)	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Travelling Chronometers.	Clock Slow used for Comparison with Trav. Chron.
″	″	s				s	h m	s
	+0·92	19·79	20·31	60·52	R	−0·14		
		21·55	21·70	60·15	R	−0·14		
		41·02	41·35	60·33	R	−0·14		
		13·45	13·70	60·25	R	−0·14		
		42·27	42·49	60·22	R	−0·14	20. 50	60·17
		21·19	21·62	60·43	R	−0·14		
		16·51	17·00	60·49	R	−0·14		
+0·92		26·69	28·23	61·54	R	−0·14	7. 40	60·72
+0·92		24·30	28·35	4·05	E	−0·30		
		33·27	34·45	1·18	E	−0·30		
		18·62	19·91	1·29	E	−0·30		
		19·98	21·68	1·70	E	−0·30		
		39·78	41·33	1·55	E	−0·30		
		11·98	13·68	1·70	E	−0·30		
		40·81	42·47	1·66	E	−0·30		
		26·03	27·69	1·66	E	−0·30		
		22·79	24·73	1·94	E	−0·30		
		15·16	17·01	1·85	E	−0·30		
		47·80	49·67	1·87	E	−0·30		
+0·92		22·80	28·48	5·68	E	−0·30		
	+0·69	3·79	5·82	2·03	M	−0·05		
+0·69		25·09	28·62	3·53	M	−0·05		
		32·30	34·44	2·14	M	−0·05		
		17·56	19·51	1·95	M	−0·05		
		39·20	41·52	2·32	M	−0·05		
		19·27	21·66	2·39	M	−0·05		
		15·02	17·42	2·40	M	−0·05		
		38·84	41·31	2·47	M	−0·05		
		51·40	53·95	2·55	M	−0·05		
		11·20	13·66	2·46	M	−0·05		
		39·98	42·45	2·47	M	−0·05		
		25·16	27·67	2·51	M	−0·05	20. 30	2·45
		57·61	0·08	2·47	M	−0·05		
		22·34	24·73	2·39	M	−0·05		
		14·42	17·01	2·59	M	−0·05		
		47·08	49·67	2·59	M	−0·05		
		24·70	28·76	4·06	M	−0·05		
+0·69								
		13·66	17·69	4·03	E	−0·30		
		8·28	12·17	3·89	E	−0·30		

V.—*Transits at Liverpool, and Results for the Error of the Transit-clock at Liverpool.*

The transit-observations, instrumental corrections, and comparisons of individual transits with tabular right ascensions, have not been transmitted to me. The results deduced from groups of transits were sent by Mr. Hartnup in the following form :—

ERRORS OF THE LIVERPOOL TRANSIT-CLOCK DERIVED IMMEDIATELY FROM GROUPS OF TRANSITS.

Day, 1844.		Sidereal Time.	Clock Error.	Number of Stars. (Illum. end West.)	Number of Stars. (Illum. end East.)	Daily Rate.
		h m	s			s
July	27	14. 4	−48·55	0	5	
	29	13. 52	−50·78	10	5	−1·12
August	2	11. 37	−56·29	9	5	−1·41
	3	17. 52	−58·10	7	4	−1·44
September	20	21. 42	−59·48	13	7	
	21	22. 44	−59·47	11	0	+0·01
	22	20. 29	−59·58	10	9	−0·12
	24	22. 36	−59·55	6	8	+0·03
	25	17. 26	−59·71	10	8	−0·20
	26	16. 17	−59·78	8	8	−0·07
	27	18. 43	−59·88	11	4	−0·09
	27	10. 2	−60·00	6	2	−0·16

From these the following errors are deduced for the time of comparison of the stationary chronometers :—

Day, 1844.		Sidereal Time.	Error, using Transit Clock's Rate.	Error, using Mean Time Clock's Rate.	Error, using Rate of Mean of Three Chronom.	Adopted Error.
		h m	s	s	s	s
July	27	6. 15	−49·30	−49·27		−49·29
	29	5. 21	−51·58	−51·59	−51·59	−51·59
August	1	11. 57	−54·90	−54·70	−54·69	−54·76
	2	5. 20	−57·36	−57·36	−57·40	−57·37
September	20	7. 38	−59·48	−59·49		−59·49
	23	19. 58	−59·56	−59·54		−59·55
	23	7. 3	−59·56	−59·55		−59·56
	25	21. 11	−59·72	−59·72		−59·72
	25	7. 15	−59·76	−59·78		−59·77
	27	22. 45	−59·90	−59·88		−59·89
	27	7. 23	−59·98	−59·95		−59·97

It appeared, upon examination of a resulting longitude, that these Errors are considered positive when the clock is fast, and that the Rates are considered positive when the clock is gaining. It was also noted by Mr. Hartnup, that the clock error had been ascertained by comparison of the observed transits with apparent places of stars derived from the mean places given in the Nautical Almanac, 1845. Now the places in the Nautical Almanac, 1845, are referred to the same assumed equinox as those in the Greenwich Observations of 1836, 1837, 1838, and 1839; and therefore (see the Introduction to the Greenwich Catalogue of 1439 Stars) their right ascensions ought to be increased by $-0^s\cdot09$, to make their assumed equinox the same as that of the Greenwich Catalogue of 1439 Stars, on which all other right ascensions in this Memoir are founded. Correcting for this we have the following results:—

	h m		s		s
1844, July 27, at	6. 15	sidereal, Clock Slow	+49·20,	Losing Rate	+1·12
29	5. 21		+51·50		+1·41
Aug. 1	11. 57		+54·67		+1·41
2	5. 20		+57·28		+1·44
Sept. 20	7. 38		+59·40		−0·01
23	19. 58		+59·46		−0·03
23	7. 3		+59·47		−0·03
25	21. 11		+59·63		+0·07
25	7. 15		+59·68		+0·07
27	22. 45		+59·80		+0·16
27	7. 23		+59·88		+0·16

VI.—*Transits at Kingstown, Personal Equations, Instrumental Errors, Catalogue of Clock Stars, First Results for Clock Error, and Results as amended by the Comparison of Stationary Chronometers.*

It has been stated that the transits at Kingstown were taken by Mr. Sheepshanks until ill health compelled him to desist. Mr. J. R. Hind (at that time one of the Assistants in the Magnetical and Meteorological Department of the Royal Observatory, Greenwich), in whose care and exactness, as I well knew, the most perfect reliance might be placed, was then sent to take the Kingstown transits. Mr. Sheepshanks, however, remained at Kingstown so long as to effect a satisfactory comparison of Mr. Hind's methods of observing with his

own, for personal equation. Lieutenant Gosset passed through Kingstown about the same time, and his personal equation was ascertained as compared with Messrs. Sheepshanks and Hind. The observations upon which these depend will be found below among the transits; the results are as follows:—

Clock Slow J.H. − Clock Slow S. = $-0^{s}\cdot33$
Clock Slow J.H. − Clock Slow G. = $-0\cdot04$

As the greater number of transits at Kingstown were taken by Mr. Hind, it was thought expedient to reduce all the results to the values which they would have had if Mr. Hind had observed throughout.

Before entering upon the methods of determining the instrumental errors, I must remark that, the level scale was divided into parts corresponding to 15″ of arc. From this circumstance, and from the general convenience of this quantity as a measure of the instrumental errors of transits, in the use of which the time is measured by seconds, this quantity was adopted throughout. It becomes desirable, therefore, to distinguish it by some name; and I propose in writing to call it a *fifteen″*, and to abbreviate it in the heading of the columns, &c., to *f″*.

The error of collimation was ascertained by noting the apparent position of the middle wire in reversed positions of the transit as seen upon the meridian mark, a circle 2 inches in diameter at the distance of $\frac{2}{3}$ of a mile, which therefore subtended an angle of $0^{f''}\cdot7$ nearly. On July 26 the error was sensibly corrected, but the instrument shortly afterwards received a slight blow. No other change was made in this adjustment. From careful examination of all the observations of the meridian mark, I infer that, Illuminated end East, the apparent error of collimation of the middle wire was—

To the end of July 25 = $+\frac{1}{24}$ diameter of mark = $+0^{f''}\cdot03$
After 20 Ophiuchi, July 26 = $+\frac{1}{12}$ diameter of mark = $+0\cdot06$

But equatoreal stars come later on the mean of all the wires than on the middle wire (Ill. end East) by $0^{s}\cdot01$ nearly. And the effect of diurnal aberration is $-0^{f''}\cdot01$ nearly. Thus we obtain—

Error of Collimation of the Mean of the Wires

To the end of July 25 { Ill. end East $+0^{f''}\cdot01$ / Ill. end West $-0\cdot03$

After 20 Ophiuchi, July 26 { Ill. end East $+0\cdot04$ / Ill. end West $-0\cdot06$

The level errors under the heading "Error of Level Found," is the result of sometimes two and sometimes four applications of the level; and the "Error of Level Used," is therefore sometimes the result of twenty applications. These applications were made frequently in different positions of the transit-telescope, as, elevated 45° to the N., 45° to the S., &c.; but after examination I could not discover any difference among these which would justify a separation of them into classes. The level was also frequently applied immediately before and after reversing the transit; but upon collecting all these instances, the result for correction applicable on account of inequality of pivots was only $0^{s}\cdot003$, which I have neglected. I have, therefore, in adopting the "Error of Level Used," combined the level observations taken before and after reversing. The adjusting screws affecting the axis-level were repeatedly altered; and one effect of this was, that the mean of all the level-errors is very nearly $=0$, so that the the mean result is independent of the accuracy of the scale divisions. I have no reason, however, to doubt their accuracy, as they had been carefully traced by Mr. Simms.

Before July 9, the azimuthal error was obtained only by the deductions from circumpolar stars. After that time, the mark and the stars were used in combination, in the manner already explained.

The places of the stars used for correcting the clock are all (with the exception of nine only) referred to the same equinox as the Greenwich Catalogue of 1439 Stars. Some places are taken from that Catalogue without alteration; some are combined with the results of later observations at the Royal Observatory; some are derived entirely from the later observations at the Royal Observatory; and, in a few instances, results have been used derived wholly or partially from Mr. Hartnup's observations at Liverpool. From the last mentioned right ascensions, $0^{s}\cdot09$ is always deducted, for the reason explained in Section V. The nine excepted stars are Capella, Cephei 51 (Hev.), η Ursæ Majoris, β Ursæ Minoris, ζ Ursæ Minoris, ϵ Ursæ Minoris, γ Draconis, λ Ursæ Minoris, and α Cygni; whose places were taken from the Nautical Almanac: nearly all had been corrected from late Greenwich Observations, but the constant $-0^{s}\cdot09$ was not applied: in the positions of these stars this omission is entirely unimportant.

The stars observed at Valentia were (as far as they went) the same as those observed at Kingstown, with very few additions. To avoid repetition the whole are included in the following catalogue.

MEAN R.A. FOR 1844, JAN. 1, OF THE STARS OBSERVED AT KINGSTOWN AND VALENTIA.

Star's Name.	Mean R.A. 1844, Jan. 1.	Star's Name.	Mean R.A. 1844, Jan. 1.
	h m s		h m s
γ Pegasi	0. 5. 12·43	κ Ophiuchi	16. 50. 17·18
Polaris	1. 3. 17·60	30 Ophiuchi	16. 52. 50·12
Groombridge 642	3. 16. 8·13	ε Ursæ Minoris	17. 2. 9·06
Groombridge 746	3. 44. 15·78	α Herculis	17. 7. 32·05
Groombridge 779	4. 0. 12·65	A.S.C. 1998	17. 18. 21·36
Groombridge 856	4. 31. 25·12	A.S.C. 2004	17. 20. 52·23
Capella	5. 5. 10·51	h Ophiuchi	17. 23. 32·11
Groombridge 944	5. 12. 36·82	α Ophiuchi	17. 27. 41·60
Groombridge 1004	5. 43. 6·06	ο Serpentis	17. 32. 38·94
α Orionis	5. 46. 43·57	β Ophiuchi	17. 35. 45·95
Cephei 51 (Hev.)	6. 25. 28·66	γ Ophiuchi	17. 40. 4·20
Piazzi VI. 292	6. 57. 52·74	ν Ophiuchi	17. 50. 26·22
Castor	7. 24. 38·21	γ Draconis	17. 52. 59·15
Procyon	7. 31. 7·91	70 Ophiuchi	17. 57. 34·21
Pollux	7. 35. 45·63	72 Ophiuchi	17. 59. 57·30
Groombridge 1359	7. 38. 43·95	δ Ursæ Minoris	18. 22. 39·75
Piazzi IX. 37	9. 14. 19·57	24 Ursæ Minoris	18. 28. 28·24
*N.P.D. 11°. 47′	11. 11. 56·24	α Lyræ	18. 31. 39·32
β Leonis	11. 41. 5·77	3 Aquilæ	18. 35. 1·47
9 Draconis	12. 54. 0·22	6 Aquilæ	18. 38. 53·74
Groombridge 1960	12. 59. 59·79	ε Lyræ	18. 39. 10·09
Spica	13. 16. 58·84	β Lyræ	18. 44. 19·16
η Ursæ Majoris	13. 41. 23·13	9 Aquilæ	18. 48. 42·41
η Bootis	13. 47. 15·32	ε Aquilæ	18. 52. 32·49
Arcturus	14. 8. 32·78	ζ Aquilæ	18. 58. 14·31
μ Virginis	14. 34. 50·61	19 Aquilæ	19. 1. 21·42
ε Bootis	14. 38. 10·37	21 Aquilæ	19. 5. 50·69
α Libræ	14. 42. 15·44	22 Aquilæ	19. 8. 47·72
β Ursæ Minoris	14. 51. 13·78	*N.P.D. 6°. 19′	19. 12. 0·46
β Libræ	15. 8. 37·19	26 Aquilæ	19. 12. 13·04
5 Serpentis	15. 11. 21·16	δ Aquilæ	19. 17. 37·84
10 Serpentis	15. 20. 45·65	ν Aquilæ	19. 18. 32·28
37 Libræ	15. 25. 39·54	36 Aquilæ	19. 22. 30·17
α Coronæ	15. 28. 4·95	μ Aquilæ	19. 26. 28·01
α Serpentis	15. 36. 35·14	σ Aquilæ	19. 31. 29·52
λ Serpentis	15. 38. 52·53	χ Aquilæ	19. 35. 13·46
ζ Ursæ Minoris	15. 49. 45·92	γ Aquilæ	19. 38. 50·53
β′ Scorpii	15. 56. 22·52	α Aquilæ	19. 43. 10·15
14 Scorpii	16. 2. 56·10	β Aquilæ	19. 47. 38·89
δ Ophiuchi	16. 6. 10·45	Aquilæ 204 (Bode)	19. 51. 18·09
ε Ophiuchi	16. 10. 4·21	Aquilæ 207 (Bode)	19. 53. 25·96
19 Ursæ Minoris	16. 15. 20·80	τ Aquilæ	19. 56. 31·02
υ Ophiuchi	16. 18. 22·28	θ Aquilæ	20. 3. 15·11
η Ursæ Minoris	16. 22. 7·89	α′ Capricorni	20. 8. 59·69
λ Ophiuchi	16. 23. 2·94	α² Capricorni	20. 9. 23·61
ζ Ophiuchi	16. 28. 34·36	β Capricorni	20. 12. 14·34
20 Ophiuchi	16. 41. 12·55	λ Ursæ Minoris	20. 18. 15·00
ι Ophiuchi	16. 46. 37·69	ε Delphini	20. 25. 45·53

Star's Name.	Mean R.A. 1844, Jan. 1.	Star's Name.	Mean R.A. 1844, Jan. 1.
	h m s		h m s
ζ Delphini	20. 28. 0·83	51 Aquarii	22. 15. 59·05
β Delphini	20. 30. 13·94	ζ Aquarii	22. 20. 47·62
α Delphini	20. 32. 23·47	η Aquarii	22. 27. 20·21
α Cygni	20. 36. 6·89	κ Aquarii	22. 29. 40·40
75 Draconis	20. 37. 45·44	*N.P.D. 2°. 42′	22. 32. 10·92
ε Aquarii	20. 39. 13·52	ζ Pegasi	22. 33. 40·94
μ Aquarii	20. 44. 14·01	3 Piscium	22. 52. 37·78
32 Vulpeculæ	20. 47. 54·67	α Pegasi	22. 56. 59·52
76 Draconis	20. 53. 30·56	Groombridge 4008	23. 4. 3·93
θ Capricorni	20. 57. 10·18	Groombridge 4009	23. 4. 16·98
ν Aquarii	21. 1. 5·34	γ Piscium	23. 9. 4·59
α Equulei	21. 8. 1·41	κ Piscium	23. 18. 56·06
β Aquarii	21. 23. 20·51	9 Piscium	23. 19. 15·18
γ Aquarii	22. 13. 35·69	ι Piscium	23. 31. 55·61

It appears only necessary to add, in explanation of the following transits, that, on July 13, the wind being so high as to make the clock nearly inaudible, the transits were observed with the Mean Solar Chronometer 2354. Three comparisons of the chronometer with the transit-clock were made, by coincidence of beats, one before, one during, and one after the transits; and between these the numbers by the transit-clock corresponding to those by the chronometer were interpolated.

The azimuth of the meridian mark, or x in the column of "Error of Azimuth Found from Observations of the Meridian Mark," was concluded, from the mean of all the comparisons of the Error of Azimuth Found from Stars with the Error of Azimuth Found from the Meridian Mark, to be $+0^{s}\cdot19$.

The transit-clock was an excellent clock with mercurial pendulum by Molyneux, the property of Mr. Sheepshanks.

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	f″	f″	f″	f″
June 27	E	Groomb. 779 S.P...	1	15.59.41·86		+0·01		+0·094
		δ Ophiuchi.....	6	16. 5.55·27				
		ϵ Ophiuchi.....	4	16. 9.49·06			+0·098	
		ζ Ophiuchi.....	1	16.28.19·24				
		Groomb. 856 S.P...	2	16.30.53·39				
		ι Ophiuchi.....	7	16.46.23·06				
		κ Ophiuchi.....	7	16.50. 2·22				
		30 Ophiuchi	7	16.52.35·04				
	W	ϵ Ursæ Minoris	5	17. 2.11·43		−0·03		
		α Herculis	3	17. 7.17·11			+0·087	+0·062
		γ Pegasi	1	0. 4.56·48			+0·107	
							+0·087	
		Polaris	4	1. 4.38·28				
	E	Polaris	3	1. 4.38·37		+0·01		
							+0·060	
							+0·083	
June 28	W	Procyon.....	6	7.30.49·58		−0·03		
		Pollux	5	7.35.28·58			+0·043	+0·140
		Polaris S.P.....	3	13. 1.46·70			+0·083	
		Spica	7	13.16.41·09				
		Arcturus	7	14. 8.16·03				
		μ Virginis	7	14.34.33·44				
		ϵ Bootis	6	14.37.54·12				
		α Libræ	2	14.41.57·87				
	E	β Ursæ Minoris....	6	14.51. 3·44		+0·01		
		β Libræ	7	15. 8.20·01				
		5 Serpentis.....	7	15.11. 4·30				
		Groomb. 642 S.P...	1	15.15.17·60				
		10 Serpentis	7	15.20.28·79				
		37 Libræ	7	15.25.22·42				
		α Coronæ	7	15.27.48·84				
		α Serpentis	7	15.36.18·46				
		λ Serpentis.....	4	15.38.35·83				
		Groomb. 746 S.P...	3	15.43.45·15				
		ζ Ursæ Minoris	4	15.49.38·64				
		β Scorpii.....	7	15.56. 5·23				
		δ Ophiuchi	7	16. 5.53·63			+0·198	
		ϵ Ophiuchi.....	7	16. 9.47·47				
June 30	W	Polaris S.P.....	4	13. 3. 4·13		−0·03	+0·225	+0·271
		Spica	7	13.16.40·15				
		η Ursæ Majoris	7	13.41. 3·99				
		η Bootis	6	13.46.56·32				
		Arcturus	7	14. 8.13·84				
		ϵ Bootis	7	14.37.51·64				
		α Libræ	3	14.41.57·10			+0·280	
	E	β Ursæ Minoris....	7	14.50.54·44		+0·01	+0·270	
		β Libræ	7	15. 8.19·02				

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f″	*f″*	*f″*	s	s	s		s	h m	s
	+4·17	+4·15	59·46	14·86	+15·40	S	−0·33		
	+4·17		58·82	14·16	+15·34				
			52·65	7·96	+15·31				
			23·07	38·30	+15·23				
	+4·16		11·75	26·95	+15·20				
	+4·16		26·01	41·28	+15·27				
			5·21	20·78	+15·57				
			38·59	53·97	+15·38				
	+4·12		56·84	12·76	+15·92				
	+4·12		19·86	35·61	+15·75			17. 34	+15·16
	+3·93	+3·93	59·05	15·14	+16·09				
			14·52	30·65	+16·13				
	+3·93		16·10	30·65	+14·55			3. 46	+15·94
	+3·96								
			52·50	9·21	+16·71				
			30·50	47·18	+16·68				
			14·57	31·12	+16·55				
	+3·96		44·70	1·79	+17·09				
	+3·96		18·44	35·62	+17·18				
			36·86	53·94	+17·08				
			56·16	13·29	+17·13				
			1·71	19·02	+17·31			14. 47	+16·80
	+3·95		58·47	16·03	+17·56				
			23·63	40·77	+17·14				
			7·47	24·55	+17·08				
	+3·95		53·76	11·57	+17·81				
			31·96	49·07	+17·11				
			26·03	43·20	+17·17				
			50·92	8·06	+17·14				
			21·44	38·56	+17·12				
			38·78	55·95	+17·17				
	+3·85		1·34	18·28	+16·94				
	+3·85		31·17	48·59	+17·42				
			9·26	26·57	+17·31				
			57·03	14·16	+17·13				
			50·90	7·96	+17·06				
	+0·63	+0·71	13·71	32·87	+19·16				
	+0·63		40·89	1·77	+20·88				
			4·42	25·49	+21·07				
			56·95	18·09	+21·14				
			14·47	35·60	+21·13				
			52·23	13·27	+21·04				
			57·86	18·99	+21·13				
	+0·87		54·45	15·90	+21·45				
			19·80	40·76	+20·96				

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
June 30	E	Groomb. 642 S.P...	1	15.15.45·30		+0·01		+0·271
		10 Serpentis	7	15.20.27·28				
		37 Libræ.....	7	15.25.21·26				
		α Coronæ.....	4	15.27.46·37				
		α Serpentis.....	7	15.36.16·73				
		λ Serpentis.....	7	15.38.34·04				
		Groomb. 746 S.P...	4	15.43.54·81				
		ζ Ursæ Minoris.....	2	15.49.27·30				
		β^1 Scorpii.....	6	15.56. 4·64				
		Groomb. 779 S.P...	3	15.59.52·17				
		14 Scorpii	5	16. 2.38·22				
		δ Ophiuchi.....	6	16. 5.52·32				
		ε Ophiuchi	7	16. 9.46·11			+0·310	
July 1		η Bootis.....	2	13.46.54·75				+0·252
		Arcturus	7	14. 8.12·09			+0·257	
		Groomb. 779 S.P...	1	16. 0.51·36				
		δ Ophiuchi.....	7	16. 5.50·61				
		ε Ophiuchi.....	7	16. 9.44·41				
		ε Ursæ Minoris.....	4	17. 1.50·87			+0·248	
		Groomb. 944 S.P...	2	17.12.12·86				
		Capella.....	7	5. 4.47·64			+0·187	+0·194
July 2	W	ε Ursæ Minoris.....	6	17. 1.47·26		−0·03	+0·168	
		A.S.C. 1998	4	17.17.59·49			+0·182	
		A.S.C. 2004	7	17.20.30·14				
		h Ophiuchi.....	7	17.23. 9·93				
		α Ophiuchi.....	7	17.27.19·31				
	E	β Ophiuchi	7	17.35.23·93		+0·01	+0·229	
		γ Ophiuchi	6	17.39.42·30				
		Groomb. 1004 S.P.	2	17.42.39·09				
		γ Draconis.....	7	17.53.36·64				
		δ Ursæ Minoris.....	5	18.22.21·69				
		Cephei 51 (Hev.) S.P.	4	18.24.57·93				
		ε Lyræ.....	7	18.38.47·95				
		β Lyræ	6	18.43.56·99				
July 4		ε Ursæ Minoris	4	17. 1.44·37				+0·269
		Groomb. 944 S.P...	1	17.12. 4·92				
		A.S.C. 1998	7	17.17.54·97				
		α Ophiuchi	3	17.27.14·87				
		Groomb. 1004 S.P.	1	17.42.32·41				
		γ Draconis	7	17.52.32·22				
		70 Ophiuchi	3	17.57. 7·73			+0·289	
		δ Ursæ Minoris	4	18.22.20·87			+0·249	

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow Used for Comparison with Chronometers.
f″	*f″*	*f″*	s	s	s		s	h m	s
	+0·87	+0·71	48·94	12·18	+23·24	S	−0·33		
			28·01	49·07	+21·06				
			22·03	43·20	+21·17				
			47·00	8·05	+21·05				
			17·45	38·56	+21·11				
			34·75	55·93	+21·18				
	+0·78		56·69	18·52	+21·83				
	+0·78								
	+0·67		27·08	48·44	+21·36				
			5·46	26·57	+21·11				
	+0·67		54·07	15·19	+21·12				
			39·04	0·17	+21·13			16.12	+20·91
			53·08	14·15	+21·07				
			46·88	7·96	+21·08				
			55·40	18·08	+22·68				
			12·74	35·59	+22·85				
	+0·67		53·34	15·30	+21·96				
			51·36	14·15	+22·79				
			45·17	7·96	+22·79			17.23	+22·82
	+0·67		50·02	12·43	+22·41				
	+0·66								
	+0·66	+0·39	16·05	37·91	+21·86				
			47·99	12·50	+24·51			6.40	+24·04
	+0·35		46·90	12·33	+25·43				
			59·89	25·31	+25·42				
			30·54	56·07	+25·53				
			10·32	35·92	+25·60				
			19·69	45·24	+25·55				
			24·36	49·74	+25·38				
			42·73	8·04	+25·31				
	+0·35		40·71	5·54	+24·83				
	+0·42		36·99	2·42	+25·43				
	+0·42		20·99	46·51	+25·52				
			59·75	25·97	+26·22			18.47	+25·18
			48·30	13·54	+25·24				
			57·38	22·66	+25·28				
	+0·88	+0·84	43·17	12·14	+28·97				
	+0·76								
	+0·88		8·98	38·40	+29·42			17.33	+29 28
			55·84	25·31	+29·47				
			15·65	45·24	+29·59				
	+0·76		38·14	5·95	+27·81				
			32·71	2·41	+29·70				
			8·57	38·08	+29·51				
	+0·88		17·06	46·31	+29·25				

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
July 4	E	Cephei 51 (Hev.) S.P.	2	18. 24. 49·54		+0·01		+0·269
	W	δ Ursæ Minoris	2	18. 22. 17·14		−0·03		
		Cephei 51 (Hev.) S.P.	4	18. 24. 53·36				
		ε Lyræ	2	18. 38. 43·22				
		β Lyræ	7	18. 43. 52·18				
		ζ Aquilæ.....	3	18. 57. 47·57				
July 5	E	β^1 Scorpii.....	7	15. 55. 54·56		+0·01		+0·236
		δ Ophiuchi.....	7	16. 5. 42·33				
		υ Ophiuchi.....	6	16. 18. 54·26				
		λ Ophiuchi.....	4	16. 22. 34·66				
		Groomb. 856 S.P...	5	16. 30. 55·95			+0·236	
July 6	W	ε Ursæ Minoris	7	17. 1. 39·03		−0·03		+0·172
		Groomb. 944 S.P...	5	17. 12. 4·81				
		A. S. C. 2004.....	4	17. 20. 22·03				
		h Ophiuchi.....	6	17. 23. 1·69				
		α Ophiuchi.....	7	17. 27. 11·07				
		β Ophiuchi.....	7	17. 35. 15·60				
		γ Ophiuchi.....	7	17. 39. 33·92				
		Groomb. 1004 S.P..	2	17. 42. 33·10				
		ν Ophiuchi.....	1	17. 49. 56·24				
		γ Draconis.....	3	17. 52. 27·94			+0·171	
		δ Ursæ Minoris	4	18. 22. 11·85				
		Cephei 51 (Hev.) S.P.	2	18. 24. 50·63				
	E	δ Ursæ Minoris	3	18. 22. 11·36		+0·01	+0·174	
		Cephei 51 (Hev.) S.P.	3	18. 24. 50·90				
		β Lyræ.....	7	18. 43. 48·21				
		ζ Aquilæ	7	18. 57. 43·75				
July 9		β Leonis.....	7	11. 40. 27·37	0·00		+0·065	+0·101
		β Ursæ Minoris....	3	14. 50. 34·52			+0·127	
		β Libræ.....	5	15. 7. 59·61			+0·127	
		α Serpentis	2	15. 35. 57·72				
		β Ophiuchi	7	17. 35. 8·53				
		γ Ophiuchi.....	7	17. 39. 26·91				
		Groomb. 1004 S.P.	1	17. 42. 25·88				
		γ Draconis.....	5	17. 52. 21·20				
		70 Ophiuchi.....	7	17. 56. 56·92				
		72 Ophiuchi.....	7	17. 59. 19·76			+0·087	
July 10	W	β Ophiuchi.....	7	17. 35. 5·99		−0·03		+0·073
							+0·085	
		Groomb. 1004 S.P..	2	17. 42. 24·20			+0·075	
							+0·060	
July 11		α Coronæ.....	2	15. 27. 21·62	+ 0·02			+0·027
	E	δ Ursæ Minoris	2	18. 21. 58·50		+0·01		

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f''	f''	f''	s	s	s		s	h m	s
	+0·88	+0·84	56·12	26·27	+30·15	S	−0·33		
			12·66	46·31	+33·65				
			0·77	26·27	+25·50				
			43·78	13·55	+29·77				
			52·78	22·67	+29·89				
			48·30	18·05	+29·75				
		+0·34	54·99	26·55	+31·56			10. 12	+30·62
	+0·34		42·76	14·14	+31·38				
			54·69	26·12	+31·43			16. 16	+31·10
			35·09	6·42	+31·33				
	+0·34		56·39	27·82	+31·43				
	+0·27	+0·23	39·10	11·95	+32·85				
	+0·20								
	+0·27		5·44	38·74	+33·30				
			22·28	56·08	+33·80				
			1·95	35·93	+33·98				
			11·32	45·25	+33·93				
			15·85	49·76	+33·91				
			34·18	8·05	+33·87				
	+0·20		33·91	6·37	+32·46				
			56·50	30·36	+33·86				
			28·18	2·40	+34·22				
	+0·21		11·65	46·14	+34·49				
			51·53	26·52	+34·99				
			11·83	46·14	+34·31				
	+0·21		50·97	26·52	+35·55				
			48·50	22·68	+34·18			18. 46	+33·72
			44·05	18·06	+34·01				
		+0·25	27·62	7·87	+40·25			9. 31	+39·80
	+0·16		34·57	15·27	+40·70				
			59·90	40·70	+40·80				
$x+0·06$			57·98	38·50	+40·52				
			8·80	49·76	+40·96				
			27·17	8·06	+40·89				
	+0·16		27·17	7·06	+39·89			17. 46	+40·63
			21·39	2·39	+41·00				
			57·19	38·09	+40·90				
			20·02	1·07	+41·05				
	−0·02	−0·02	5·99	49·76	+43·77				
	−0·02		23·51	7·30	+43·79			17. 54	+43·40
		+0·16	21·70	7·92	+46·22				
	+0·08		57·57	45·46	+47·89			18. 1	+46·19

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
July 11	E	Cephei 51 (Hev.) S.P.	1	18. 24. 39·66		+0·01		+0·027
	W	δ Ursæ Minoris	1	18. 21. 58·53		−0·03		
		α Lyræ.....	3	18. 30. 56·17			+0·017	
							+0·037	
July 12								
July 13		α Coronæ.....	5	15. 27. 15·82	0·00		+0·105	+0·075
		α Serpentis.....	5	15. 35. 46·42				
		ζ Ursæ Minoris	7	15. 48. 54·74				
		β^1 Scorpii.....	5	15. 55. 34·26				
		Groomb. 779 S.P...	1	15. 59. 24·79				
		δ Ophiuchi.....	7	16. 5. 21·90				
		ε Ophiuchi.....	6	16. 9. 15·76				
	E	α Ophiuchi.....	3	17. 26. 52·94		+0·01		
		β Ophiuchi.....	4	17. 34. 57·54				
		γ Ophiuchi	6	17. 39. 15·79				
		Groomb. 1004 S.P.	2	17. 42. 15·72				
		γ Draconis.....	2	17. 52. 9·14				
		70 Ophiuchi	2	17. 56. 45·87				
		72 Ophiuchi	6	17. 59. 8·74				
		δ Ursæ Minoris....	4	18. 21. 53·58			+0·100	
		Cephei 51 (Hev.) S.P.	2	18. 24. 32·34			+0·077	
	W	δ Ursæ Minoris....	3	18. 21. 51·63		−0·03	+0·019	
		Cephei 51 (Hev.) S.P.	3	18. 24. 36·71				
		β Lyræ.....	2	18. 43. 30·46				
		ζ Aquilæ.....	5	18. 57. 25·75				
July 14	E	ζ Ursæ Minoris	7	15. 48. 52·20		+0·01		+0·021
		β^1 Scorpii.....	4	15. 55. 31·99				
		Groomb. 779 S.P...	3	15. 59. 22·72				
		δ Ophiuchi.....	7	16. 5. 19·51				
		ε Ophiuchi.....	7	16. 9. 13·40				
	W	α Ophiuchi.....	7	17. 26. 50·35		−0·03		
		ο Serpentis.....	5	17. 31. 48·20				
		β Ophiuchi.....	7	17. 34. 55·00				
		γ Ophiuchi.....	7	17. 39. 13·35				
		Groomb. 1004 S.P.	2	17. 42. 15·35			+0·010	
		ν Ophiuchi.....	7	17. 49. 35·61				
		70 Ophiuchi.....	7	17. 56. 43·31				
		72 Ophiuchi.....	7	17. 59. 6·20				
		δ Ursæ Minoris....	2	18. 21. 47·58			+0·014	
							+0·025	
							+0·020	
		Cephei 51 (Hev.) S.P.	1	18. 24. 33·70			+0·037	
July 15	E	ζ Ursæ Minoris	4	15. 48. 49·01		+0·01		+0·015
		β^1 Scorpii.....	3	15. 55. 29·13				

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f''	f''	f''	s	s	s		s	h m	s
$x-0\cdot03$	$+0\cdot08$	$+0\cdot16$	41·14	27·45	+46·31	S	−0·33		
$x-0\cdot03$			56·93	45·46	+48·53				
			56·22	42·79	+46·57				
								9. 28	+48·03
		$+0\cdot05$	15·89	7·90	+52·01				
			46·48	38·50	+52·02				
	$-0\cdot04$		54·83	47·33	+52·50				
	$+0\cdot07$								
			34·30	26·50	+52·20				
	$-0\cdot04$		24·88	16·81	+51·93				
			21·95	14·10	+52·15				
			15·81	7·90	+52·09			16. 16	+51·72
			53·04	45·21	+52·17				
			57·64	49·76	+52·12				
			15·89	8·06	+52·17				
	$+0\cdot07$		15·09	8·05	+52·96				
			9·28	2·35	+53·07				
			45·97	38·10	+52·13				
			8·84	1·08	+52·24				
	$+0\cdot13$		54·35	45·09	+50·74				
			31·57	28·01	+56·44				
			51·73	45·09	+53·36				
	$+0\cdot13$		36·77	28·01	+51·24				
			30·52	22·70	+52·18				
			25·81	18·11	+52·30				
	$-0\cdot08$	$-0\cdot13$	52·61	47·23	+54·62				
	$-0\cdot18$								
			31·88	26·48	+54·60				
	$-0\cdot08$		22·00	16·94	+54·94				
			19·42	14·10	+54·68				
			13·31	7·89	+54·58				
			50·25	45·21	+54·96			17. 21	+54·52
			48·06	43·14	+55·08				
			54·88	49·76	+54·88				
			13·23	8·06	+54·83				
	$-0\cdot18$		14·11	8·31	+54·20				
			35·47	30·38	+54·91				
			43·19	38·10	+54·91				
			6·10	1·08	+54·98				
	$-0\cdot14$		48·58	44·88	+56·30				
	$-0\cdot14$		32·26	28·30	+56·04				
	$-0\cdot17$	0·00	49·13	47·14	+58·01				
			29·15	26·49	+57·34				

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
July 15	E	Groomb. 779 S.P...	3	15. 59. 20 ·26		+0 ·01	+0 ·031	+0 ·015
		δ Ophiuchi.....	7	16. 5. 16 ·77				
		ε Ophiuchi.....	7	16. 9. 10 ·53				
		19 Ursæ Minoris...	4	16. 14. 25 ·28				
		η Ursæ Minoris....	5	16. 21. 12 ·46				
		Groomb. 856 S.P...	7	16. 30. 31 ·55				
	W	ε Ursæ Minoris	4	17. 1. 14 ·01		−0 ·03	−0 ·001	
July 20								
July 21	E	ζ Ophiuchi.....	7	16. 27. 23 ·10		+0 ·01		+0 ·205
		Groomb. 856 S.P...	1	16. 30. 15 ·96				
		20 Ophiuchi	7	16. 40. 1 ·15				
		ι Ophiuchi	7	16. 45. 25 ·92			+0 ·203	
		κ Ophiuchi.....	7	16. 49. 5 ·29				
		30 Ophiuchi.....	7	16. 51. 38 ·58			+0 ·220	
		ε Ursæ Minoris	6	17. 0. 54 ·68				
		Groomb. 944 S.P...	3	17. 11. 29 ·04				
		α Ophiuchi	7	17. 26. 30 ·18				
		β Ophiuchi.....	7	17. 34. 34 ·64				
		γ Ophiuchi.....	7	17. 38. 53 ·04				
		ν Ophiuchi.....	7	17. 49. 15 ·43			+0 ·205	
		72 Ophiuchi.....	7	17. 58. 45 ·80			+0 ·200	
	W	δ Ursæ Minoris....	7	18. 21. 28 ·00		−0 ·03	+0 ·180	
		3 Aquilæ	5	18. 33. 50 ·70			+0 ·220	
		6 Aquilæ	7	18. 37. 42 ·90			+0 ·205	
		ε Aquilæ.....	7	18. 51. 21 ·42			+0 ·207	
		Piazzi VI. 292 S.P.	2	18. 56. 39 ·46				
		21 Aquilæ	7	19. 4. 39 ·66				
		22 Aquilæ	7	19. 7. 36 ·50				
		26 Aquilæ	7	19. 11. 2 ·07				
July 22		α Coronæ.....	7	15. 27. 50 ·34	+ 0 ·04		+0 ·217	+0 ·218
							−0 ·189	−0 ·196
		ζ Ursæ Minoris....	7	15. 49. 30 ·37			−0 ·167	
							−0 ·234	
July 23	E	Capella.....	5	5. 4. 50 ·50		+0 ·01	−0 ·282	−0 ·222
							−0 ·236	
July 24	W	η Ursæ Majoris....	6	13. 41. 1 ·92	+ 0 ·04	−0 ·03	−0 ·193	
							−0 ·177	
		Arcturus.....	5	14. 8. 11 ·95				
		ζ Ursæ Minoris....	2	15. 49. 23 ·13			+0 ·014	+0 ·025
		δ Ophiuchi.....	1	16. 5. 50 ·05				
		ε Ophiuchi.....	7	16. 9. 43 ·81				
		κ Ophiuchi.....	7	16. 49. 56 ·90				

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f″	*f″*	*f″*	s	s	s		s	h m	s
	−0·17	0·00	20·14	17·08	+56·94	S	−0·33		
			16·79	14·09	+57·30				
			10·55	7·89	+57·34				
	+0·07		25·38	22·59	+57·21				
	+0·07		12·56	9·77	+57·21				
	+0·07								
	+0·08		31·42	29·08	+57·66			16. 45	+57·08
	+0·08		13·89	10·96	+57·07				
								16. 47	+71·78
		+0·09	23·28	38·21	+74·93				
	+0·10		15·40	29·88	+74·48			12. 55	+74·23
			1·33	16·46	+75·13				
			26·14	41·18	+75·04			16. 38	+74·68
			5·51	20·71	+75·20				
	+0·10		38·78	53·93	+75·15				
	+0·05		55·77	10·21	+74·44				
	+0·05		27·82	41·77	+73·95				
			30·41	45·23	+74·82	J H	0·00		
			34·86	49·74	+74·88				
			53·25	8·05	+74·80				
			15·61	30·37	+74·76				
			46·02	1·07	+75·05	G	−0·04		
	+0·12		29·57	43·57	+74·00	J H	0·00		
			50·85	5·69	+74·84	G	−0·04		
			43·06	57·89	+74·83	J H	0·00		
			21·61	36·29	+74·68				
	+0·12		39·03	54·00	+74·97				
			39·83	54·73	+74·90				
			36·69	51·72	+75·03	G	−0·04		
			2·23	17·24	+75·01				
x−0·12									
x+0·04	+0·07	+0·07	50·56	7·77	+17·21	S	−0·33	15. 1	+16·84
	+0·07		29·21	46·46	+17·25				
		+0·34	50·25	13·18	+22·93				
x−0·15									
x−0·10			1·55	24·90	+23·35			13. 51	+23·20
			11·92	35·29	+23·37				
	+0·27		22·39	46·26	+23·87				
	+0·27		50·32	14·01	+23·69				
			44·08	7·81	+23·73				
			57·13	20·68	+23·55	J H	0·00		

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
July 24	W	30 Ophiuchi.....	3	16. 52. 30·30		−0·03		+0·025
		ϵ Ursæ Minoris....	7	17. 1. 49·15				
		α Ophiuchi.....	7	17. 27. 21·02				
		β Ophiuchi.....	6	17. 35. 25·77				
		γ Ophiuchi.....	6	17. 39. 44·12				
		ν Ophiuchi.....	3	17. 50. 7·02				
		70 Ophiuchi.....	7	17. 57. 14·21			+0·036	
		72 Ophiuchi	7	17. 59. 37·17			+0·025	
	E	δ Ursæ Minoris....	7	18. 22. 19·15		+0·01	+0·023	
							+0·038	
		3 Aquilæ	7	18. 34. 41·27				
		6 Aquilæ	7	18. 38. 33·71				
		β Lyræ.....	6	18. 43. 58·51				
		9 Aquilæ	7	18. 48. 22·43				
		ϵ Aquilæ.....	7	18. 52. 12·15				
		Piazzi VI. 292 S.P.	3	18. 57. 30·47				
		ζ Aquilæ.....	7	18. 57. 54·07				
		21 Aquilæ	7	19. 5. 30·42				
		22 Aquilæ	4	19. 8. 27·42				
		26 Aquilæ	7	19. 11. 53·05				
		δ Aquilæ.....	7	19. 17. 17·53				
		36 Aquilæ	7	19. 22. 9·63				
		μ Aquilæ	7	19. 26. 7·39				
		σ Aquilæ	7	19. 31. 8·80				
		χ Aquilæ	7	19. 34. 52·82				
		γ Aquilæ	7	19. 38. 30·21				
		α Aquilæ	7	19. 42. 49·78				
		β Aquilæ	7	19. 47. 18·80				
		τ Aquilæ	3	19. 56. 10·75				
		θ Aquilæ.....	7	20. 2. 54·83			+0·014	
		α^1 Capricorni.....	2	20. 8. 40·67				
		α^2 Capricorni.....	7	20. 9. 3·55				
		β Capricorni.....	4	20. 10. 54·30				
		β Capricorni.....	3	20. 10. 54·33				
					+0·03			
July 26	W	ζ Ursæ Minoris....	6	15. 49. 19·76	0·00	0·00	−0·066	−0·017
		β^1 Scorpii.....	7	15. 55. 59·04			−0·021	
		δ Ophiuchi.....	7	16. 5. 46·75				
		ϵ Ophiuchi.....	7	16. 9. 40·55				
		19 Ursæ Minoris...	3	16. 14. 55·71				
	E	η Ursæ Minoris....	7	16. 21. 42·40		0·00		
		ζ Ophiuchi.....	7	16. 28. 10·87				
		Groomb. 856 S.P...	4	16. 31. 1·92				
		20 Ophiuchi.....	7	16. 40. 49·03				
		ι Ophiuchi.....	7	16. 46. 13·89		+0·04		
		κ Ophiuchi.....	6	16. 49. 53·24				
		30 Ophiuchi.....	7	16. 52. 26·60				

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f″	*f″*	*f″*	s	s	s		s	h m	s
		+0·34	30·57	53·91	+23·34	J H	0·00		
	+0·80		47·86	9·80	+21·94				
	+0·80		21·24	45·19	+23·95	G	−0·04		
			26·02	49·73	+23·71				
			44·37	8·03	+23·66				
			7·31	30·37	+23·06				
			14·47	38·10	+23·63	J H	0·00		
			37·40	1·07	+23·67				
	+0·05		16·52	42·89	+26·37				
			41·59	5·70	+24·11				
			34·02	57·90	+23·88				
			58·69	22·70	+24·01				
			22·74	46·61	+23·87				
			12·40	36·30	+23·90				
	+0·05		32·11	54·29	+22·18				
			54·32	18·15	+23·83				
			30·71	54·74	+24·03				
			27·73	51·72	+23·99				
			53·36	17·25	+23·89				
			17·82	41·89	+24·07				
			9·93	34·34	+24·41	S	−0·33		
			7·67	32·00	+24·33				
			9·08	33·56	+24·48				
			53·08	17·40	+24·32				
			30·48	54·48	+24·00	G	−0·04		
			50·05	14·15	+24·10				
			19·08	42·90	+23·82				
			11·03	35·03	+24·00	J H	0·00		
			55·13	19·27	+24·14			20. 0	+23·88
			41·01	4·07	+23·06				
			3·89	27·99	+24·10				
			54·65	18·76	+24·11	G	−0·04		
			54·68	18·76	+24·08	J H	0·00		
x+0·00									
x+0·00	+0·33		18·99	46·06	+27·07	S	−0·33		
			59·37	26·39	+27·02				
			47·02	13·99	+26·97				
			40·83	7·80	+26·97				
	+0·41		55·09	21·71	+26·62				
	+0·33		41·79	8·90	+27·11				
	+0·33		11·17	38·16	+26·99				
	+0·41								
	+0·33		3·53	30·61	+27·08				
			49·33	16·43	+27·10				
			14·15	41·15	+27·00				
			53·51	20·67	+27·16				
			26·92	53·90	+26·98				

DETERMINATION OF THE LONGITUDE OF VALENTIA

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	f″	f″	f″	f″
July 26	E	ε Ursæ Minoris	4	17. 1. 44·81		+0·04		−0·017
		α Herculis	7	17. 7. 8·24				
		Groomb. 944 S.P...	3	17. 12. 13·32				
		α Ophiuchi.....	7	17. 27. 18·01			−0·175	
		ο Serpentis.....	7	17. 32. 16·05				
		β Ophiuchi.....	7	17. 35. 22·84				
		γ Ophiuchi.....	7	17. 39. 41·20				
		Groomb. 1004 S.P. .	1	17. 42. 41·88				
		ν Ophiuchi.....	7	17. 50. 3·55				
		70 Ophiuchi	4	17. 57. 11·10				
		72 Ophiuchi.....	7	17. 59. 34·00			−0·081	
	W	δ Ursæ Minoris.....	7	18. 22. 17·86		−0·06	−0·012	
		3 Aquilæ.....	7	18. 34. 38·52				
		6 Aquilæ	7	18. 38. 30·84				
		β Lyræ.....	7	18. 43. 55·51				
		9 Aquilæ	7	18. 48. 19·55				
		ε Aquilæ.....	7	18. 52. 9·19				
		Piazzi VI. 292 S.P.	4	18. 57. 26·72				
		ζ Aquilæ.....	7	18. 57. 51·22			+0·017	
		21 Aquilæ	7	19. 5. 27·17				
		22 Aquilæ	7	19. 8. 24·24				
		26 Aquilæ	2	19. 11. 49·81				
		δ Aquilæ.....	7	19. 17. 14·45				
		36 Aquilæ	7	19. 22. 6·78				
		μ Aquilæ.....	6	19. 26. 4·54				
		σ Aquilæ	7	19. 31. 6·07				
		χ Aquilæ	7	19. 34. 50·01				
		γ Aquilæ.....	7	19. 38. 27·01				
		α Aquilæ	7	19. 42. 46·66				
		β Aquilæ	7	19. 47. 15·38				
	E	Aquilæ 204 (Bode)	7	19. 50. 54·86		+0·04	−0·003	
		Aquilæ 207 (Bode)	6	19. 53. 2·47				
		τ Aquilæ.....	7	19. 56. 7·42				
		θ Aquilæ.....	6	20. 2. 51·74			+0·022	
		α^1 Capricorni	2	20. 8. 36·42			+0·028	
		α^2 Capricorni	7	20. 9. 0·22				
		β Capricorni.....	6	20. 11. 51·08				
		λ Ursæ Minoris	1	20. 18. 18·35			−0·035	
	W	λ Ursæ Minoris	1	20. 18. 25·42		−0·06		
July 27	E	70 Ophiuchi.....	7	17. 57. 9·55		+0·04		−0·079
		ζ Aquilæ.....	7	18. 57. 49·56			−0·051	
		19 Aquilæ.....	6	19. 0. 56·90				
		21 Aquilæ.....	7	19. 5. 26·20				
		22 Aquilæ.....	7	19. 8. 23·15				
		26 Aquilæ.....	7	19. 11. 48·58				
		δ Aquilæ.....	6	19. 17. 13·48				
		σ Aquilæ	5	19. 31. 4·92				

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f″	*f″*	*f″*	s	s	s		s	h m	s
	+0·48	+0·34	43·77	9·52	+25·75	S	−0·33		
	+0·39		8·49	35·52	+27·03				
	+0·48		15·64	42·94	+27·30				
			18·27	45·18	+26·91				
			16·39	43·11	+26·72	J H	0·00		
			23·13	49·71	+26·58				
			41·49	8·02	+26·53				
	+0·39		45·27	11·84	+26·57				
			3·89	30·36	+26·47				
			11·40	38·10	+26·70				
			34·27	1·05	+26·78				
	+0·09		13·46	42·43	+28·97				
			38·75	5·70	+26·95				
			31·06	57·89	+26·83				
			55·56	22·69	+27·13				
			19·77	46·62	+26·85				
			9·34	36·29	+26·95				
	+0·09		29·15	54·49	+25·34				
			51·37	18·15	+26·78				
			27·37	54·75	+27·38	S	−0·33		
			24·45	51·73	+27·28				
			50·03	17·26	+27·23			19.10	+26·87
			14·64	41·90	+27·26				
			6·99	34·35	+27·36				
			4·72	32·02	+27·30				
			6·25	33·56	+27·31				
			50·17	17·40	+27·23				
			27·18	54·50	+27·32				
			46·83	14.16	+27·33				
			15·56	42·92	+27·36				
			55·20	22·43	+27·23				
			2·74	29·97	+27·23				
			7·70	35·05	+27·35				
			52·05	19·27	+27·22				
			36·77	4·08	+27·31				
	+0·32		0·57	28·00	+27·43				
			51·44	18·78	+27·34				
	+0·32		9·80	38·90	+29·10				
			11·89	38·90	+27·01				
								12.36	+28·04
		+0·16	9·66	38·08	+28·42	J H	0·00		
			49·65	18·15	+28·50				
			57·01	25·41	+28·40				
			26·31	54·75	+28·44				
			23·26	51·74	+28·48				
			48·72	17·26	+28·54	G	−0·04		
			13·59	41·89	+28·30	J H	0·00		
			5·03	33·57	+28·54	G	−0·04		

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
July 27	E	Groomb. 1359 S.P. .	2	19. 38. 13·94		+0·04		−0·079
		α Aquilæ.	7	19. 42. 45·56				
	W	β Aquilæ.	7	19. 47. 14·38		−0·06	−0·062	
							−0·071	
		Aquilæ (204) Bode	7	19. 50. 53·77				
		Aquilæ (207) Bode	5	19. 53. 1·58				
		τ Aquilæ.	7	19. 56. 6·30				
		θ Aquilæ.	7	20. 2. 50·65			−0·098	
		α^2 Capricorni	6	20. 8. 59·30				
		λ Ursæ Minoris	1	20. 18. 20·65			−0·111	
July 28	E	α Ophiuchi.	6	17. 27. 15·01		+0·04		−0·129
		β Ophiuchi	3	17. 36. 19·64				
		γ Ophiuchi	7	17. 39. 37·79				
		ν Ophiuchi	7	17. 50. 0·18				
		70 Ophiuchi.	7	17. 57. 7·73			−0·150	
							−0·118	
		72 Ophiuchi.	7	17. 59. 30·80			−0·112	
		δ Ursæ Minoris.	4	18. 22. 14·81				
		Cephei 51 (Hev.) S.P.	2	18. 24. 54·63				
	W	δ Ursæ Minoris	3	18. 22. 15·30		−0·06	−0·132	
		Cephei 51 (Hev.) S.P.	2	18. 24. 55·61			−0·140	
		6 Aquilæ	7	18. 38. 27·70				
		β Lyræ	7	18. 43. 52·38				
		ε Aquilæ.	7	18. 52. 6·09				
		Piazzi VI. 292 S.P.	1	18. 57. 21·44				
		ζ Aquilæ.	6	18. 57. 47·58				
		19 Aquilæ.	5	19. 0. 54·66				
		*N.P.D. 6°. 19′. .	5	19. 11. 36·09				
		δ Aquilæ.	7	19. 17. 11·26				
		μ Aquilæ	7	19. 26. 1·70				
		γ Aquilæ	5	19. 38. 24·09				
		α Aquilæ	7	19. 42. 43·88				
		β Aquilæ	7	19. 47. 12·54				
		θ Aquilæ.	6	20. 2. 48·55				
		λ Ursæ Minoris	1	20. 18. 21·65			−0·121	
		α Cygni	7	20. 35. 40·12				
July 29					+0·06			
July 30	E	δ Ursæ Minoris	3	18. 22. 12·24		+0·04	−0·174	−0·156
		9 Aquilæ	7	18. 48. 13·03				
		ε Aquilæ.	7	18. 52. 2·95				
		Piazzi VI. 292 S.P.	1	18. 52. 19·29				
		ζ Aquilæ.	7	18. 57. 44·76				
	W	21 Aquilæ.	6	19. 5. 21·32		−0·06		
		22 Aquilæ.	7	19. 8. 18·23				

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f''	f''	f''	s	s	s		s	h m	s
	+0·16	+0·16	15·25	43·89	+28·64	J H	0·00		
			45·65	14·16	+28·51				
			14·39	42·92	+28·53				
			53·82	22·44	+28·62	G	−0·04		
			1·57	29·97	+28·40				
			6·31	35·06	+28·75				
			50·67	19·28	+28·61	J H	0·00		
			59·36	28·01	+28·65				
	+0·16		9·83	38·62	+28·79			20. 24	+28·58
		+0·22	15·10	45·16	+30·06				
			19·76	49·71	+29·95	G	−0·04		
			37·92	8·01	+30·09	J H	0·00		
			0·36	30·35	+29·99				
			7·86	38·08	+30·22				
			30·90	1·05	+30·15			18. 2	+30·18
	+0·27		11·62	41·86	+30·24				
			58·79	32·24	+33·45	S	−0·33		
			10·43	41·86	+31·43	J H	0·00		
	+0·27		1·85	32·24	+30·39	S	−0·33		
			27·76	57·89	+30·13	J H	0·00		
			52·26	22·69	+30·43				
			6·07	36·30	+30·23				
	+0·18		23·84	54·70	+30·86	S	−0·33		
	+0·21								
			47·57	18·15	+30·58				
			54·67	25·41	+30·74				
	+0·18		33·52	4·80	+31·28				
			11·29	41·89	+30·60				
			1·71	32·02	+30·31	G	−0·04		
			24·09	54·50	+30·41				
			43·89	14·16	+30·27				
			12·55	42·93	+30·38				
			48·59	19·29	+30·70	S	−0·33		
	+0·21		7·06	38·32	+31·26				
			39·91	10·75	+30·84				
x+0·02									
x+0·02								12. 14	+31·37
	+0·30	+0·30	7·93	41·36	+33·43	J H	0·00		
			13·25	46·60	+33·35				
			3·06	36·29	+33·23				
	+0·30		21·50	54·93	+33·43				
			44·88	18·15	+33·27				
			21·39	54·74	+33·35				
			18·31	51·73	+33·42				

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
July 30	W	26 Aquilæ	7	19.11.43·98		−0·06		−0·156
		∂ Aquilæ.....	7	19.17. 8·52				
		36 Aquilæ	7	19.22. 0·88				
		μ Aquilæ.....	6	19.25.58·63				
		σ Aquilæ	7	19.30.59·97			−0·137	
		γ Aquilæ.....	7	19.38.21·02				
		α Aquilæ.....	6	19.42.40·81				
		β Aquilæ.....	7	19.47. 9·48				
July 31					0·00		−0·173	
							−0·166	
Aug. 1		Polaris S.P.....	1	13. 3. 9·55	+ 0·06		−0·241	−0·241
	E	Capella.....	6	5. 4.37·28		+0·04	−0·214	−0·235
		α Orionis	7	5.46. 9·09			−0·204	
Aug. 2	W	ϵ Ursæ Minoris	4	17. 1.35·60		−0·06	−0·324	
							−0·201	
Aug. 4	E	Groomb. 1004 S.P..	2	17.42.28·90	+ 0·06	+0·04		−0·145
		70 Ophiuchi.....	4	17.56.58·08				
		72 Ophiuchi.....	7	17.59.20·97			−0·122	
		∂ Ursæ Minoris	7	18.22. 5·00			−0·118	
		3 Aquilæ	7	18.34.25·50				
		6 Aquilæ	7	18.38.17·87				
		β Lyræ.....	7	18.43.42·88				
		9 Aquilæ	7	18.48. 6·52				
		ϵ Aquilæ	7	18.51.56·30				
	W	Piazzi VI. 292 S.P.	2	18.57.14·09		−0·06		
		ζ Aquilæ	7	18.57.38·08				
		21 Aquilæ	6	19. 5.14·75				
		22 Aquilæ	7	19. 8.11·54				
		26 Aquilæ	7	19.11,37·20				
		∂ Aquilæ.....	7	19.17. 1·85				
		36 Aquilæ	7	19.21,54·28				
		μ Aquilæ	7	19.25.51·95				
		σ Aquilæ	6	19.30.53·50				
		χ Aquilæ.....	6	19.34.37·32				
		γ Aquilæ.....	7	19.38.14·41				
		α Aquilæ	7	19.42.34·18				
		β Aquilæ	7	19.47. 2·87				
		θ Aquilæ	7	20. 2.39·23				
		λ Ursæ Minoris	2	20.18. 9·68			−0·187	
							−0·153	
Aug. 5					+ 0·06			

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f''	f''	f''	s	s	s		s	h m	s
		+0·30	44·10	17·27	+33·17	J H	0·00		
			8·59	41·89	+33·30				
			0·98	34·37	+33·39				
			58·68	32·02	+33·34				
			0·04	33·57	+33·53				
			21·05	54·51	+33·46				
			40·85	14·17	+33·32			19. 44	+33·37
			9·53	42·94	+33·41				
x+0·06									
x−0·06								12. 37	+34·30
x−0·06									
x−0·06	+0·19	+0·13	21·88	58·50	+36·62				
			37·03	13·51	+36·48				
			9·06	45·62	+36·56			5. 50	+36·54
								12. 48	+36·94
	+0·19		33·15	8·50	+35·35				
								12. 48	+39·62
x+0·06	+0·40	+0·26	33·13	14·95	+41·82				
x+0·08									
			58·23	38·04	+39·81				
			21·08	1·00	+39·92				
	+0·40		1·22	40·10	+38·88				
			25·70	5·68	+39·98				
			18·05	57·88	+39·83				
			42·87	22·63	+39·76				
			6·71	46·60	+39·89				
	+0·14		56·39	36·28	+39·89				
			16·80	55·52	+38·72				
			38·08	18·13	+40·05				
			14·80	54·75	+39·95				
			11·59	51·73	+40·14				
			37·28	17·27	+39·99				
			1·90	41·90	+40·00				
			54·35	34·36	+40·01				
			51·98	32·02	+40·04				
			53·54	33·59	+40·05				
			37·33	17·41	+40·08				
			14·42	54·51	+40·09				
			34·20	14·19	+39·99				
			2·90	42·96	+40·06				
			39·30	19·32	+40·02			20. 0	+40·02
	+0·14		53·28	36·27	+42·99				
								13. 33	+40·82
x+0·03									
x+0·03									

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
Aug. 8	E	21 Aquilæ	7	19. 5. 8·59		+0·04		+1·365
		22 Aquilæ	7	19. 8. 5·69				
		δ Aquilæ.....	7	19. 16. 55·93			+1·365	
		β Aquilæ	7	19. 46. 57·93				+0·092
		λ Ursæ Minoris	1	20. 18. 11·08			+0·088	
							+0·096	
Aug. 9					+0·05			
Aug. 10					+0·06			
Aug. 13					+0·06		+0·060	
Aug. 14		ε Ursæ Minoris	7	17. 1. 17·00	+0·05		+0·064	+0·045
		α Ophiuchi.....	7	17. 26. 54·54			+0·088	
		ο Serpentis.....	7	17. 31. 52·41				
		β Ophiuchi.....	4	17. 34. 59·23				
		γ Ophiuchi.....	7	17. 39. 17·40				
		Groomb. 1004 S.P..	2	17. 42. 29·59				
		ν Ophiuchi	3	17. 49. 38·55				
	W	δ Ursæ Minoris	1	18. 21. 46·58		−0·06		
		24 Ursæ Minoris ...	1	18. 27. 35·87				
		6 Aquilæ.....	7	18. 38. 7·47				
		β Lyræ	7	18. 43. 32·08				
		9 Aquilæ.....	7	18. 47. 56·16				
		ε Aquilæ.....	7	18. 51. 45·76				
		Piazzi VI. 292 S.P.	3	18. 57. 6·32				
		ζ Aquilæ.....	7	18. 57. 27·63				
		21 Aquilæ	7	19. 5. 4·16				
		22 Aquilæ	7	19. 8. 1·30				
		26 Aquilæ	7	19. 11. 26·85				
		δ Aquilæ.....	7	19. 16. 51·55				
		36 Aquilæ	7	19. 21. 43·94				
		μ Aquilæ	7	19. 25. 41·55				
		σ Aquilæ	7	19. 30. 43·03				
		γ Aquilæ	7	19. 38. 3·96			0·000	
		α Aquilæ	7	19. 42. 23·73				
		β Aquilæ	7	19. 46. 52·48				
		θ Aquilæ	6	20. 2. 28·91			+0·028	
		α^2 Capricorni	7	20. 8. 37·53				
		β Capricorni.....	7	20. 11. 28·48				
		λ Ursæ Minoris	1	20. 17. 43·65				
Aug. 15	E	26 Aquilæ	7	19. 11. 25·43		+0·04	−0·049	−0·085
		ν Aquilæ.....	7	19. 17. 44·50			−0·083	

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow Used for Comparison with Chronometers.
f″	*f″*	*f″*	s	s	s		s	h m	s
		+0·89	10·18	54·73	+44·55	J H	0·00		
			7·44	51·71	+44·27				
			57·53	41·90	+44·37				
	+0·89		58·69	42·96	+44·27				
	+0·89		51·03	35·06	+44·03			20. 5	+44·40
								10. 40	+45·00
x+0·01									
x+0·01									
x+0·00									
x+0·00								10. 55	+49·07
x+0·06									
x+0·04									
	+0·10	+0·04	17·45	6·58	+49·13				
x−0·06			54·65	44·98	+50·33				
x−0·04			52·51	42·95	+50·44				
			59·33	49·54	+50·21				
			17·50	7·85	+50·35				
	+0·10		28·73	18·77	+50·04				
			38·65	30·22	+51·57				
	−0·03		45·83	36·91	+51·08				
	+0·03		35·03	25·31	+50·28				
			7·46	57·81	+50·35				
			32·08	22·53	+50·45				
			56·15	46·55	+50·40				
			45·77	36·21	+50·44				
	−0·03								
	+0·03		6·76	56·86	+50·10				
	+0·04		27·64	18·07	+50·43				
			4·16	54·70	+50·54				
			1·30	51·69	+50·39				
			26·84	17·23	+50·39				
			51·55	41·87	+50·32				
			43·93	34·33	+50·40				
			41·55	31·99	+50·44				
			43·03	33·55	+50·52				
			3·96	54·49	+50·53				
			23·73	14·18	+50·45				
			52·48	42·94	+50·46				
			28·91	19·33	+50·42			20. 3	+50·48
			37·53	28·08	+50·55				
			28·48	18·85	+50·37				
	+0·04		41·33	31·56	+50·23				
		−0·04	25·40	17·23	+51·83				
			44·46	36·36	+51·90				

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	f″	f″	f″	f″
Aug. 15	E	36 Aquilæ	5	19.21.42·46		+0·04		−0·085
		μ Aquilæ	7	19.25.40·08				
		σ Aquilæ	6	19.30.41·73				
		χ Aquilæ	7	19.34.25·59				
		γ Aquilæ	7	19.38. 2·55				
		α Aquilæ	7	19.42.22·31				
		β Aquilæ	7	19.46.51·12				
		θ Aquilæ.....	7	20. 2.27·59				
		α^2 Capricorni	5	20. 8.36·23				
		β Capricorni.....	7	20.11.26·97				
		λ Ursæ Minoris	2	20.17.39·52				
	W	ε Delphini.....	7	20.24.57·90		−0·06		
		ζ Delphini.....	7	20.27.13·14				
		β Delphini	7	20.29.26·33				
		α Delphini	7	20.31.35·82				
		75 Draconis.....	4	20.36.59·76				
		ε Aquarii	7	20.38.26·20				
		μ Aquarii.....	7	20.43.26·70			−0·104	
		76 Draconis.....	3	20.52.45·90			−0·105	
							−0·172	
							−0·145	
Aug. 17		Polaris S.P.....	2	13. 2.59·90	+ 0·06		−0·120	−0·135
	E	β Aquilæ.....	7	19.46.48·53		+0·04		
		Aquilæ 204 (Bode)..	7	19.50.27·95				
		Aquilæ 207 (Bode)..	6	19.52.35·59			−0·134	
		θ Aquilæ.....	7	20. 2.24·87				
		α^2 Capricorni.....	7	20. 8.33·50				
		β Capricorni.....	7	20.11.24·59				
		λ Ursæ Minoris	1	20.17.43·35			−0·128	
	W	λ Ursæ Minoris	1	20.17.48·38		−0·06		
		ε Delphini.....	7	20.24.55·49				
		β Delphini	7	20.29.23·68				
		α Delphini	7	20.31.33·15				
		75 Draconis.....	5	20.36.56·98				
		μ Aquarii.....	7	20.43.24·06				
		32 Vulpeculæ.....	7	20.47. 4·27				
		76 Draconis.....	3	20.52.44·07			−0·111	
Aug. 18	E	δ Ursæ Minoris	6	18.21.41·34		+0·04	−0·149	−0·178
		Cephei 51 (Hev.) S.P.	2	18.24.40·60			−0·178	
		β Lyræ.....	7	18.43.26·76				
		9 Aquilæ.....	7	18.47.50·71				
		ε Aquilæ.....	7	18.51.40·41				
		ζ Aquilæ.....	7	18.57.22·35				
	W	Piazzi VI. 292 S.P.	2	18.56.58·85		−0·06		
		21 Aquilæ.....	7	19. 4.59·13				
		22 Aquilæ.....	7	19. 7.56·03				
		26 Aquilæ.....	7	19.11.21·60				

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f''	*f''*	*f''*	s	s	s		s	h m	s
		−0·04	42·42	34·33	+51·91	J H	0·00		
			40·03	31·99	+51·96				
			41·68	33·55	+51·87				
			25·54	17·39	+51·85				
			2·50	54·48	+51·98				
			22·26	14·17	+51·91				
	−0·04		51·07	42·94	+51·87				
			27·55	19·33	+51·78			20. 5	+51·89
			36·19	28·08	+51·89				
			26·94	18·86	+51·92				
	−0·04		39·22	31·07	+51·85				
			57·75	49·61	+51·86				
			12·98	4·87	+51·89				
			26·17	17·99	+51·82				
			35·66	27·51	+51·85				
			59·02	50·89	+51·87				
			26·06	17·95	+51·89				
			26·56	18·42	+51·86				
			45·08	36·93	+51·85				
x−0·29									
x−0·18	+0·26	+0·14	9·34	9·70	+60·36			11.55	+53·93
x−0·06									
x−0·04			48·58	42·93	+54·35				
			28·06	22·46	+54·40				
			35·63	29·99	+54·36				
			24·94	19·32	+54·38				
			33·62	28·08	+54·46				
			24·71	18·86	+54·15				
			35·82	30·23	+54·41				
	+0·26		35·87	30·23	+54·36				
			55·43	49·60	+54·17				
			23·60	17·99	+54·39				
			33·07	27·51	+54·44				
			55·44	50·79	+55·35				
			24·07	18·44	+54·37				
			4·17	58·65	+54·48				
			42·31	36·83	+54·52			20.50	+54·40
	+0·06	−0·05	39·96	35·68	+55·72				
	+0·06		41·98	40·09	+58·11				
			26·58	22·48	+55·90				
			50·62	46·52	+55·90				
			40·28	36·17	+55·89				
			22·22	18·04	+55·82				
	−0·15		0·06	57·45	+57·39				
			58·92	54·67	+55·75				
			55·80	51·66	+55·86				
			21·41	17·21	+55·80				

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	″	″	″	″
Aug. 18	W	δ Aquilæ.....	7	19. 16. 46·32		−0·06	−0·242	−0·178
		μ Aquilæ.....	6	19. 25. 36·39				
		σ Aquilæ	7	19. 30. 37·92			−0·072	
		γ Aquilæ.....	6	19. 37. 58·62				
		α Aquilæ.....	7	19. 42. 18·56				
		β Aquilæ	7	19. 46. 47·29			−0·226	
		θ Aquilæ.....	7	20. 2. 23·60			−0·201	
		α^2 Capricorni.....	7	20. 8. 32·24				
		β Capricorni.....	7	20. 11. 23·07				
		λ Ursæ Minoris	1	20. 17. 37·65				
Aug. 20	E	δ Aquilæ.....	7	19. 16. 42·67	+0·06	+0·04	−0·272	−0·200
		36 Aquilæ	7	19. 21. 35·07			−0·129	
		μ Aquilæ	7	19. 25. 32·84				
		χ Aquilæ	7	19. 34. 18·28				
		γ Aquilæ.....	5	19. 37. 55·29				
		α Aquilæ	7	19. 42. 14·94				
		β Aquilæ	7	19. 46. 43·77				
		Aquilæ 207 (Bode)..	7	19. 52. 30·94				
		θ Aquilæ.....	7	20. 2. 20·18				
		75 Draconis.....	2	20. 36. 54·12				
Aug. 21					+0·06			
Aug. 22					+0·06			
Aug. 24		Polaris S.P.....	4	13. 3. 7·52	+0·06		−0·124	−0·092
							−0·130	
		ε Ursæ Minoris	7	17. 1. 1·41				
		α Ophiuchi.....	7	17. 26. 40·35			−0·022	
		ο Ophiuchi.....	7	17. 31. 38·28			−0·045	
		β Ophiuchi.....	7	17. 34. 44·96				
		γ Ophiuchi	7	17. 39. 3·35				
		Groomb. 1004 S.P..	2	17. 42. 22·09				
		70 Ophiuchi	7	17. 56. 33·53				
		72 Ophiuchi	7	17. 58. 56·15				
		δ Ursæ Minoris	1	18. 21. 30·52				
	W	α^2 Capricorni.....	5	20. 8. 23·74		−0·06	−0·198	
		β Capricorni.....	6	20. 11. 14·57			−0·036	
Aug. 25					+0·11			
Aug. 27		α Ophiuchi.....	7	17. 26. 35·16	+0·07			+0·061

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f''	f''	f''	s	s	s		s	h m	s
		−0·05	46·11	41·83	+55·72	J H	0·00		
			36·16	31·97	+55·81				
			37·70	33·53	+55·83				
			58·39	54·46	+56·07				
			18·33	14·15	+55·82				
			47·07	42·92	+55·85				
			23·40	19·32	+55·92				
			32·06	28·08	+56·02				
			22·89	18·86	+55·97				
	−0·15		28·89	29·87	+60·98			20. 23	+55·94
x−0·18									
x−0·18									
x−0·06		+0·13	42·68	41·82	+59·14				
x−0·06									
			35·11	34·31	+59·20				
			32·83	31·95	+59·12				
			18·26	17·36	+59·10				
			55·27	54·45	+59·18				
			14·93	14·14	+59·21				
	+0·52		43·77	42·92	+59·15				
			30·93	29·97	+59·04				
			20·21	19·32	+59·11				
	+0·52		52·87	50·63	+57·76			20. 28	+59·19
x−0·06									
x−0·06								12. 43	+60·10
x−0·12									
x−0·12									
x−0·12	+0·08	+0·07	10·34	14·46	+64·12				
x−0·12									
	+0·08		0·86	4·85	+63·99				
			40·37	44·84	+64·47				
			38·24	42·81	+64·57				
			44·99	49·42	+64·43				
			3·38	7·72	+64·34				
	−0·16		23·43	22·90	+59·47				
			33·56	37·82	+64·26				
			56·17	0·77	+64·60				
	−0·16		29·24	33·47	+64·23			18. 26	+64·45
			23·71	28·05	+64·34				
			14·54	18·84	+64·30				
x−0·29									
x−0·18								14. 1	+65·71
x+0·06		+0·24	35·31	44·80	+69·49	S	−0·33		
x+0·08									

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
Aug. 27	W	β Ophiuchi	4	17. 34. 39 ·92		−0 ·06		+0 ·061
		γ Ophiuchi.....	5	17. 38. 58 ·26				
		Groomb. 1004 S.P..	1	17. 42. 11 ·62				
		70 Ophiuchi.....	7	17. 56. 28 ·58				
		72 Ophiuchi.....	7	17. 58. 51 ·40			+0 ·060	
		δ Ursæ Minoris	4	18. 21. 25 ·57			+0 ·054	
	E	δ Ursæ Minoris.....	3	18. 21. 24 ·37		+0 ·04		
		Cephei 51 (Hev.) S.P.	2	18. 24. 34 ·38				
		β Lyræ.....	7	18. 43. 13 ·08				
		9 Aquilæ	7	18. 47. 36 ·99				
		ε Aquilæ	7	18. 51. 26 ·69				
		Piazzi VI. 292 S.P.	3	18. 56. 49 ·94				
		ζ Aquilæ	7	18. 57. 9 ·13				
		21 Aquilæ	6	19. 4. 45 ·15				
		δ Aquilæ.....	7	19. 16. 32 ·33				
		36 Aquilæ	7	19. 21. 24 ·66			+0 ·061	
		γ Aquilæ.....	7	19. 37. 45 ·01			+0 ·071	
		α Aquilæ	7	19. 42. 4 ·67				
Aug. 28		26 Aquilæ	7	19. 11. 6 ·07				+0 ·070
		δ Aquilæ.....	7	19. 16. 30 ·78				
		36 Aquilæ	6	19. 21. 23 ·13				
		μ Aquilæ.....	7	19. 25. 20 ·87				
		σ Aquilæ	7	19. 30. 22 ·44				
		χ Aquilæ.....	7	19. 34. 6 ·19				
		γ Aquilæ.....	7	19. 37. 43 ·38				
		α Aquilæ.....	7	19. 42. 3 ·17				
		β Aquilæ.....	7	19. 46. 31 ·77			+0 ·075	
		θ Aquilæ	7	20. 2. 8 ·28			+0 ·070	
		α^2 Capricorni	6	20. 8. 16 ·96				
		β Capricorni.....	7	20. 11. 7 ·82				
		λ Ursæ Minoris	1	20. 17. 14 ·35				
	W	λ Ursæ Minoris	1	20. 17. 20 ·88		−0 ·06		
		ε Delphini.....	3	20. 24. 38 ·54				
		β Delphini	7	20. 29. 6 ·96				
		α Delphini	7	20. 31. 16 ·46				
		75 Draconis.....	4	20. 36. 39 ·31				
		ε Aquarii	7	20. 38. 6 ·96				
		μ Aquarii	7	20. 43. 7 ·30				
		32 Vulpeculæ.....	7	20. 46. 47 ·62			+0 ·085	
							+0 ·050	
Aug. 29					+ 0 ·06			
Aug. 30	E	ε Ursæ Minoris	4	17. 0. 51 ·13		+0 ·04		+0 ·058
		α Ophiuchi.....	7	17. 26. 30 ·84				
		ο Serpentis.....	7	17. 31. 28 ·69				

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f″	f″	f″	s	s	s		s	h m	s
x+0·06		+0·24	40·08	49·37	+69·29	S	−0·33		
x+0·06			58·43	7·68	+69·25				
	+0·28		14·58	24·20	+69·62				
			28·75	37·78	+69·03	J H	0·00		
			51·55	0·73	+69·18			18. 7	+69·05
	+0·23		23·20	32·34	+69·14				
	+0·20								
	+0·28		23·68	32·34	+68·66				
	+0·23		35·75	44·41	+68·66				
			13·29	22·33	+69·04				
			37·27	46·43	+69·16				
			26·93	36·06	+69·13				
	+0·20		50·60	58·91	+68·31				
			9·38	17·94	+68·56				
			45·42	54·59	+69·17				
			32·60	41·77	+69·17				
			24·93	34·24	+69·31				
			45·27	54·40	+69·13				
			4·92	14·09	+69·17				
		+0·25	6·37	17·11	+70·74			19. 7	+70·72
			31·05	41·76	+70·71				
			23·42	34·23	+70·81				
			21·14	31·88	+70·74				
			22·72	33·46	+70·74				
			6·45	17·29	+70·84				
			43·65	54·39	+70·74				
			3·44	14·08	+70·64				
			32·05	42·86	+70·81				
			8·57	19·27	+70·70				
	+0·27		17·27	28·03	+70·76				
			8·13	18·82	+70·69				
			11·94	23·02	+71·08				
	+0·27		13·49	23·02	+69·53				
			38·70	49·56	+70·86				
			7·12	17·95	+70·83				
			16·62	27·46	+70·84				
			38·59	50·08	+71·49				
			7·16	17·94	+70·78				
			7·50	18·41	+70·91				
			47·77	58·61	+70·84				
x+0·06									
x+0·06								11. 38	+71·81
	+0·16	+0·16	51·23	3·79	+72·56				
			31·04	44·74	+73·70				
			28·90	42·73	+73·83				

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
Aug. 30	E	β Ophiuchi.....	6	17. 34. 35 ·40		+0 ·04		+0 ·058
		γ Ophiuchi	7	17. 38. 53 ·66				
		Groomb. 1004 S.P..	2	17. 42. 12 ·59				
		ν Ophiuchi	7	17. 49. 16 ·02				
		70 Ophiuchi.....	7	17. 56. 23 ·64			+0 ·056	
		72 Ophiuchi.....	7	17. 58. 46 ·50			+0 ·024	
	W	δ Ursæ Minoris.....	6	18. 21. 18 ·85		−0 ·06	+0 ·073	
		Cephei 51 (Hev.) S.P.	3	18. 24. 28 ·68				
		β Lyræ	7	18. 43. 8 ·42				
		9 Aquilæ	7	18. 47. 32 ·31				
		ε Aquilæ.....	7	18. 51. 21 ·97				
		ζ Aquilæ.....	7	18. 57. 4 ·11				
		Piazzi VI. 292 S. P.	3	18. 56. 44 ·65				
		21 Aquilæ.....	7	19. 4. 40 ·54				
		22 Aquilæ.....	7	19. 7. 37 ·60				
		26 Aquilæ	7	19. 11. 3 ·01				
		δ Aquilæ.....	7	19. 16. 27 ·67			+0 ·081	
Aug. 31					+0 ·06			
Sep. 1	E	72 Ophiuchi.....	7	17. 58. 43 ·27		+0 ·04	+0 ·074	
		δ Ursæ Minoris	6	18. 21. 13 ·24			+0 ·068	
		Cephei 51 (Hev.) S.P.	2	18. 24. 27 ·43				
		β Lyræ.....	7	18. 44. 4 ·99				
		9 Aquilæ	6	18. 47. 29 ·03				
		ε Aquilæ.....	7	18. 51. 18 ·69				
		Piazzi VI. 292 S. P.	3	18. 56. 43 ·31				
		ζ Aquilæ.....	6	18. 57. 0 ·64				
		21 Aquilæ.....	4	19. 4. 37 ·21				
		22 Aquilæ	3	19. 7. 34 ·08				
		26 Aquilæ	7	19. 10. 59 ·79				
		δ Aquilæ.....	7	19. 16. 24 ·61				
	W	36 Aquilæ	7	19. 21. 17 ·05		−0 ·06	+0 ·051	
		μ Aquilæ	6	19. 25. 44 ·53			+0 ·041	
		σ Aquilæ	7	19. 30. 16 ·20				
		χ Aquilæ	2	19. 34. 0 ·01				
		γ Aquilæ	7	19. 37. 37 ·00				
		α Aquilæ	7	19. 41. 56 ·82				
		β Aquilæ	7	19. 46. 25 ·64				
		θ Aquilæ.....	7	20. 2. 1 ·88				
		α^2 Capricorni.....	7	20. 8. 10 ·62				
		λ Ursæ Minoris	1	20. 17. 7 ·65				
Sep. 2		Polaris S.P.....	4	13. 3. 0 ·41	+0 ·06		+0 ·124	+0 ·117
		Spica	7	13. 15. 42 ·74			+0 ·111	
Sep. 3		κ Ophiuchi.....	6	16. 48. 59 ·60	+0 ·06			+0 ·041

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f″	*f″*	*f″*	s	s	s		s	h m	s
		+0·16	35·60	49·32	+73·72	J H	0·00		
			53·86	7·63	+73·77				
	+0·16		12·91	25·49	+72·58				
			16·23	30·01	+73·78				
			23·84	37·74	+73·90				
			46·69	0·68	+73·99				
	+0·18		17·18	31·30	+74·12				
	+0·13								
	+0·18		31·12	45·68	+74·56				
			8·48	22·28	+73·80				
			32·42	46·39	+73·97				
			22·06	36·03	+73·97				
			4·21	17·90	+73·69				
	+0·13		45·66	59·42	+73·76				
			40·64	54·55	+73·91				
			37·71	51·54	+73·83				
x+0·06			3·12	17·09	+73·97			19.13	+73·90
x+0·06			27·77	41·74	+73·97				
		+0·23	43·51	0·65	+77·14				
	+0·23		12·60	30·59	+77·99				
	+0·23		28·73	46·59	+77·86				
			5·19	22·24	+77·05				
			29·30	46·36	+77·06				
			18·93	36·00	+77·07				
	+0·12		43·92	59·77	+75·85				
			0·88	17·88	+77·00				
			37·47	54·53	+77·06				
			34·35	51·51	+77·16				
			0·06	17·07	+77·01				
			24·87	41·71	+76·84				
			17·21	34·19	+76·98				
			14·68	31·83	+77·15				
			16·35	33·41	+77·06				
			0·15	17·25	+77·10				
			37·14	54·35	+77·21				
			56·96	14·04	+77·08				
			25·79	42·82	+77·03				
			2·04	19·24	+77·20				
			10·80	28·00	+77·20				
	+0·12		0·35	20·21	+79·86			20.13	+77·14
x+0·04									
x+0·04	+0·07		4·53	19·11	+74·58			11. 2	+78·17
x+0·04	+0·07		42·94	1·09	+78·15				
x+0·04									
x+0·00		+0·19	59·70	20·12	+80·42				
x+0·00									

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	f″	f″	f″	f″
Sep. 3	W	ϵ Ursæ Minoris	3	17. 0.46·33		−0·06		+0·041
		α Ophiuchi.....	7	17.26.24·26				
		β Ophiuchi.....	7	17.34.28·93				
		γ Ophiuchi.....	7	17.38.47·17				
		ν Ophiuchi	7	17.49. 9·53				
		70 Ophiuchi.....	7	17.56.17·20			+0·073	
		72 Ophiuchi.....	7	17.58.40·07			+0·078	
	E	δ Ursæ Minoris	4	18.21. 8·90		+0·04		
		Cephei 51 (Hev.) S.P.	1	18.24.24·52				
		β Lyræ.....	7	18.43. 1·48				
		9 Aquilæ.....	7	18.47.25·84				
		ϵ Aquilæ.....	7	18.51.15·37				
		Piazzi VI. 292 S.P..	3	18.56.36·27				
		ζ Aquilæ.....	7	18.56.57·35				
		21 Aquilæ	7	19. 4.33·84				
		22 Aquilæ	4	19. 7.30·90				
		26 Aquilæ	7	19.10.56·53				
		δ Aquilæ.....	7	19.16.21·14			+0·013	
							+0·001	
Sep. 4					+0·04			
Sep. 6					+0·04			
Sep. 9					+0·08			
Sep. 10								
Sep. 11	W	γ Aquarii.....	7	22.12. 8·52		−0·06		+0·027
		51 Aquarii.....	7	22.14.31·84				
		ζ Aquarii	7	22.19.20·48				
		*N.P.D. 2°. 42′...	5	22.31. 6·38			+0·075	
		η Aquarii.....	7	22.25.52·95			−0·029	
		κ Aquarii	7	22.29.13·05				
		ζ Pegasi.....	4	22.32.13·52				
	E	3 Piscium.....	7	22.51.10·30		+0·04		
		α Ursæ Majoris S.P.	4	22.52.31·71				
		α Pegasi.....	7	22.55.32·02				
		γ Piscium.....	3	23. 7.37·17				
		Groomb. 4008.....	2	23. 2.41·29				
		Groomb. 4009.....	2	23. 2.54·01				
		*N.P.D. 11°. 47′ S.P.	4	23.10.21·61				
		κ Piscium.....	7	23.17.28·56				
		9 Piscium.....	2	23.17.47·61			+0·031	
		ι Piscium	7	23.30.28·10			+0·031	

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f''	f''	f''	s	s	s		s	h m	s
	+0·45	+0·19	45.46	3·06	+77·60	J H	0·00	17. 3	+80·26
			24·36	44·67	+80·31				
			29·04	49·25	+80·21				
			47·29	7·57	+80·28				
			9·66	29·95	+80·29				
			17·32	37·67	+80·35				
			40·17	0·62	+80·45				
	+0·14		8·39	29·82	+81·43				
	+0·45		25·57	47·57	+82·00				
			1·65	22·20	+80·55				
			26·06	46·33	+80·27				
			15·56	35·96	+80·40				
	+0·14		36·77	0·13	+83·36				
			57·55	17·85	+80·30				
			34·06	54·49	+80·43				
			31·13	51·49	+80·36				
			56·75	17·04	+80·29				
			21·36	41·69	+80·33				
$x-0·02$									
$x-0·06$									
$x-0·06$									
$x-0·02$								12. 19	+84·12
$x-0·12$									
$x-0·12$									
$x+0·06$									
$x+0·12$								13. 33	+89·65
		+0·28	8·71	40·06	+91·35			22. 10	+91·52
			32·04	3·46	+91·42				
			20·67	52·01	+91·34				
	+0·33		2·26	32·95	+90·69				
			53·14	24·60	+91·46				
			13·25	44·81	+91·56				
			13·68	45·27	+91·59				
			10·59	42·18	+91·59				
			32·13	4·00	+91·87				
			32·26	3·91	+91·65				
			37·45	9·05	+91·60				
	+0·14		40·95	13·30	+92·35				
	+0·08		53·67	26·36	+92·69				
	+0·08								
	+0·14		22·35	53·79	+91·44				
	+0·33		28·84	0·47	+91·63				
			47·89	19·59	+91·70				
			28·37	0·02	+91·65				

TRANSITS OBSERVED AT KINGSTOWN.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Mean of Seven Wires.	Error of Collimation of Middle Wire Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f*″	*f*″	*f*″	*f*″
Sep. 12	E				+0·08	+0·04		+0·027
Sep. 13					+0·08			
Sep. 14					+0·08			
Sep. 15	W	Polaris	2	1. 2.54·20	+0·08	−0·06		+0·110
		9 Draconis S.P. ...	4	0.52.21·13				
		Groomb. 1960 S.P..	3	0.58.19·02				
		β Ursæ Minoris S.P.	4	2.49.31·32			+0·108	
		Castor	4	7.23. 3·36			+0·101	
		Pollux	1	7.34.10·52			+0·120	

COMPARISONS OF STATIONARY CHRONOMETERS AT KINGSTOWN.

The stationary chronometers used at Kingston were the following:—

Molyneux 2354 a half-seconds box-chronometer, going solar time nearly.
$\frac{1}{2}\,\Sigma$, a half-seconds box-chronometer, going sidereal time nearly.
Σ, a table-chronometer, beating seconds, going sidereal time.
σ, a small half-seconds chronometer, going sidereal time.
Molyneux 2388, a half-seconds box-chronometer, going sidereal time nearly to July 16 (after which it was altered to go solar time nearly).
House clock, a clock going sidereal time.
Molyneux 1839, a half-seconds box-chronometer, going solar time.
Molyneux 2388, going solar time from July 26.

The whole of these are the property of Mr. Sheepshanks.

TRANSITS OBSERVED AT KINGSTOWN.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f''	*f''*	*f''*	s	s	s		s	h m	s
$x+0\cdot12$		$+0\cdot28$				J H	$0\cdot00$		
$x+0\cdot06$									
$x+0\cdot18$									
$x+0\cdot14$								12. 1	$+95\cdot29$
$x+0\cdot18$	$+0\cdot35$	$+0\cdot35$	$47\cdot79$	$24\cdot98$	$+97\cdot19$				
$x+0\cdot14$	$+0\cdot34$								
	$+0\cdot37$								
	$+0\cdot35$		$21\cdot93$	$59\cdot15$	$+97\cdot22$				
	$+0\cdot34$		$20\cdot00$	$56\cdot96$	$+96\cdot96$				
	$+0\cdot37$		$32\cdot34$	$9\cdot94$	$+97\cdot60$				
			$3\cdot56$	$41\cdot47$	$+97\cdot91$				
			$10\cdot73$	$48\cdot69$	$+97\cdot96$			7.35	$+97\cdot94$

COMPARISONS OF STATIONARY CHRONOMETERS AT KINGSTOWN.

The comparisons made among these chronometers and with the transit-clock were very numerous; but in the reductions it was found that a very large proportion of them might have been omitted as unnecessary, a single comparison being (to sense) as accurate as many. In the following table, a single comparison only is taken from each group.

The chronometer 2354 ran down between July 16 and July 20.

The errors on solar time, as has been already explained, are all subject to the same constant correction.

The comparison of 2354 and Σ, which is given for the time, August 15, 10^h, was in reality made at August 14, 22^h; that of 2354 and σ, which is given for July 29, 3^h, was made at July 29, 10^h.

COMPARISONS OF STATIONARY CHRONOMETERS AT KINGSTOWN.

Approximate Solar Time, 1844.	Time of Transit Clock at Comparison	Corresponding Time of 2354.	2354, Slow.	Time of 2354 at Comparison.	Corresponding Time of $\frac{1}{2}\Sigma$	$\frac{1}{2}\Sigma$ Slow.
d h	h m s	h m s	m s	h m s	h m s	m s
June 27. 11	17. 33. 50	11. 31. 44·0	−22. 15·32	11. 55. 53·5	18. 21. 30·0	−23. 11·36
27. 22	3. 45. 51	21. 42. 5·0	−22. 14·82	21. 56. 24·0	4. 23. 39·0	−23. 10·70
28. 8	14. 47. 10	8. 41. 36·0	−22. 14·30	10. 41. 40·0	17. 11. 0·5	−23. 9·91
30. 9	16. 12. 28	9. 58. 50·5	−22. 12·49	10. 44. 15·0	17. 21. 29·0	−23. 8·12
July 1. 11	17. 23. 50	11. 6. 6·5	−22. 12·19	11. 45. 52·0	18. 27. 12·0	−23. 7·14
2. 1	6. 40. 8	0. 20. 15·0	−22. 11·93	0. 35. 19·0	7. 18. 45·0	−23. 6·47
2. 11	18. 47. 18	12. 25. 26·5	−22. 11·42	12. 55. 50·5	19. 41. 18·0	−23. 5·80
4. 11	17. 33. 43	11. 4. 14·0	−22. 9·61	12. 59. 39·0	19. 53. 0·0	−23. 3·66
5. 2	10. 12. 26	3. 40. 14·0	−22. 8·90	3. 11. 5·0	10. 6. 46·0	−23. 3·21
5. 9	16. 16. 52	9. 43. 40·5	−22. 8·60	9. 0. 35·5	15. 57. 14·0	−23. 3·02
6. 11	18. 46. 48	12. 9. 17·0	−22. 6·97	12. 56. 36·0	19. 57. 50·0	−23. 1·50
9. 3	9. 31. 20	2. 43. 35·0	−22. 3·64	2. 52. 13·0	10. 3. 38·0	−22. 58·77
9. 9	17. 46. 58	10. 57. 52·0	−22. 3·01	10. 24. 48·5	17. 37. 28·0	−22. 58·33
10. 10	17. 54. 27	11. 1. 25·0	−22. 1·38	10. 12. 24·0	17. 28. 58·0	−22. 56·71
11. 10	18. 1. 28	11. 4. 30·0	−21. 59·67	10. 31. 51·0	17. 52. 25·0	−22. 55·22
12. 3	9. 28. 55	2. 29. 26·0	−21. 58·78	2. 44. 8·0	10. 7. 22·0	−22. 54·55
13. 10	16. 16. 18	9. 11. 48·0	−21. 56·74	9. 52. 14·5	17. 20. 36·0	−22. 53·09
14. 10	17. 21. 6	10. 12. 30·5	−21. 54·97	9. 27. 55·5	17. 0. 10·0	−22. 51·81
15. 9	16. 45. 40	9. 33. 15·5	−21. 53·53	10. 32. 30·0	18. 8. 52·0	−22. 50·62
16. 4	16. 51. 46	9. 39. 20·5	−21. 53·52	5. 24. 25·5	13. 3. 54·0	−22. 49·82
20. 9	16. 47. 11	9. 14. 49·5	−21. 21·66	7. 19. 18·5	15. 15. 18·0	−22. 45·39
21. 5	12. 55. 5	5. 19. 26·5	−21. 20·10	5. 6. 49·0	13. 6. 24·0	−22. 44·32
21. 9	16. 38. 16	9. 2. 1·0	−21. 19·73	12. 3. 14·5	20. 3. 58·0	−22. 43·96
22. 7	15. 1. 24	7. 20. 30·5	−21. 18·95	7. 0. 24·5	15. 4. 15·0	−22. 43·47
24. 3	13. 51. 24	6. 2. 52·5	−21. 14·97	6. 51. 13·5	15. 2. 57·0	−22. 40·78
24. 10	20. 0. 17	12. 10. 45·5	−21. 14·72	12. 41. 10·0	20. 53. 51·0	−22. 40·58
26. 10	19. 10. 46	11. 13. 30·5	−21. 11·45	13. 0. 3·0	21. 20. 41·0	−22. 37·98
27. 3	12. 36. 40	4. 36. 33·0	−21. 10·12	3. 46. 5·0	12. 9. 9·0	−22. 37·30
27. 11	20. 24. 9	12. 22. 45·5	−21. 9·67	12. 45. 2·5	21. 9. 35·0	−22. 36·74
28. 11	18. 2. 19	9. 57. 23·0	−21. 8·25	10. 57. 34·0	19. 25. 45·0	−22. 34·87
29. 3	12. 14. 26	4. 6. 31·0	−21. 6·98	3. 33. 6·5	12. 4. 1·0	−22. 33·64
30. 11	19. 44. 5	11. 31. 0·5	−21. 5·06	11. 54. 35·0	20. 30. 49·0	−22. 32·33

COMPARISONS OF STATIONARY CHRONOMETERS AT KINGSTOWN.

Time of 2354 at Comparison.	Corresponding Time of Σ	Σ Slow.	Time of 2354 at Comparison.	Corresponding Time of σ	σ Slow.	Approximate Solar Time, 1844.
h m s	h m s	m s	h s	h m s	m s	d h
12. 21. 50 ·0	18. 47. 56	−23. 36 ·56	....	....	....	June 27. 11
21. 9. 29 ·5	3. 37. 4	−23. 37 ·94	21. 13. 54 ·0	3. 40. 32 ·0	−22. 40 ·72	27. 22
11. 45. 56 ·5	18. 15. 58	−23. 40 ·30	11. 52. 7 ·5	18. 21. 8 ·0	−22. 38 ·29	28. 8
8. 6. 45 ·0	14. 44. 12	−23. 47 ·03	11. 2. 48 ·0	17. 39. 30 ·5	−22. 33 ·56	30. 9
12. 6. 22 ·0	18. 48. 30	−23. 51 ·76	12. 9. 56 ·0	18. 50. 46 ·0	−22. 33 ·18	July 1. 11
0. 58. 15 ·0	7. 42. 32	−23. 53 ·69	0. 57. 40 ·0	7. 40. 34 ·5	−22. 31 ·28	2. 1
13. 14. 50 ·5	20. 1. 11	−23. 55 ·67	13. 16. 58 ·0	20. 1. 53 ·5	−22. 30 ·33	2. 11
13. 19. 11 ·5	20. 13. 36	−24. 3 ·94	13. 23. 46 ·0	20. 16. 34 ·5	−22. 27 ·19	4. 11
3. 14. 34 ·5	10. 11. 19	−24. 6 ·13	....	....	....	5. 2
11. 44. 30 ·0	18. 42. 40	−24. 7 ·38	11. 43. 8 ·0	18. 39. 36 ·0	−22. 25 ·60	5. 9
13. 19. 41 ·0	20. 22. 8	−24. 10 ·71	13. 18. 1 ·0	20. 18. 40 ·5	−22. 23 ·46	6. 11
4. 36. 8 ·0	11. 49. 10	−24. 18 ·56	....	....	....	9. 3
12. 25. 11 ·5	19. 39. 32	−24. 19 ·42	12. 25. 59 ·0	19. 38. 19 ·5	−22. 19 ·29	9. 9
12. 6. 35 ·0	19. 24. 53	−24. 21 ·83	12. 3. 23 ·0	19. 19. 35 ·0	−22. 16 ·35	10. 10
13. 3. 56 ·5	20. 26. 25	−24. 24 ·58	13. 1. 32 ·0	20. 21. 51 ·0	−22. 15 ·48	11. 10
4. 29. 12 ·0	11. 54. 15	−24. 26 ·17	4. 24. 15 ·0	11. 47. 4 ·5	−22. 13 ·50	12. 3
12. 57. 10 ·5	20. 27. 39	−24. 29 ·49	13. 2. 39 ·0	20. 30. 50 ·0	−22. 11 ·09	13. 10
12. 40. 40 ·0	20. 15. 6	−24. 31 ·46	12. 44. 9 ·0	20. 16. 14 ·5	−22. 10 ·38	14. 10
11. 2. 30 ·5	18. 40. 40	−24. 33 ·15	11. 1. 20 ·0	18. 37. 5 ·5	−22. 9 ·34	15. 9
5. 33. 35 ·5	13. 14. 50	−24. 34 ·29	5. 30. 37 ·0	13. 9. 25 ·5	−22. 8 ·80	16. 4
6. 56. 4 ·0	14. 53. 54	−24. 39 ·69	6. 58. 0 ·0	14. 53. 11 ·0	−22. 0 ·42	20. 9
7. 34. 26 ·0	15. 36. 22	−24. 40 ·80	7. 36. 40 ·0	15. 35. 54 ·5	−21. 58 ·96	21. 5
12. 32. 30 ·5	20. 35. 16	−24. 41 ·13	12. 35. 0 ·0	20. 35. 3 ·5	−21. 58 ·72	21. 9
6. 50. 24 ·5	14. 56. 12	−24. 42 ·13	6. 48. 3 ·0	14. 51. 5 ·5	−21. 57 ·53	22. 7
23. 35. 55 ·0	7. 48. 29	−24. 43 ·47	23. 35. 33 ·0	7. 45. 16 ·5	−21. 53 ·03	24. 3
12. 51. 55 ·5	21. 6. 42	−24. 44 ·30	12. 50. 54 ·0	21. 2. 48 ·0	−21. 51 ·97	24. 10
....	....	....	....	....	....	26. 10
4. 13. 20 ·0	12. 38. 37	−24. 45 ·79	....	....	....	27. 3
13. 9. 35 ·0	21. 36. 21	−24. 46 ·21	13. 10. 50 ·0	21. 34. 37 ·0	−21. 47 ·01	27. 11
9. 41. 30 ·0	18. 11. 40	−24. 46 ·44	9. 42. 52 ·0	18. 10. 0 ·5	−21. 44 ·72	28. 11
10. 3. 55 ·0	18. 38. 7	−24. 46 ·57	10. 29. 58 ·0	19. 1. 9 ·5	−21. 41 ·77	29. 3
12. 5. 37 ·0	20. 44. 8	−24. 47 ·50	12. 7. 32 ·0	20. 42. 55 ·0	−21. 39 ·19	30. 11

COMPARISONS OF STATIONARY CHRONOMETERS AT KINGSTOWN.

Approximate Solar Time, 1844.	Time of 2354 at Comparison.	Corresponding Time of 2388 (Sidereal).	2388 (Sidereal) Slow.	Time of 2354 at Comparison.	Corresponding Time of House Clock.	House Clock Slow.
d h	h m s	h m s	m s	h m s	h m s	m s
June 27. 11	11. 36. 49 ·0	18. 2. 43 ·5	−23. 32 ·50	11. 53. 59 ·5	17. 56. 24	+0. 0 ·34
27. 22	21. 42. 45 ·0	4. 10. 19 ·5	−23. 32 ·45	21. 6. 10 ·5	3. 10. 4	+0. 2 ·51
28. 8	7. 54. 20 ·0	14. 23. 35 ·5	−23. 32 ·47	10. 25. 0 ·0	16. 31. 2	+0. 5 ·85
30. 9	10. 56. 57 ·0	17. 34. 43 ·0	−23. 38 ·02	10. 25. 26 ·0	16. 39. 12	+0. 16 ·79
July 1. 11	11. 12. 16 ·0	17. 54. 3 ·5	−23. 40 ·16	11. 36. 15 ·0	17. 54. 4	+0. 22 ·29
2. 1	0. 39. 8 ·0	7. 23. 9 ·5	−23. 41 ·35	0. 33. 29 ·0	6. 53. 23	+0. 25 ·22
2. 11	12. 46. 26 ·0	19. 32. 28 ·0	−23. 41 ·86	12. 45. 38 ·0	19. 7. 30	+0. 28 ·01
4. 11	11. 4. 47 ·0	17. 58. 30 ·0	−23. 44 ·63	10. 5. 0 ·0	16. 34. 11	+0. 37 ·52
5. 2	1. 34. 25 ·0	8. 30. 32 ·5	−23. 45 ·64	1. 37. 6 ·0	8. 8. 48	+0. 40 ·31
5. 9	8. 59. 49 ·0	15. 57. 10 ·5	−23. 46 ·14	11. 26. 10 ·5	17. 59. 28	+0. 42 ·11
6. 11	12. 30. 3 ·0	19. 31. 59 ·0	−23. 47 ·89	9. 53. 50 ·0	16. 30. 46	+0. 46 ·34
9. 3	2. 58. 18 ·0	10. 10. 38 ·0	−23. 52 ·76	....	....	....
9. 9	10. 31. 41 ·0	17. 45. 16 ·5	−23. 53 ·20	12. 8. 18 ·5	18. 57. 16	+1. 0 ·80
10. 10	10. 13. 54 ·0	17. 31. 26 ·0	−23. 54 ·45	11. 40. 5 ·5	18. 32. 52	+1. 5 ·29
11. 10	12. 44. 12 ·0	20. 6. 9 ·0	−23. 56 ·36	12. 37. 40 ·5	19. 34. 30	+1. 10 ·08
12. 3	2. 40. 34 ·0	10. 4. 50 ·5	−23. 57 ·63	2. 46. 15 ·0	9. 45. 22	+1. 12 ·80
13. 10	9. 53. 16 ·0	17. 22. 44 ·0	−23. 59 ·43	9. 58. 25 ·5	17. 2. 36	+1. 18 ·93
14. 10	9. 15. 15 ·0	16. 48. 36 ·5	−24. 0 ·91	9. 30. 51 ·5	16. 38. 51	+1. 23 ·68
15. 9	9. 41. 33 ·0	17. 18. 58 ·5	−24. 2. 53	8. 19. 30 ·0	15. 31. 11	+1. 28 ·41
16. 4	5. 36. 36 ·0	13. 17. 20 ·5	−24. 3. 80	5. 36. 10 ·5	12. 51. 18	+1. 33 ·14
20. 9	....	....	....	....	....	....
21. 5	....	....	....	....	....	....
21. 9	....	....	....	....	....	....
22. 7	....	....	....	....	....	....
24. 3	....	....	....	....	....	....
24. 10	....	....	....	....	....	....
26. 10	....	....	....	....	....	....
27. 3	....	....	....	....	....	....
27. 11	....	....	....	....	....	....
28. 11	....	....	....	....	....	....
29. 3	....	....	....	....	....	....
30. 11	....	....	....	....	....	....

COMPARISONS OF STATIONARY CHRONOMETERS AT KINGSTOWN.

Time of $\frac{1}{2}\Sigma$ at Comparison.	Corresponding Time of 1839.	1839, Slow.	Time of Transit Clock or of $\frac{1}{2}\Sigma$ at Comparison.	Corresponding Time of 2388 (Solar).	2388 (Solar) Slow.	Approximate Solar Time, 1844.
h m s	h m s	m s	h m s	h m s	m s	d h
18. 22. 18·0	11. 56. 32·0	−22. 5·94	....	....	....	June 27. 11
3. 53. 44·0	21. 26. 24·0	−22. 4·94	....	....	....	27. 22
17. 16. 50·0	10. 47. 18·0	−22. 3·68	....	....	....	28. 8
14. 42. 33·0	8. 5. 32·5	−21. 59·93	....	....	....	30. 9
					....	
18. 28. 39·0	11. 47. 4·5	−21. 57·92	....	....	....	July 1. 11
7. 21. 17·0	0. 37. 35·5	−21. 56·83	....	....	....	2. 1
19. 40. 34·0	12. 54. 51·0	−21. 55·77	....	....	....	2. 11
16. 50. 20·0	9. 57. 11·5	−21. 52·19	....	....	....	4. 11
8. 26. 16·0	1. 30. 33·5	−21. 50·99	....	....	....	5. 2
15. 59. 21·0	9. 2. 24·0	−21. 50·50	....	....	....	5. 9
19. 54. 13·0	12. 52. 40·5	−21. 47·88	....	....	....	6. 11
9. 35. 10·0	2. 23. 29·0	−21. 43·00	....	....	....	9. 3
17. 38. 41·0	10. 25. 40·5	−21. 42·26	....	....	....	9. 9
17. 33. 42·0	10. 16. 46·0	−21. 40·21	....	....	....	10. 10
20. 4. 39·0	12. 43. 22·0	−21. 38·32	....	....	....	11. 10
10. 13. 30·0	2. 49. 53·5	−21. 37·25	....	....	....	12. 3
17. 23. 56·0	9. 55. 12·0	−21. 34·74	....	....	....	13. 10
16. 50. 5·0	9. 17. 30·0	−21. 32·83	....	....	....	14. 10
15. 58. 58·0	8. 22. 35·0	−21. 31·22	....	....	....	15. 9
13. 1. 0·0	5. 21. 9·5	−21. 29·64	....	....	....	16. 4
15. 0. 36·0	7. 4. 39·0	−21. 21·95	....	....	....	20. 9
13. 14. 16·0	5. 14. 40·0	−21. 20·37	....	....	....	21. 5
19. 35. 56·0	11. 35. 17·5	−21. 20·27	....	....	....	21. 9
15. 5. 6·0	7. 1. 15·5	−21. 19·07	....	....	....	22. 7
15. 5. 41·0	6. 53. 58·0	−21. 15·83	....	....	....	24. 3
20. 53. 5·0	12. 40. 25·0	−21. 15·55	....	....	....	24. 10
21. 23. 40·0	13. 3. 2·5	−21. 12·29	19. 13. 53·0*	10. 56. 9·0	−0. 43·46	26. 10
12. 7. 18·5	3. 44. 16·0	−21. 11·38	12. 9. 52·0†	3. 26. 20·5	−0. 42·80	27. 3
21. 15. 38·0	12. 51. 5·5	−21. 10·64	18. 29. 40·0*	10. 8. 8·0	−0. 42·55	27. 11
19. 29. 29·0	11. 1. 18·0	−21. 8·80	19. 27. 38·0†	10. 39. 0·0	−0. 41·50	28. 11
12. 34. 23·0	4. 3. 24·0	−21. 7·53	12. 36. 26·0†	3. 45. 0·0	−0. 40·85	29. 3
20. 30. 3·5	11. 53. 50·0	−21. 5·52	....	....	....	30. 11

* Time by Transit Clock.

† Time by $\frac{1}{2}\Sigma$.

COMPARISONS OF STATIONARY CHRONOMETERS AT KINGSTOWN.

Approximate Solar Time, 1844.	Time of Transit Clock at Comparison	Corresponding Time of 2354.	2354, Slow.	Time of 2354 at Comparison.	Corresponding Time of $\frac{1}{2}\Sigma$	$\frac{1}{2}\Sigma$ Slow.
d h	h m s	h m s	m s	h m s	h m s	m s
July 31. 3	12.37.26	4.21.35·5	−21. 4·15	3.10.45·5	11.49.30·0	−22.31·41
Aug. 1.21	5.50.20	21.27.45·0	−21. 2·55	21.38.55·5	6.24.38·0	−22.29·12
2. 3	12.48.26	4.24.42·5	−21. 2·14	3. 6.12·0	11.52.48·5	−22.29·04
4. 3	12.48.39	4.17. 2·5	−20.58·32	2.42.57·5	11.37.25·0	−22.27·00
4.10	20. 0.18	11.27.30·5	−20.57·64	11.50.30·0	20.46.28·0	−22.26·65
5. 4	13.33.49	4.58. 8·0	−20.55·92	3.54.39·5	12.53.17·0	−22.26·19
8.10	20. 5.54	11.17.20·5	−20.51·81	9.51.20·0	19. 2.49·0	−22.25·23
9. 0	10.40.58	1.50. 0·5	−20.50·59	23.52.15·0	9. 6. 3·0	−22.25·00
13. 0	10.55.23	1.48.39·5	−20.46·53	0. 9.55·5	9.39.36·0	−22.24·27
14.10	20. 3.58	10.51.48·0	−20.44·40	11.25.24·0	21. 0.54·0	−22.23·90
15.10	20. 5. 2	10.48.55·5	−20.42·58	9.32.46·0	19.11.55·5	−22.23·61
17. 1	11.55.33	2.32.54·0	−20.39·67	0.35. 3·0	10.20.39·0	−22.22·59
17.11	20.50.14	11.26. 7·5	−20.39·29	11.41.55·0	21.29.21·0	−22.22·49
18.10	20.23.59	10.56. 0·5	−20.37·36	11. 8. 7·0	20.59.25·0	−22.21·55
20.10	20.28.58	10.53. 6·5	−20.33·76	11.17.46·0	21.17. 0·0	−22.19·26
21. 1	12.43.58	3. 5.27·0	−20.33·08	1. 4.52·0	11. 6.22·0	−22.18·79
24. 8	18.26.34	8.35.18·0	−20.27·58	6.27.38·0	16.41.53·5	−22.16·15
25. 2	14. 1.26	4. 6.57·0	−20.25·81	2.18.58·5	12.36.31·0	−22.15·70
27. 8	18. 7.22	8. 4.19·0	−20.20·58	7.39.37·0	18. 5.59·0	−22.14·05
28. 9	19. 7. 6	8.59.56·5	−20.18·11	11.13.25·0	21.44.21·0	−22.13·72
29. 0	11.38.35	1.28.42·5	−20.16·46	23.55.52·0	10.28.54·0	−22.13·12
30. 8	19.13.26	8.58.22·0	−20.13·28	9.20.41·5	19.59.15·0	−22.11·90
Sep. 1. 9	20.13.34	9.50.27·0	−20. 8·72	10.15.14·0	21. 1.52·0	−22. 9·78
2. 0	11. 2.34	0.37. 2·5	−20. 8·84	0.15.28·0	11. 4.24·0	−22. 9·87
3. 7	17. 3.50	6.33.24·0	−20. 7·34	5.52.33·0	16.46.20·0	−22. 7·47
6. 0	12.19.57	1.38.30·0	−20. 3·70	23.57. 7·0	11. 1.47·0	−22. 5·61
10. 1	13.33.48	2.36.27·5	−20. 0·41	0.57.37·0	12.18.13·0	−22. 2·12
11.11	22.10.28	11. 7.47·0	−19.58·60	12.40.34·0	0. 7. 2·0	−22. 0·18
14. 0	12. 1. 9	0.48.19·0	−19.53·74	0.30.58·5	12. 7.19·0	−21.58·09
15.20	7.35.24	20.15.27·0	−19.52·38	20.42.37·0	8.26.13·0	−21.56·59

COMPARISONS OF STATIONARY CHRONOMETERS AT KINGSTOWN.

Time of 2354 at Comparison.	Corresponding Time of Σ	Σ Slow.	Time of 2354 at Comparison.	Corresponding Time of σ	σ Slow.	Approximate Solar Time, 1844.
h m s	h m s	m s	h m s	h m s	m s	d h
3. 11. 47 ·0	11. 52. 48	−24. 47 ·74	3. 13. 19 ·0	11. 51. 10 ·0	−21. 37 ·49	July 31. 3
21. 37. 8 ·5	6. 25. 10	−24. 48 ·40	....	....	....	Aug. 1. 21
3. 8. 30 ·5	11. 57. 27	−24. 48 ·66	3. 8. 53 ·0	11. 54. 35 ·0	−21. 34 ·10	2. 3
2. 46. 29 ·5	11. 43. 20	−24. 49 ·42	2. 47. 0 ·0	11. 40. 32 ·5	−21. 31 ·31	4. 3
12. 6. 30 ·5	21. 4. 54	−24. 49 ·52	....	....	....	4. 10
3. 53. 48 ·0	12. 54. 49	−24. 49 ·83	....	....	....	5. 4
9. 52. 39 ·5	19. 6. 35	−24. 51 ·52	....	....	....	8. 10
1. 21. 49 ·5	10. 38. 19	−24. 51 ·69	23. 58. 59 ·0	9. 11. 44 ·0	−21. 20 ·91	9. 0
0. 9. 15 ·0	9. 41. 25	−24. 53 ·87	0. 8. 19 ·0	9. 36. 48 ·5	−21. 13 ·54	13. 0
11. 26. 43 ·0	21. 4. 44	−24. 54 ·69	11. 28. 54 ·0	21. 3. 13 ·5	−21. 12 ·82	14. 10
22. 14. 29 ·5	7. 54. 18	−24. 54 ·91	....	....	....	15. 10
0. 41. 24 ·0	10. 29. 34	−24. 55 ·53	0. 41. 43 ·0	10. 26. 7 ·0	−21. 9 ·48	17. 1
11. 46. 20 ·0	21. 36. 20	−24. 55 ·75	11. 48. 15 ·0	21. 34. 28 ·0	−21. 8 ·43	17. 11
11. 12. 59 ·0	21. 6. 52	−24. 55 ·74	11. 15. 22 ·0	21. 5. 26 ·5	−21. 6 ·85	18. 10
11. 25. 24 ·5	21. 27. 17	−24. 56 ·49	11. 26. 17 ·0	21. 24. 16 ·0	−21. 2 ·85	20. 10
1. 9. 24 ·5	11. 13. 33	−24. 56 ·54	1. 13. 27 ·0	11. 13. 41 ·5	−21. 1 ·88	21. 1
6. 31. 40 ·5	16. 48. 38	−24. 57 ·47	6. 33. 11 ·0	16. 46. 9 ·5	−20. 58 ·23	24. 8
2. 24. 14 ·5	12. 44. 30	−24. 57 ·84	2. 23. 49 ·0	12. 40. 3 ·0	−20. 56 ·41	25. 2
10. 7. 8 ·0	20. 36. 39	−24. 58 ·60	10. 7. 47 ·0	20. 33. 10 ·0	−20. 50 ·50	27. 8
12. 0. 5 ·0	22. 33. 54	−24. 58 ·96	....	....	....	28. 9
1. 17. 4 ·5	11. 53. 6	−24. 59 ·13	0. 4. 28 ·0	10. 36. 5 ·5	−20. 47 ·19	29. 0
9. 38. 25 ·5	20. 19. 50	−24. 59 ·97	9. 39. 54 ·0	20. 17. 3 ·0	−20. 44 ·22	30. 8
10. 9. 39 ·5	20. 59. 8	−25. 1 ·20	10. 11. 37 ·0	20. 56. 46 ·0	−20. 41 ·37	Sep. 1. 9
0. 24. 38 ·0	11. 16. 28	−25. 2 ·37	0. 23. 57 ·0	11. 11. 26 ·0	−20. 41 ·49	2. 0
9. 33. 11 ·5	20. 30. 30	−25. 2 ·54	9. 34. 4 ·0	20. 26. 58 ·0	−20. 37 ·89	3. 7
23. 47. 52 ·5	10. 55. 30	−25. 4 ·64	23. 48. 12 ·0	10. 51. 19 ·5	−20. 34 ·59	6. 0
0. 59. 8 ·5	12. 22. 49	−25. 6 ·37	1. 1. 38 ·0	12. 20. 44 ·0	−20. 31 ·46	10. 1
13. 6. 38 ·0	0. 36. 17	−25. 6 ·86	13. 7. 25 ·5	0. 32. 26 ·0	−20. 28 ·24	11. 11
0. 37. 57 ·5	12. 17. 29	−25. 7 ·92	0. 36. 51 ·5	12. 11. 39 ·0	−20. 24 ·10	14. 0
20. 45. 51 ·0	8. 32. 40	−25. 9 ·05	20. 41. 52 ·0	8. 23. 54 ·0	−20. 22 ·70	15. 20

COMPARISONS OF STATIONARY CHRONOMETERS AT KINGSTOWN.

Approximate Solar Time, 1844.	Time of 2354 at Comparison.	Corresponding Time of 2388 (Sidereal).	2388 (Sidereal) Slow.	Time of 2354 at Comparison.	Corresponding Time of House Clock.	House Clock Slow.
d h	h m s	h m s	m s	h m s	h m s	m s
July 31. 3	....	....	....	....	....	....
Aug. 1.21	....	....	....	....	....	....
2. 3	....	....	....	....	....	....
4. 3	....	....	....	....	....	....
4.10	....	....	....	....	....	....
5. 4	....	....	....	....	....	....
8.10	....	....	....	....	....	....
9. 0	....	....	....	....	....	....
13. 0	....	....	....	....	....	....
14.10	....	....	....	....	....	....
15.10	....	....	....	....	....	....
17. 1	....	....	....	....	....	....
17.11	....	....	....	....	....	....
18.10	....	....	....	....	....	....
20.10	....	....	....	....	....	....
21. 1	....	....	....	....	....	....
24. 8	....	....	....	....	....	....
25. 2	....	....	....	....	....	....
27. 8	....	....	....	....	....	....
28. 9	....	....	....	....	....	....
29. 0	....	....	....	....	....	....
30. 8	....	....	....	....	....	....
Sep. 1. 9	....	....	....	....	....	....
2. 0	....	....	....	....	....	....
3. 7	....	....	....	....	....	....
6. 0	....	....	....	....	....	....
10. 1	....	....	....	....	....	....
11.11	....	....	....	....	....	....
14. 0	....	....	....	....	....	....
15.20	....	....	....	....	....	....

COMPARISONS OF STATIONARY CHRONOMETERS AT KINGSTOWN.

Time of $\frac{1}{2}\Sigma$ at Comparison.	Corresponding Time of 1839.	1839 Slow.	Time of Transit Clock or of $\frac{1}{2}\Sigma$ at Comparison.	Corresponding Time of 2388 (Solar).	2388 (Solar) Slow.	Approximate Solar Time, 1844.
h m s	h m s	m s	h m s	h m s	m s	d h
11.48.27·0	3. 9.43·0	−21. 4·56	....	....	....	July 31. 3
6.26.45·0	21.41. 1·0	−21. 1·40	....	....	....	Aug. 1.21
11.53.14·0	3. 6.36·5	−21. 1·29	....	....	....	2. 3
11.34.28·0	2.40. 1·0	−20.58·51	....	....	....	4. 3
20.45.33·0	11.49.35·5	−20.57·94	....	....	....	4.10
12.55.44·0	3.57. 7·0	−20.56·91	....	....	....	5. 4
18.59.58·0	9.48.30·0	−20.52·35	....	....	....	8.10
9. 5.23·0	23.51.35·5	−20.51·13	....	....	....	9. 0
9.34.24·0	0. 4.42·5	−20.44·81	....	....	....	13. 0
20.59.34·0	11.24. 2·5	−20.42·57	....	....	....	14.10
19. 7.13·0	9.28. 3·0	−20.41·29	....	....	....	15.10
10.28.34·0	0.42.56·5	−20.39·62	....	....	....	17. 1
21.32. 9·0	11.44.41·5	−20.38·23	....	....	....	17.11
21. 1.46·0	11.10.26·5	−20.36·25	....	....	....	18.10
21.18. 6·0	11.18.51·5	−20.33·44	....	....	....	20.10
11. 8.17·0	1. 6.46·0	−20.32·48	....	....	....	21. 1
16.42.40·0	6.28.24·0	−20.27·35	....	....	....	24. 8
12.37.31·0	2.19.58·5	−20.26·14	....	....	....	25. 2
18. 4. 1·0	7.37.41·0	−20.22·30	....	....	....	27. 8
21.44.48·5	11.13.55·0	−20.20·55	....	....	....	28. 9
10.29.19·0	23.56.20·0	−20.19·71	....	....	....	29. 0
19.58. 8·0	9.19.39·5	−20.18·06	....	....	....	30. 8
21. 0.21·5	10.13.50·0	−20.14·98	....	....	....	Sep. 1. 9
11. 4.46·0	0.15.56·0	−20.14·92	....	....	....	2. 0
16.50.39·0	5.56.56·0	−20.12·07	....	....	....	3. 7
10.54.55·0	23.50.20·5	−20. 8·16	....	....	....	6. 0
12.19. 4·0	0.58.29·0	−20. 1·59	....	....	....	10. 1
0.10.39·0	12.44.11·0	−19.59·14	....	....	....	11.11
10.47.11·0	23.11. 5·0	−19.55·24	....	....	....	14. 0
8.27. 5·0	20.43.29·0	−19.52·51	....	....	....	15.20

As has been explained, the "chronometer slow," for the times of comparison with travelling chronometers, has been interpolated by simple proportion of times between the "chronometer slow" for the times of groups of transits, and then the following corrections have been applied for change of chronometer rates:—

		d	h		s
2354,	August	5.	4,	correction applied	+ 0·08
Σ,	July	12.	4,	. . . . .	− 0·06
	July	16.	5,	. . . . .	− 0·35
	July	20.	10,	. . . . .	− 0·35
	July	24.	4,	. . . . .	− 0·06

CORRECTIONS TO THE ERRORS OF TRANSIT CLOCK AT KINGSTOWN, AS SHEWN BY THE

	June 27d. 23h	July 2d. 2h	July 5d. 3h	July 9d. 4h	July 12d. 4h	July 16d. 5h	July 20d. 10h	July 21d. 6h	July 24d. 4h	July 27d. 4h	July 29d. 4h
	s	s	s	s	s	s	s	s	s	s	s
Transit Clock	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00
2354	−0·03	+0·09	+0·03	+0·17	+0·08	...	...	...	−0·24	−0·12	−0·10
½ Σ	+0·04	−0·11	−0·01	+0·04	−0·01	+0·06	+0·11	+0·14	−0·11	+0·09	−0·31
Σ	−0·06	−0·07	+0·05	+0·10	−0·04	−0·23	−0·17	−0·06	−0·36	...	−0·38
σ	...	(−0·43)	...	...	−0·57	+0·81	−0·46	−0·12	−0·30	...	−0·23
2388 Sidereal	(−0·09)	(+0·16)	+0·01	+0·13	+0·31	...	...	...	...	...	...
House Clock	+0·06	(−0·07)	(+0·02)	...	+0·04	...	...	...	...	...	...
1839	+0·03	−0·01	−0·07	+0·09	+0·05	−0·02	−0·44	−0·37	−0·10	+0·11	−0·13
2388 Solar	...	...	...	...	...	...	...	...	...	+0·02	...
Mean, or Correction for Transit Clock	+0·01	−0·02	0·00	+0·11	+0·02	+0·05	−0·16	−0·08	−0·18	+0·02	−0·19

Then the excess of this corrected interpolated "chronometer slow" above the "chronometer slow" found from the comparison, is taken as a correction which, so far as that chronometer indicates, ought to be applied to "Transit Clock Slow." They are collected in the following table, and their means taken. The results of 2354 for August 29 and September 2, those of σ for July 2, August 21, and August 25, those of 2388 for June 27 and July 2, and those of House Clock for July 2 and July 5, are rejected on account of the unsteadiness of rates about those times, and generally only half weight is given to the results of $\frac{1}{2}\sigma$. The results are as follows:—

ADOPTED IN THE REDUCTION OF COMPARISONS OF TRAVELLING CHRONOMETERS, DIFFERENT STATIONARY CHRONOMETERS.

July 31d. 4h	August 2d. 4h	August 4d. 4h	August 5d. 5h	August 9d. 1h	August 13d. 1h	August 17d. 2h	August 21d. 2h	August 25d. 3h	August 29d. 1h	Sep. 2d. 1h	Sep. 6d. 1h	Sep. 10d. 2h	Sep. 14d. 1h
s	s	s	s	s	s	s	s	s	s	s	s	s	s
0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00
−0·18	+0·11	+0·13	−0·60	−0·42	+0·42	−0·17	+0·39	+0·14	(−0·01)	(+0·58)	−0·65	+0·39	−1·19
−0·16	+0·14	+0·06	−0·16	−0·18	+0·03	−0·20	+0·05	+0·09	−0·16	+0·84	+0·56	+0·62	−1·03
0·00	+0·12	0·00	−0·04	−0·17	−0·11	−0·10	−0·07	+0·04	−0·12	+0·77	+0·67	+0·35	−0·20
...	...	...	...	...	...	...	(−0·21)	(+0·21)	...	+1·19	−0·23	+1·63	−0·96
...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...
−0·09	+0·20	+0·02	+0·06	−0·35	−0·16	−0·06	−0·01	+0·16	−0·12	+0·90	+0·36	+0·10	−0·16
...	...	...	...	...	...	...	...	...	...	...	...	...	...
−0·09	+0·11	+0·04	−0·15	−0·22	+0·04	−0·11	+0·07	+0·05	−0·10	+0·69	+0·15	+0·41	−0·38

VII.—*Transits at Valentia, Personal Equations, Instrumental Errors, Clock Stars, First Results for Clock Errors, and Results as amended by the Comparison of Stationary Chronometers.*

In the beginning of Section VI. it has been mentioned that by comparisons made at Kingstown, personal equations were found, from which the following may be deduced:—

Clock Slow, G — Clock Slow, S = − 0ˢ·29.

As Mr. Sheepshanks and Lieutenant Gosset were the only observers at Valentia, this equation alone is sufficient. The number of observations by Lieutenant Gosset being far greater than that by Mr. Sheepshanks, it was thought expedient to reduce all the results to Lieutenant Gosset's method of observing.

The weather at Valentia, during the whole continuance of the observations, was excessively bad, and nothing but the most constant vigilance on the part of Lieutenant Gosset could have secured the necessary number of observations. Among those obtained, comparatively few were complete transits on the seven wires. It was thought convenient, therefore, to reduce all transits, perfect or imperfect, to transits over the central wire (instead of the mean of the seven wires as at Greenwich and at Kingstown).

The error of collimation was ascertained by noting the apparent position of the middle wire in reversed positions of the transit, as seen upon the meridian mark, and noting the error from bisection as estimated in thicknesses of the middle wire. This wire was measured by Mr. Simms, after the return of the instrument to London, and its thickness was found to be $0^{f''}\cdot16$. From the observations thus computed, the following errors, illuminated end East, were inferred:—

	f''
August 7 and 8	− 0·01
August 10 to 24	− 0·15
August 29 to September 12 . . .	− 0·03

It was thought prudent at Valentia to combine with these the results from circumpolar stars, as obtained from reversing the instrument during the star's passage. As obtained simply from the times at the wires, they are as follows:—

August	17 by δ Ursæ Minoris	− 0ˢ·256
	18 .. δ Ursæ Minoris	− 0·260
	29 .. λ Ursæ Minoris	− 0·219
	30 .. λ Ursæ Minoris	− 0·066
	31 .. λ Ursæ Minoris	− 0·230

But on each of these days, except August 29, the azimuthal screws were used,

so that, both before and after reversion, the wire was made to bisect the south meridian mark. The real errors of collimation are, therefore, on these days only about $\frac{1}{8}$ of those given above. Upon the whole, applying $-0^{f''}\cdot01$ for diurnal aberration, the following numbers were adopted:—

	Illuminated End East.	Illuminated End West.
	f''	f''
August 7 and 8	$-0\cdot02$	$0\cdot00$
August 10 to 24	$-0\cdot22$	$+0\cdot20$
August 29 to September 12	$-0\cdot12$	$+0\cdot10$

I think it likely that these numbers are too large; but the effect of the error will be totally insignificant.

The level is not furnished with a cross-level for adjustment of its position when placed on the transit-pivots. But I am assured by Mr. Simms, that great care had been used in fixing the glass bubble within its brass case, so as to render extreme delicacy of position unnecessary. Each end of the level carries a pin, projecting in a direction parallel to the axis of the level; and the position of the level was defined by making one of these pins to pass between the forks of a vertical crutch attached to one of the transit piers. On August 18, in consequence of some unsatisfactory appearance in the level, the position of the crutch was so altered that the level when placed with either pin in it had no tendency to lean either north or south; and thus the level determinations were freed from the possibility of a constant error which might have affected them before. On two or three occasions there seemed (to Lieutenant Gosset's watchful eye) to be some appearance of unsteadiness, and the level was then immediately applied several times; but I do not see anything injurious to the credit of the results. The difference of pivots is apparently insensible.

The azimuthal errors were found as at Kingstown. The meridian mark was fixed rather hastily, and was not placed so near the meridian as was desirable, but near enough for perfect accuracy. The value of x, the azimuthal error of the meridian mark, was found from the mean of all the deductions to be $-5^{f''}\cdot30$. The results for separate sections were: to August 17, $-5^{f''}\cdot32$; August 18 to September 3, $-5^{f''}\cdot33$; September 8 to September 12, $-5^{f''}\cdot22$, shewing that the the mark had not sensibly moved.

The transit-clock is a good clock, with gridiron-pendulum, the property of the Ordnance Department.

Before the observations of August 24, the clock was advanced 1^{m}; and before the observations of Polaris, September 8, it was advanced 2^{m}. In winding up, before α Ophiuchi, September 8, it lost 28^{s}.

On August 7, the clock-errors are unsteady; but I can give no explanation of the cause.

TRANSITS OBSERVED AT VALENTIA.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Middle Wire.	Error of Collimation Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	f″	f″	f″	f″
Aug. 7	E	ϵ Ophiuchi	5	10. 9. 54·23		−0·02		−0·159
					−0·01		+0·161	
							+0·257	
	W	ζ Ophiuchi	7	16. 28. 24·94		0·00		+0·218
							+0·151	
		ι Ophiuchi	7	16. 46. 25·94				
		κ Ophiuchi	7	16. 50. 5·29				
		ϵ Ursæ Minoris	3	17. 1. 29·29				
		Groomb. 944 S.P.	3	17. 13. 12·89				
		ο Serpentis	3	17. 32. 30·10				
		γ Ophiuchi	2	17. 39. 53·69				
		ν Ophiuchi	4	17. 50. 17·19			+0·063	
							+0·120	
							+0·124	
							+0·123	
							+0·187	
							+0·067	
Aug. 8		Polaris S.P.	2	13. 6. 7·35			+0·107	+0·117
							−0·002	
Aug. 10		Polaris S.P.	2	13. 5. 59·79	−0·24	+0·20	+0·029	+0·008
							0·000	
		ν Ophiuchi	4	17. 50. 9·90				
		70 Ophiuchi	7	17. 57. 16·40				
		72 Ophiuchi	4	17. 59. 38·79				
							+0·008	
							−0·028	
		δ Ursæ Minoris	3	18. 21. 16·86				
							+0·079	
Aug. 11								
Aug. 15		Polaris S.P.	1	13. 5. 44·00	0·00		+0·040	+0·048
		Spica	7	13. 16. 30·16				
Aug. 17		Polaris S.P.	3	13. 5. 43·35			−0·048	−0·043
							−0·043	
		β¹ Scorpii	5	15. 55. 50·93				+0·030
							0·000	
		ζ Ophiuchi	3	16. 28. 2·49				
		ι Ophiuchi	5	16. 46. 4·30				
							+0·040	
		ϵ Ursæ Minoris	4	17. 1. 5·37				
		Groomb. 944 S.P.	2	17. 12. 53·73			+0·028	
							+0·085	
		72 Ophiuchi	3	17. 59. 23·95				+0·107
							+0·108	
		δ Ursæ Minoris	3	18. 20. 57·66			+0·087	

TRANSITS OBSERVED AT VALENTIA.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f''	f''	f''	s	s	s		s	h m	s
$x-0\cdot05$		$-5\cdot35$	49·84	7·67	+17·83	S	−0·29		
$x-0\cdot05$									
$x-0\cdot01$			20·22	38·04	+17·82				
		$-5\cdot29$	22·56	41·01	+18·45				
			1·84	20·54	+18·70				
	$-5\cdot29$		50·66	7·73	+17·07				
	$-5\cdot29$		28·85	45·99	+17·14			17. 16	+17·90
			25·30	43·02	+17·72	G	0·00		
$x+0\cdot03$	$-5\cdot85$		49·82	7·93	+18·11				
			12·56	30·28	+17·72				
	$-5\cdot85$	$-5\cdot85$	43·60	3·96	+20·36			11. 7	+19·75
	$-5\cdot48$	$-5\cdot54$	39·10	5·42	+26·32				
			5·13	30·26	+25·13				
			12·40	37·99	+25·59				
			35·22	0·94	+25·72				
$x-0\cdot15$									
$x-0\cdot33$	$-5\cdot48$		13·49	38·25	+24·76			18. 49	+25·56
								14. 27	+27·31
$x-0\cdot15$	$-5\cdot09$	$-5\cdot47$	23·83	8·48	+44·65			12. 24	+35·71
$x-0\cdot19$									
	$-5\cdot09$		25·46	1·25	+35·79				
$x-0\cdot15$	$-5\cdot31$	$-5\cdot45$	26·30	9·70	+43·40				
$x-0\cdot47$	$-5\cdot31$		45·68	26·10	+40·42				
$x-0\cdot15$			57·79	37·91	+40·12				
			0·85	40·87	+40·02				
	$-5\cdot23$		27·62	6·08	+38·46				
	$-5\cdot23$		7·69	48·75	+41·06				
$x-0\cdot15$			20·51	0·87	+40·36				
	$-5\cdot53$		54·80	35·99	+41·19				

TRANSITS OBSERVED AT VALENTIA.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Middle Wire.	Error of Collimation Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
Aug. 17	E	δ Ursæ Minoris.....	2	18.21. 6·26	−0·12	−0·22	−0·033	−0·041
		Piazzi VI. 292 S.P.	3	18.57.45·43			+0·082	+0·131
		δ Aquilæ.....	6	19.17. 5·65			+0·168	
		μ Aquilæ	5	19.25.55·54			+0·130	
		σ Aquilæ	7	19.30.57·17				
		χ Aquilæ	5	19.34.40·82				
		γ Aquilæ	5	19.38.17·64			+0·135	
		β Aquilæ	6	19.47. 6·59				
		Aquilæ 204 (Bode)..	7	19.50.47·27			+0·145	
		θ Aquilæ.....	6	20. 2.43·43				
		α^1 Capricorni.....	5	20. 8.29·13				
		α^2 Capricorni.....	6	20. 8.52·52				
		λ Ursæ Minoris	4	20.15.12·64			+0·098	
		ν Aquarii	5	21. 0.34·36				
		α Equulei.....	7	21. 7.29·32			+0·145	
	W	β Aquarii	7	21.22.49·00			+0·172	
							+0·042	
Aug. 18		κ Ophiuchi.....	5	16.49.41·75		+0·20	−0·004	+0·061
		ε Ursæ Minoris	5	17. 1. 2·82				
		Groomb. 944 S.P...	2	17.12.52·26			+0·056	
		α Ophiuchi.....	7	17.27. 5·97				
		ο Serpentis.....	7	17.32. 5·35				
		β Ophiuchi.....	6	17.35.11·22			+0·045	
							+0·265	
							+0·070	
							+0·072	
		70 Ophiuchi.....	4	17.56.59·30				
		δ Ursæ Minoris	2	18.20.55·75			+0·085	
	E	δ Ursæ Minoris	2	18.21. 4·50	−0·16	−0·22	+0·040	+0·068
		ε Aquilæ.....	7	18.51.56·94				
		Piazzi VI. 292 S.P.	5	18.57.42·48			+0·032	
		22 Aquilæ	7	19. 8.13·02			+0·105	
		μ Aquilæ	7	19.25.53·20			+0·080	
		σ Aquilæ	7	19.30.54·94			+0·115	
		γ Aquilæ	5	19.38.15·67				
		α Aquilæ	7	19.42.35·15				
		β Aquilæ	7	19.47. 4·25				
		Aquilæ 207 (Bode)..	6	19.52.51·13			+0·085	

TRANSITS OBSERVED AT VALENTIA.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow Used for Comparison with Chronometers.
f″	*f″*	*f″*	s	s	s		s	h m	s
x+0·15		−5·27	52·54	35·99	+43·45	G	0·00	18. 40	+40·26
	−5·53		15·97	57·30	+41·33				
			1·52	41·85	+40·33				
			51·65	31·98	+40·33				
			53·18	33·54	+40·36				
			37·21	17·39	+40·18				
			13·95	54·47	+40·52				
			2·65	42·93	+40·28				
			42·36	22·46	+40·10				
			39·06	19·32	+40·26				
			24·04	4·16	+40·12				
	−5·44		47·43	28·08	+40·65				
	−5·44		4·31	30·23	+25·92				
			29·37	9·81	+40·44				
			25·31	5·63	+40·32				
x−0·09			44·35	24·87	+40·52				
		−5·45	38·27	20·37	+42·10				
	−5·24		25·27	5·91	+40·64				
	−5·24		5·96	49·03	+43·07				
			2·69	44·93	+42·24				
x+0·15			0·53	42·89	+42·36				
			7·44	49·50	+42·06				
			55·41	37·91	+42·50				
	−5·35		52·26	35·68	+43·42				
x+0·15		−5·15	51·15	35·68	+44·53				
			53·55	36·17	+42·62				
	−5·35		15·05	57·45	+42·40				
			8·55	51·66	+43·11				
			49·35	31·97	+42·62				
			50·99	33·53	+42·54				
			12·00	54·46	+42·46				
			31·40	14·15	+42·75				
			0·35	42·93	+42·58				
			46·29	29·99	+43·70				

TRANSITS OBSERVED AT VALENTIA.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Middle Wire.	Error of Collimation Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	f″	f″	f″	f″
Aug. 18	E	θ Aquilæ.....	3	20. 2.41·05		−0·22		+0·068
		α^2 Capricorni	6	20. 8.50·33				
							+0·049	
							+0·178	
		λ Ursæ Minoris....	4	20.15.10·81				
							+0·108	
							+0·132	
							+0·162	
							+0·145	
		α Equulei.....	3	21. 7.26·91				+0·160
							+0·225	
		β Aquarii	7	21.22.46·80				
							+0·187	
Aug. 19								
Aug. 22	W	β Ophiuchi	5	17.35. 2·36	− 0·12	+0·20	+0·209	+0·223
		72 Ophiuchi.....	4	17.59.13·49			+0·039	+0·061
		δ Ursæ Minoris	1	18.20.42·68			+0·061	
							+0·056	
Aug. 23		9 Aquilæ.....	3	18.47.57·73			+0·010	+0·038
		ε Aquilæ.....	5	18.51.45·99				
		Piazzi VI. 292 S.P.	2	18.57.36·31			+0·028	
		26 Aquilæ.....	4	19.11.28·45				
							0·000	
		36 Aquilæ.....	5	19.21.45·25				
		μ Aquilæ	7	19.25.42·55				
							+0·052	
Aug. 24		ε Ursæ Minoris	1	17. 1.50·00			+0·056	+0·064
		ο Serpentis.....	3	17.32.52·12				
		γ Ophiuchi	7	17.40.16·54				
							+0·062	
		70 Ophiuchi.....	7	17.57.46·45				
							+0·030	
		δ Ursæ Minoris	6	18.21.44·69			+0·070	
		β Lyræ.....	7	18.44.28·90				
		9 Aquilæ	6	18.48.55·64				
							+0·058	
							+0·172	
	E	δ Aquilæ.....	6	19.17.50·46	− 0·11	−0·22		+0·136
							+0·158	
							+0·085	
Aug. 26								
Aug. 27								

TRANSITS OBSERVED AT VALENTIA.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f''	*f''*	*f''*	s	s	s		s	h m	s
		−5·15	36·74	19·32	+42·58	G	0·00		
x+0·15	−5·50		45·30	28·08	+42·78				
	−5·50		36·40	29·87	+53·47				
			23·00	5·63	+42·63				
			42·27	24·87	+42·60			21. 34	+42·74
								14. 22	+44·20
x−0·15		−5·42	58·72	49·44	+50·72				
	−5·87		10·04	0·80	+50·76				
x−0·09	−5·87		38·90	34·28	+55·38			18. 30	+50·81
x−0·15		−5·45	53·28	46·47	+53·19			13. 12	+52·62
	−5·30		42·82	36·12	+53·30				
	−5·30		4·06	58·24	+54·18				
			24·05	17·17	+53·12				
			40·99	34·28	+53·29				
			38·89	31·93	+53·04				
x−0·15	−4·88	−5·47	12·54	4·85	− 7·69				
			47·29	42·81	− 4·48				
	−4·88		12·64	7·72	− 4·92				
			42·55	37·82	− 4·73				
	−5·15		41·43	33·47	− 7·96				
	−5·15		27·11	22·38	− 4·73				
x−0·19			51·19	46·46	− 4·73				
x+0·15		−5·17	46·40	41·79	− 4·61			20. 43	− 4·50
x+0·11								2. 14	+ 0·03
								14. 51	+ 1·09

TRANSITS OBSERVED AT VALENTIA.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Middle Wire.	Error of Collimation Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	f″	f″	f″	f″
Aug. 29	E	β Ophiuchi	7	17. 35. 48 ·25		−0 ·12	−0 ·012	+0 ·031
		δ Ursæ Minoris	5	18. 21. 34 ·63			+0 ·012	
		Piazzi VI. 292 S.P.	4	18. 58. 23 ·14			+0 ·020	
		δ Aquilæ.....	5	19. 17. 40 ·31				
							+0 ·092	
							−0 ·020	
		γ Aquilæ.....	6	19. 38. 52 ·42				
							+0 ·028	
		α Aquilæ	5	19. 43. 12 ·27				
							+0 ·030	
							+0 ·082	
		θ Aquilæ	4	20. 3. 18 ·30				
		α^2 Capricorni	2	20. 9. 27 ·63				
		λ Ursæ Minoris	1	20. 15. 44 ·58			+0 ·081	
	W	λ Ursæ Minoris	1	20. 15. 22 ·84	0 ·00	+0 ·10	+0 ·069	+0 ·040
		ν Aquarii	6	21. 1. 9 ·06				
							+0 ·010	
		α Equulei.....	7	21. 8. 3 ·82				
		Piazzi IX. 37 S.P..	3	21. 14. 42 ·21			−0 ·021	
							+0 ·068	
Aug. 30	E	α Ophiuchi.....	7	17. 27. 40 ·99	− 0 ·04	−0 ·12	+0 ·160	+0 ·161
		δ Ursæ Minoris.....	4	18. 21. 33 ·41			+0 ·080	
		22 Aquilæ	5	19. 8. 48 ·29			+0 ·199	
		γ Aquilæ.....	4	19. 38. 50 ·71			+0 ·218	
		λ Ursæ Minoris	2	20. 15. 27 ·20			+0 ·158	
	W	λ Ursæ Minoris	1	20. 15. 20 ·68	− 0 ·08	+0 ·10	+0 ·115	+0 ·126
		α Equulei.....	6	21. 8. 1 ·88				
Aug. 31		δ Ursæ Minoris	2	18. 21. 31 ·44	0 ·00		−0 ·001	−0 ·004
		ε Aquilæ	7	18. 52. 30 ·15				
		Piazzi VI. 292 S.P.	4	18. 58. 22 ·29			−0 ·060	
		δ Aquilæ.....	7	19. 17. 36 ·50				
		36 Aquilæ	6	19. 22. 29 ·40				
							−0 ·055	
		σ Aquilæ	7	19. 31. 28 ·20				
		γ Aquilæ	6	19. 38. 48 ·85				
							+0 ·035	
		β Aquilæ.....	7	19. 47. 37 ·41				
							−0 ·010	
		λ Ursæ Minoris	2	20. 15. 16 ·51			+0 ·023	
	E	λ Ursæ Minoris	3	20. 15. 39 ·31	− 0 ·08	−0 ·12	+0 ·032	+0 ·052
		ν Aquarii.....	7	21. 1. 5 ·32				
		β Aquarii.....	5	21. 23. 20 ·24			+0 ·082	
Sep. 2		70 Ophiuchi.....	7	17. 57. 28 ·18			+0 ·056	+0 ·054
		δ Ursæ Minoris	6	18. 21. 27 ·81			+0 ·036	
		6 Aquilæ	5	18. 38. 48 ·41				
		9 Aquilæ	7	18. 48. 37 ·28				

TRANSITS OBSERVED AT VALENTIA.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f″	*f″*	*f″*	s	s	s		s	h m	s
		−5·33	44·22	49·34	+ 5·12	G	0·00		
	−5·49		24·18	31·64	+ 7·46				
x+0·00	−5·49		54·11	59·25	+ 5·14				
			36·18	41·75	+ 5·57				
			48·70	54·38	+ 5·68				
	−5·42		8·45	14·07	+ 5·62				
			13·92	19·26	+ 5·34				
			22·51	28·02	+ 5·51				
			19·06	22·30	+ 3·24				
x−0·06	−5·42		8·60	22·30	+13·70				
			4·28	9·81	+ 5·53				
	−5·35		0·02	5·64	+ 5·62				
x−0·03	−5·35		13·68	19·25	+ 5·57			21. 47	+ 5·66
x+0·03	−5·26	−5·28	37·58	44·74	+ 7·16				
	−5·26		24·29	31·30	+ 7·01				
			43·89	51·54	+ 7·65				
x−0·13	−5·52	−5·43	47·02	54·37	+ 7·35				
x−0·17		−5·47	11·03	21·60	+10·57				
x−0·03	−5·52	−5·33	9·86	21·60	+11·74			20. 19	+ 7·48
x−0·03			58·14	5·62	+ 7·48				
x−0·03	−5·26	−5·34	24·30	30·95	+ 6·65			14. 57	+ 8·83
			26·92	36·01	+ 9·09				
	−5·26		51·66	59·60	+ 7·94				
x−0·05			32·54	41·72	+ 9·18				
			25·12	34·20	+ 9·08				
			24·38	33·42	+ 9·04				
			45·33	54·36	+ 9·03				
	−5·46	−5·57	33·49	42·83	+ 9·34				
x−0·27	−5·46		7·68	20·91	+13·23				
x+0·03		−5·27	12·82	20·91	+ 8·09				
			0·40	9·81	+ 9·41				
			15·65	24·90	+ 9·25				
x+0·03			24·11	37·68	+13·57				
	−5·23		17·10	30·22	+13·12				
			43·90	57·61	+13·71				
			32·70	46·34	+13·64				

TRANSITS OBSERVED AT VALENTIA.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Middle Wire	Error of Collimation Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	f″	f″	f″	f″
Sep. 2	E	Piazzi VI. 292 S.P..	5	18. 58. 14·94		−0·12	+0·048	+0·054
		δ Aquilæ.....	5	19. 17. 31·89				
		36 Aquilæ	7	19. 22. 24·69				
		μ Aquilæ	5	19. 26. 21·82				
		α Aquilæ	6	19. 43. 3·97				
		β Aquilæ	6	19. 47. 32·96				
		θ Aquilæ	7	20. 3. 9·53			+0·098	
	W	λ Ursæ Minoris	2	20. 15. 11·11	−0·02	+0·10	+0·104	+0·132
		θ Capricorni.....	7	20. 57. 6·05				
		ν Aquarii	5	21. 1. 0·94				
		α Equulei.....	7	21. 7. 55·49				
		Piazzi IX. 37 S.P..	3	21. 14. 34·56			+0·139	
Sep. 3		Aquilæ 207 (Bode)	7	19. 53. 17·71			−0·092	−0·096
		θ Aquilæ.....	7	20. 3. 7·75			−0·098	
		α^2 Capricorni.....	7	20. 9. 17·08				
		β Capricorni.....	7	20. 12. 8·07			−0·068	
		λ Ursæ Minoris	3	20. 15. 13·52				
		Groomb. 3268.....	3	20. 35. 56·25			−0·141	
		75 Draconis.....	2	20. 37. 16·12				
	E	ν Aquarii.....	6	21. 0. 58·96	−0·02	−0·12	−0·019	−0·086
		α Equulei.....	6	21. 7. 53·65			−0·075	
		Piazzi IX. 37 S.P..	5	21. 14. 29·42			−0·134	
Sep. 4								
Sep. 7								
Sep. 8		Polaris S.P.....	1	13. 7. 59·08	−0·08		+0·008	+0·014
		α Ophiuchi.....	7	17. 28. 55·17			−0·012	
		β Ophiuchi.....	6	17. 37. 0·18				
		γ Ophiuchi.....	7	17. 41. 18·52				
		ν Ophiuchi	7	17. 51. 41·72			0·000	
		70 Ophiuchi.....	7	17. 58. 48·71				
		72 Ophiuchi.....	4	18. 1. 10·81				
		δ Ursæ Minoris	7	18. 22. 45·17			+0·058	
		Piazzi VI. 292 S.P.	3	18. 59. 36·98			−0·009	
		μ Aquilæ	5	19. 27. 42·48				
		σ Aquilæ	6	19. 32. 44·19				
		γ Aquilæ	7	19. 40. 4·64			+0·078	
	W	θ Aquilæ.....	5	20. 4. 30·15	−0·02	+0·10	+0·015	+0·030
		α^2 Capricorni.....	2	20. 10. 39·68				
		θ Capricorni.....	4	20. 58. 26·69			+0·029	

TRANSITS OBSERVED AT VALENTIA.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f″	*f″*	*f″*	s	s	s		s	h m	s
	−5·23	−5·27	46·12	59·94	+13·82	G	0·00		
			27·82	41·70	+13·88				
			20·28	34·17	+13·89				
			17·99	31·82	+13·83				
			0·23	14·03	+13·80				
			29·07	42·81	+13·74				
			5·22	19·23	+14·01				
x−0·11	−5·47	−5·41	2·92	19·50	+16·58				
			0·88	14·76	+13·88				
			56·14	9·80	+13·66				
			51·69	5·62	+13·93			21. 32	+13·94
	−5·47		5·16	19·56	+14·40				
x−0·03		−5·34	14·01	29·86	+15·85				
			3·51	19·22	+15·71				
			12·14	27·99	+15·85				
	−5·63		3·02	18·76	+15·74				
	−5·63		54·18	18·75	+24·57				
x−0·05	−5·39		32·57	49·59	+17·02				
x+0·03		−5·27	53·97	9·80	+15·83				
			49·59	5·62	+16·03				
	−5·39		3·05	19·65	+16·60			23. 43	+16·10
								15. 6	+17·31*
								19. 56	−96·68
x+0·03	−5·23	−5·28	56·50	22·24	−94·26†			13. 59	−95·25
	−5·23		51·65	44·58	−67·07			14. 12	−67·25
			56·19	49·17	−67·02				
			14·41	7·48	−66·93				
			36·90	29·85	−67·05				
			44·60	37·59	−67·01				
			7·10	0·53	−66·57				
	−5·35		34·00	27·70	−66·30				
	−5·35		8·32	1·04	−67·28				
			38·61	31·75	−66·86				
			40·20	33·33	−66·87				
x+0·01			0·95	54·28	−66·67				
x−0·03		−5·35	25·98	19·18	−66·80				
			34·79	27·94	−66·85				
x−0·07			21·54	14·72	−66·82				

* After this comparison, the clock was put forward 2m.
† After this transit, the clock lost 28s while being wound up.

TRANSITS OBSERVED AT VALENTIA.

Month and Day, 1844.	Position of Illuminated End.	Star's Name.	Number of Wires observed.	Clock Time of Transit over Middle Wire.	Error of Collimation Found from Observation of Meridian Mark. (Ill. End East.)	Error of Collimation Used.	Error of Level Found.	Error of Level Used.
				h m s	*f″*	*f″*	*f″*	*f″*
Sep. 10	W	Polaris S.P.	2	13. 7.42·95	−0·08	+0·10	+0·060	+0·091
		Arcturus	6	14. 9.40·88			+0·105	
					0·00			
Sep. 11	E	Polaris S.P.....	4	13. 7.39·04	−0·02	−0·12	+0·118	+0·163
					0·00			
		Arcturus.....	7	14. 9.39·11			+0·181	
							+0·190	
							+0·172	
Sep. 12	W	Piazzi VI. 292 S.P.	6	18.59.31·23	+0·01	+0·10	+0·027	+0·069
		26 Aquilæ	7	19.13.20·53			+0·093	
		∂ Aquilæ	4	19.18.44·66				

The Stationary Chronometers used at Valentia were the following:—

Solar Clock.—The same clock which was used at Kingstown under the name of "House Clock" (the property of Mr. Sheepshanks).

Chronometer 2306.—A chronometer going sidereal time nearly (the property of the Ordnance Department).

Two or three comparisons of these were usually made about the same time; but, for the reasons before mentioned, it has been thought sufficient usually to give here a single comparison.

TRANSITS OBSERVED AT VALENTIA.

Error of Azimuth Found from Observation of Meridian Mark.	Error of Azimuth Found from Stars.	Error of Azimuth Used.	Seconds of Transit Corrected.	Seconds of Apparent R.A.	Clock Slow.	Observer.	Correction for Personal Equation.	Clock Time of Comparison with Chronometers.	Clock Slow used for Comparison with Chronometers.
f''	f''	f''	s	s	s		s	h m	s
$x-0\cdot03$	$-5\cdot42$	$-5\cdot35$	28·17	22·92	$-65\cdot25$	G	0·00	13. 55	$-63\cdot48$
$x-0\cdot07$	$-5\cdot42$		38·08	34·62	$-63\cdot46$				
	$-5\cdot59$	$-5\cdot43$	28·52	23·23	$-65\cdot29$			12. 47	$-61\cdot59$
$x-0\cdot13$	$-5\cdot59$		36·09	34·61	$-61\cdot48$				
$x-0\cdot03$	$-5\cdot17$	$-5\cdot33$	0·26	1·79	$-58\cdot47$			17. 5	$-59\cdot39$
			16·15	16·92	$-59\cdot23$				
	$-5\cdot17$		40·77	41·56	$-59\cdot21$				

COMPARISONS OF STATIONARY CHRONOMETERS AT VALENTIA.

Approximate Solar Time, 1844.	Time of Transit Clock at Comparison.	Corresponding Time of Solar Clock.	Solar Clock Slow.	Time of Solar Clock at Comparison.	Corresponding Time of 2306.	2306 Slow.
d h	h m s	h m s	m s	h m s	h m s	m s
Aug. 7. 8	17.16.32	8.15.15	− 4.11·09	....	....	....
8. 2	11. 6.49	2. 2.45	− 4.17·60	2. 8.50	11.12.55·0	+0.19·71
10. 9	18.49. 3	9.36.15	− 4.35·34	9.40.22	18.53.11·5	+0.24·72
11. 5	14.26.60	5.11. 8	− 4.42·57	5.13.33	14.29.26·0	+0.26·69
15. 2	12.24.12	2.53.40	− 5.17·71	2.51.48	12.22.20·5	+0.34·91
17. 9	18.40.49	9. 1.50	− 5.39·69	9. 5.15	18.44.15·5	+0.39·30
18.11	21.33.35	11.50.25	− 5.50·43	12. 2.22	21.45.35·0	+0.41·62
19. 4	14.22.42	4.36.55	− 5.57·29	4.38.42	14.24.30·5	+0.42·99
22. 8	18.29.46	8.32.10	− 6.29·89	8.43.22	18.41. 2·0	+0.48·58
23. 3	13.11.50	3.11.20	− 6.37·92	3. 8.30	13. 9. 1·5	+0.50·67
24.10	20.42.43	10.36.20	− 6.51·66	10.29.36	20.35. 0·0	+0.53·44
26.16	2.14.30	15.59.49	− 7.15·30	15.57.18	2.11. 0·5	+0.58·15
27. 4	14.50.50	4.34.12	− 7.21·15	4.30.45	14.46.24·5	+0.59·07
29.11	21.46.58	11.21.50	− 7.46·59	11.26.24	21.50.35·5	+1. 2·87
30. 9	20.18.57	9.50.20	− 7.57·25	10.30.44	20.58.30·5	+1. 4·30
31. 4	14.57.20	4.25.50	− 8. 6·13	4.15.28	14.46. 0·0	+1. 5·21
Sep. 2.10	21.32.30	10.52.35	− 8.32·59	10.55.20	21.34.20·0	+1. 9·36
3.12	23.43.42	12.59.45	− 8.45·83	13. 5.27	23.48.30·0	+1.10·99
4. 4	15. 5.44	4.19.25	− 8.53·67	4.20.35	15. 5.59·5	+1.12·01
7. 8	19.56. 0	8.55.52	− 9.33·63	9. 0.16	19.57.30·5	+1.17·49
8. 2	13.59.55	2.57. 0	− 9.42·78	2.49.20	13.49.19·5	+1.19·04
8. 3	14.12.29	3.10. 0	− 9.42·91	....	....	....
10. 2	13.55. 0	2.45.11	−10. 8·10	2.48.28	13.55.50·5	+1.23·52
11. 1	12.47.50	1.34.30	−10.20·12	1.30.30	12.41.22·0	+1.25·80
12. 5	17. 5.41	5.48. 0	−10.35·08	5.45.32	17. 0.45·0	+1.28·23

The "chronometer slow" for the times of comparison with travelling chronometers has been interpolated by simple proportion of times between the "chronometer slow" for the times of groups of transits, and then the following corrections have been applied for change of chronometer rates:—

		d	h		s
Solar Clock	August...	11.	3	.....	+ 0·29
		19.	3	.....	+ 0·17
		23.	2	.....	+ 0·01
		26.	15	.....	+ 0·52
		27.	3	.....	+ 0·52
		31.	5	.....	+ 0·01
	September	3.	14	.....	+ 0·03
		4.	3	.....	+ 0·16
		8.	3	.....	+ 0·03
		12.	4	.....	+ 0·01
Chronometer 2306..	August	26.	15	.....	+ 0·18
		27.	3	.....	+ 0·19
	September	4.	3	.....	− 0·09

By means of these corrected interpolations, as at Kingstown, the following table of corrections to the Transit Clock Errors is formed; applying to all the times of comparison of travelling chronometers except two (August 7, 4^h and August 15, 2^h), which were sufficiently near to groups of transits:—

CORRECTIONS TO THE ERROR OF TRANSIT CLOCK AT VALENTIA, AS SHEWN BY THE DIFFERENT STATIONARY CHRONOMETERS.

	August $11^d.\ 3^h$	August $19^d.\ 3^h$	August $23^d.\ 2^h$	August $26^d.\ 15^h$	August $27^d.\ 3^h$	August $31^d.\ 3^h$	Sep. $3^d.\ 14^h$	Sep. $4^d.\ 3^h$	Sep. $8^d.\ 3^h$	Sep. $12^d.\ 4^h$
	s	s	s	s	s	s	s	s	s	s
Transit Clock...	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00	0·00
Solar Clock....	+0·20	−0·17	+0·03	−0·18	−0·08	−0·08	+0·04	+0·06	−0·07	0·00
Sidereal Chronometer 2306	−0·21	−0·09	−0·07	−0·34	−0·27	0·00	+0·06	+0·05	0·00	−0·02
Mean.....	0·00	−0·09	−0·01	−0·17	−0·12	−0·03	+0·03	+0·04	−0·02	−0·01

VIII.—*List of Travelling Chronometers; Method of using Travelling Chronometers, of combining Results, and of deducing probable Errors.*

The stock of pocket-chronometers belonging to the Government, and in my charge at the Royal Observatory, being insufficient for the determination of longitude with the accuracy which I desired, I had recourse to the kindness of Mr. Sheepshanks, and of several eminent chronometer-makers, for the loan of a sufficient number to make up my full complement of thirty. In every instance most obliging attention was given to my request; and I think it my duty publicly to acknowledge my obligations to these gentlemen for the prompt supply and gratuitous loan of these valuable instruments. To Mr. Sheepshanks in particular I am indebted for the use of ten chronometers of somewhat larger size than the rest, and of generally superior construction. A list will be subjoined, after a few remarks explanatory of the reasons for separating them into classes.

In the greater part of the chronometers, 150 beats were made in one minute; or the seconds' hand advanced at each beat four-tenths of a second, or in five beats advanced two seconds. Therefore, if the circle were properly divided, and if we found one second to which the hand pointed exactly at any beat, it would point exactly to every alternate second, counted from that first second. It was soon seen, however, that the circles were very inaccurately divided; and it became necessary, therefore, to make conspicuous marks on the circles (by small lines in Indian ink) at every alternate second, so as in some parts to correct the divisions of the circle, and in all to indicate the seconds at which the coincidence of the hand with the second was assumed to take place. In some of these chronometers the coincidence took place at every even second, and in others at every odd second.

A few of the chronometers made 160 beats in a minute; they, therefore, made eight beats in three seconds, or four beats in one and a half second. The places of the coincidences of the hand with the division were marked on these for every one and a half second, assuming always that the coincidence took place at 0^s upon the divided circle.

The chronometers were all adjusted to go to mean solar time very nearly. The transit clocks (or, in some instances, the half-second chronometers) with

which they were to be compared, went to sidereal time very nearly. Thus the comparison of the two was made with very great accuracy by coincidence of beats. In listening for a short time to the mingled beats of the solar and sidereal timekeepers, it is easy to fix upon one recurring series of beats following a certain order, in which series there are two beats (one of the solar and one of the sidereal time-keeper) which approach more and more nearly to coincidence, advancing towards it by, perhaps, $\frac{1}{200}$ of a second at each recurrence, by reason of the gain of the sidereal upon the solar time-keeper. The exact time of coincidence can be seized by a practised ear with great accuracy. This time being fixed on, the readings of the two time-keepers at the coincidence are to be entered in the memorandum-book. Some observers will, perhaps, take both readings at once; others will prefer to enter in the book the reading of the quicker-beating chronometer, and to count mentally the beats of the other till an opportunity presents itself of reading its face at leisure. Then the observer is free, either roughly to make another comparison as a check on the whole number of seconds, minutes, and hours, or to prepare himself for the next coincidence of beats.

In any case, to avoid the confusion into which an observer, fatigued with the comparison of so many chronometers, might easily fall, it was desirable that he should be prepared to decide without much thought upon the nature of the reading at which a coincidence was next to be expected. For this purpose (at Mr. Sheepshanks' suggestion) the chronometers were arranged in their cases in the following order. First, the 150-beat chronometers which indicated whole seconds at every even second (these extend from *A* to *U* in the following list). Secondly, the 150-beat chronometers which indicated whole seconds at every odd second (these extend from *W* to *b*). Thirdly, the 160-beat chronometers. The letters *V* and *c* were passed over, in order to call the observer's attention to this separation of classes.

The chronometer *L* failed after several journeys, and *K** was substituted for it.

LIST OF TRAVELLING CHRONOMETERS.

No. of Travelling Case.	Letter of Reference to Chronometer.	Maker's Name and Maker's Number or Letter.	How obtained.
I.	*A*	R. Molyneux..... *A*	Lent by Mr. Sheepshanks.
	B	Do. ..... *B*	Do.
	C	Do. ..... *C*	Do.
	D	Do. ..... *D*	Do.
	E	Do. ..... *E*	Do.
	F	Do. ..... *F*	Do.
	G	Do. ..... *H*	Do.
	H	Do. ..... *K*	Do.
	I	Do. 1	Lent by Mr. R. Molyneux.
	J	Do. 3	Do.
	K	Do. 4	Do.
	*K**	Dent.....6513	Lent by Mr. Dent.
	L	Parkinson and Frodsham, 251	Lent by Messrs. Parkinson and Frodsham.
	M	Do. 699	The property of the Government.
	N	Do. 750	Do.
	O	Do. 2312	Lent by Messrs. Parkinson and Frodsham.
II.	*P*	Do. 2709	The property of the Government.
	Q	Arnold.....2131	Lent by Mr. Dent.
	R	Do.....6063	Lent by Mr. C. Frodsham.
	S	Dent.....5876	Lent by Mr. Dent.
	T	Do.....6514	Do.
	U	R. Molyneux..... *G*	Lent by Mr. Sheepshanks.
	W	Do. ..... *I*	Do.
	X	Do. 5	Lent by Mr. R. Molyneux.
	Y	Parkinson and Frodsham, 1230	The property of the Government.
	Z	Do. 2310	Do.
	a	Arnold.....5416	Lent by Mr. C. Frodsham.
	b	M'Cabe..... 194	The property of the Government.
	d	Arnold..... 2139	Lent by Mr. Dent.
	e	Do. 2164	The property of the Government.
	f	Do. 2181	Lent by Mr. Dent.

The chronometers when travelling backwards and forwards between two stations were compared sometimes once (nearly at the middle of the time of stopping at the station), sometimes twice (immediately after arrival, and immediately before departure). At these comparisons, sometimes entire reliance was placed on a single coincidence of beats accurately observed, with a rough observation for check; sometimes several coincidences were accurately observed. The selections among these different arrangements will be described in the account of the observations for each separate arc.

In describing the method of calculating these observations, I must remark that a change of system was made in the course of the calculations. The first system is that which has usually been adopted; the second is that which, upon mature consideration, I have satisfied myself ought to be adopted in every case. The whole had been computed on the first system before the propriety of the second occurred to me. Advantage was then taken of the calculated results of the first system; and thus, although a form was adopted differing from that which I should have used if the second system had presented itself to me at an earlier stage, very little labour was lost.

In the first system, the times of the transit-clock or stationary chronometer at comparison were corrected so as to exhibit the true sidereal time at every comparison at each station. Then, adopting one extremity of each arc of longitude as the fundamental point, and considering the other extremity as the derived point; the sidereal time at the comparison at the fundamental point was converted into mean solar time by exactly the same process as if that fundamental point were Greenwich. In all cases, therefore, where the fundamental point was not Greenwich, there was a constant error in the resulting mean solar time; but this error disappeared when the reverse process of converting mean solar time into sidereal time was conducted in the same manner as if the place were Greenwich. The mean solar time being thus found at comparison with the solar chronometer, the "chronometer slow" for the solar chronometer was obtained, subject, however, to a constant error. By comparing successive "chronometer slow" at the fundamental point, the chronometer's rate was found; and by applying a proportional part of this, the "chronometer slow" at the time of comparison at the derived point was found, subject to the same error as before. Applying this "chronometer slow" to the chronometer time at comparison, the mean solar time was found, subject to the same error (in regard to time at the fundamental point) as

before; and then converting this into sidereal time as for Greenwich, the sidereal time related to the fundamental point was found for the time of comparison at the derived point, free from error. Comparing this with the sidereal time related to the derived point, the difference of longitude was found.

In the instances where the first comparison at the derived station preceded all the comparisons at the fundamental station, the first chronometer rate at the fundamental station was carried backwards. And when the last comparison at the derived station followed all at the fundamental station, the last chronometer rate at the fundamental station was carried forwards.

These computations constituted the first system.

Now it is evident here that the chronometer rates thus carried forwards or backwards were adopted without sufficient authority. It is evident also that no use is made of the comparisons at the derived station for giving the chronometer rates; although these comparisons are in all respects as available for this purpose as the comparisons at the fundamental station.

The proper method of using the comparisons at the derived station would have been to convert all the sidereal times referred to the derived station into mean solar times (subject to a constant error, differing from that previously mentioned), and to compare the chronometer times with these; the rates deduced from these comparisons would have been free from error.

But, the calculations on the first system having been finished, the following was a much easier method of deducing the rates from the comparisons at the derived station. Let L be the true longitude of the derived station, considered positive when it is west of the fundamental point; l the longitude resulting from any one comparison; *c.s.* the adopted "chronometer slow," by the use of which the longitude l was found; *C. S.* the true "chronometer slow," by the use of which the true longitude, L, would have been found. Then, as increase of the "chronometer slow," which is applied to a given chronometer time, does increase the nominal time referred to the fundamental point, and thus does increase the apparent difference of longitude, we shall have,

$$C.S. - c.s. = L - l,$$

which is subject to no other error than this, that one side is in solar time, and the other in sidereal time, whose difference (when the whole quantity does not exceed one or two seconds) is insensible. From this we find,

$$C.S. = c.s. - l + L;$$

and as, for the purpose of finding rates, the omission of a constant is unimportant, we may use,

$$C.S. = c.s. - \text{seconds of } l.$$

By means of the "chronometer slow" determined by this rule for each of the comparisons at the derived station, the rates from the comparisons at the derived station were obtained with accuracy.

Suppose now, to fix our ideas, that only one comparison was made at each station between the arrival and the departure of the chronometers; and suppose the intervals of time from one comparison to another were equal throughout. And let the rates, determined from the successive comparisons at that station (it matters not whether the fundamental or the derived), where the first comparison was made, be called a_1, a_3, a_5, &c., and let the rates, determined from the successive comparisons at the other station be called b_2, b_4, b_6, &c. Then it is evident that the rate b_2 appears to extend over a time which is partly subject to the rate a_1, and partly to the rate a_3; and so for every other rate. We have no reason, therefore, to fix upon either a_1 or b_2 or a_3, as applying either to the whole or to a portion of this time. And the only supposition, which we can with propriety make, is, that the rates may be different in every successive portion of time included between two proximate comparisons. Calling these x_1, x_2, x_3, &c., the relation in succession of the periods to which all the rates apply may be represented by the following scheme:—

Apparent Rates from Comparisons at First Station.	Apparent Rates from Comparisons at Second Station.	True Rates.
a_1		x_1
	b_2	x_2
a_3		x_3
	b_4	x_4
a_5		x_5
	b_6	x
a_7		x_7
	b_8	x_8
a_9		x_9
	b_{10}	x_{10}
a_{11}		x_{11}
	&c.	x_{12}
&c.		&c.

And the question now is, what principle shall be adopted for the determination of x_1, x_2, &c.?

First, supposing the intervals of comparison equal, we have these necessary equations:—

$$x_1 + x_2 = 2a_1;\ x_2 + x_3 = 2b_2;\ x_3 + x_4 = 2a_3,\ \&c.;$$

so that, having adopted any one rate, the other rates will be immediately deduced from it.

Secondly, the condition which I have adopted is this: that the quantity which is analogous to the error of observation in ordinary applications of the theory of probabilities, is, in this case, the change of chronometer's rate between one interval and the next; and, therefore, that the sum of the squares of these changes ought to be made minimum. Or, in other words, that

$$(x_1 - x_2)^2 + (x_2 - x_3)^2 + (x_3 - x_4)^2 + \&c.$$

ought to be made minimum. It will be more convenient to express it thus:—that

$$(x_2 - x_1)^2 + (x_2 - x_3)^2 + (x_4 - x_3)^2 + (x_4 - x_5)^2 + \&c.$$

shall be minimum.

Now, under the assumed equality of intervals,

$$\begin{aligned}
x_2 &= 2a_1 - x_1 \\
x_3 &= 2b_2 - x_2 = 2b_2 - 2a_1 + x_1 \\
x_4 &= 2a_3 - x_3 = 2a_3 - 2b_2 + 2a_1 - x_1 \\
x_5 &= 2b_4 - x_4 = 2b_4 - 2a_3 + 2b_2 - 2a_1 + x_1, \\
&\&c. = \&c. \\
x_2 - x_1 &= -2x_1 + 2a_1 \\
x_2 - x_3 &= -2x_1 + 4a_1 - 2b_2 \\
x_4 - x_3 &= -2x_1 + 4a_1 - 4b_2 + 2a_3 \\
x_4 - x_5 &= -2x_1 + 4a_1 - 4b_2 + 4a_3 - 2b_4, \\
&\&c. = \&c.
\end{aligned}$$

and making the sum of squares a minimum, and supposing that there are n rates, or $\overline{n-1}$ changes of rate,

$$0 = -(n-1)\,x_1 + (2n-3)\,a_1 - (2n-5)\,b_2 + (2n-7)\,a_3 - \&c.,$$

from which x_1 is determined. Then from the equations above, x_2, x_3, &c., are found.

Theoretically there is no necessity for finding the rates x_2, x_3, &c., inasmuch as, from the nature of the process for determining the rates by comparisons at the derived station, the use of any of these rates will give the same longitude for

the derived station. But it is prudent to find and apply some of these rates (in these computations I have used all) in order to have the power of taking the mean of several results, each of which is affected with the accumulation of small errors. And it is necessary to find the rates, for the estimation of the probable error of the result, in the following method.

The change of rate between one interval and the next being considered as analagous to an error of observation, and the sum of squares of these errors being made minimum, the probable change of rate will be found by the same rule as that given by the theory of probabilities for the probable error of an observation; and it will, therefore, be

$$\pm 0{\cdot}6745 \times \sqrt{\frac{\text{minimum sum of squares of differences of rate}}{n-1}}.$$

Now the analogy between the change of rate and the error of an observation is rigorously close to this point, that a change in the value of the element to be determined (which in one case is the first rate x_1, and in the other case is the result of the observations,) affects in one case all the residual changes of rate by the same $\pm$ quantity, and in the other case all the residual errors of observation by the same $\pm$ quantity. But there is this difference, that in one case an alteration, z, in the rate x_1, affects every residual change of rate by $\pm 2z$, whereas an alteration, z, in the presumed result of observations, affects every residual error of observation by $\pm z$. Hence, applying the same rule to the probable error of x_1 as to the probable error of a result of $n-1$ observations, we must take only half the quantity so computed. Thus we get for the probable errror of x_1

$$\frac{\pm 0{\cdot}3372}{n-1} \times \sqrt{\text{minimum sum of squares of differences of rate,}}$$

and the probable error of the determined longitude will be

$$\frac{\pm 0{\cdot}3372}{n-1} \times \sqrt{\text{minimum sum of squares of diff. of rate}} \times \frac{\text{time through which one rate is used}}{24^h}.$$

The number which was used for the weight of the result derived from each chronometer was

$$\frac{1000}{\text{minimum sum of squares of differences of rates,}}$$

in which expression the numerator is arbitrary; but the denominator is that indicated by the theory of probabilities, as proper to be used in the combination of the results of different chronometers, on the assumptions mentioned

above. Therefore, using the letter W for this quantity, the probable error of the determined longitude will be,

$$\frac{\pm 0{\cdot}3372}{n-1} \times \sqrt{\frac{1000}{W}} \times \frac{\text{time through which one rate is used}}{24^h},$$

which, for a moment, we will call $\frac{E}{\sqrt{W}}$. All this applies to the probable error of longitude as determined by only one chronometer.

Suppose now that we combine the results L_A, L_B, L_C, &c., for the longitude given by the different chronometers A, B, C, &c.; and suppose that we give to the respective chronometers the weights W_A, W_B, W_C, &c., as found by the formula above. This means that we take for our final longitude,

$$L = \frac{W_A \cdot L_A + W_B \cdot L_B + W_C \cdot L_C + \&c.}{W_A + W_B + W_C + \&c.}$$

$$\text{Or, } L = \frac{W_A}{W_A + W_B + W_C + \&c.} L_A + \frac{W_B}{W_A + W_B + W_C + \&c.} L_B + \frac{W_C}{W_A + W_B + W_C + \&c.} L_C + \&c.$$

Remarking that this expression consists of the sum of a number of terms, each of which is subject to an error, whose probable amount is defined above, and therefore that, by the theory of probabilities, the probable error of the sum is the square root of the sum of the squares of the probable errors of the different terms: and, remarking that the probable error of L_A, from the formula above, is $\frac{E}{\sqrt{W_A}}$, and, therefore, that the probable error of

$$\frac{W_A}{W_A + W_B + W_C + \&c.} L_A \text{ is } \frac{E}{W_A + W_B + W_C + \&c.} \sqrt{W_A},$$

we find for the probable error of L,

$$\frac{E}{W_A + W_B + W_C + \&c.} \sqrt{(W_A + W_B + W_C + \&c.)};$$

$$\text{or, } \frac{E}{\sqrt{(W_A + W_B + W_C + \&c.)}};$$

or, restoring the value of E,

$$\frac{\pm 0{\cdot}3372}{n-1} \times \sqrt{\frac{1000}{\text{Sum of weights}}} \times \frac{\text{time through which one rate is used}}{24^h}.$$

Some modifications in this method are necessary when the intervals between the comparisons are not equal; and attention is sometimes necessary to this consideration, that there is strong reason for believing that the chronometer's rate is not the same when it is journeying as when it is at rest. These matters, however, will be noticed in the accounts of the determinations for the special arcs to which they apply.

IX.—*Comparisons and Calculations for the Longitude of Liverpool, as determined with reference to Greenwich.*

THE comparisons at Greenwich and at Liverpool were made as immediately as possible after arrival and before departure of the chronometers. Thus between one comparison at Greenwich before departure of the chronometers, and the next comparison after their return, there were three different periods of time to be considered, namely, the time occupied by the journey to Liverpool, the time of the chronometer's rest at Liverpool between the two comparisons there, and the time occupied by the journey back to Greenwich. As the two comparisons at Greenwich give the whole time and whole chronometer-loss during the three periods, and as the two intervening comparisons at Liverpool give the time and chronometer-loss during the stationary period, on subtracting the latter from the former we obtain the whole time and chronometer-loss, and consequently the apparent rate, during the two travelling periods. A process exactly similar applies with regard to the three periods intervening between the time of the chronometers' departure from Liverpool and that of their return to Liverpool. The apparent travelling rates, a_1, b_2, &c., are thus obtained, and the intervals through which they apply, being nearly equal, are supposed to be exactly equal; and the rates x_1, x_2, &c., are determined by the process of Section VIII. Then each of the odd rates, x_1, x_3, &c., is used to determine the longitude; and, as there are trifling discordances in the results, arising from the combination of the two circumstances that the travelling intervals are not precisely equal, and that the rates undergo a small change, the mean of the results is adopted. This is the process used with each separate chronometer.

For the combination of all the chronometers, the sum of the squares of the differences of successive rates, x_1, x_2, &c., was taken for each chronometer; but this was not used solely to determine the weights. I thought it best to take into account the stationary rates also of the chronometers, determined from the two comparisons at each place made between the arrival and the departure of the chronometers. The differences of these stationary rates being taken, and the sum of the squares of the differences being formed, this sum was added to $\frac{1}{3}$ of the sum of the squares of the differences of the travelling rates:

and the quotient of 1000 by the compound sum was used for the weight or W.

As this process implied that the importance attached to a square of difference of a stationary rate was only $\frac{3}{4}$ of that attached to a square of difference of a travelling rate, and as there were 6 differences of travelling rates and 5 differences of stationary rates, they were treated thus.

The number of differences of travelling rates is $6+\frac{3}{4}\times 5=\frac{39}{4}$. The quantity used for $\frac{1000}{W}$ is $\frac{4}{3}\times(6+\frac{3}{4}\times 5)$ squares of differences $=\frac{4}{3}\cdot\frac{39}{4}$ squares of differences. Therefore, the quantity which ought to have been used for the sum of squares of differences is $\frac{3}{4}\cdot\frac{1000}{W}$. As this corresponds to $\frac{39}{4}$ differences, and as we want the quantity corresponding to six differences, we must take $\frac{24}{39}\cdot\frac{3}{4}\cdot\frac{1000}{W}$, or $\frac{6000}{13}\cdot\frac{1}{W}$. After this, the formula of Section VIII. applies, with no other alteration than substituting $\frac{6000}{13}$ for 1000. As the time of a journey, or rather the interval of comparisons, was nearly 13^h, the last fraction of the formula becomes $\frac{13}{24}$. Thus we have for the probable error of longitude,

$$\frac{0\cdot 3372}{6}\times\sqrt{\frac{6000}{13\times\text{sum of weights}}}\times\frac{13}{24}.$$

This will be expressed in seconds of time, because the differences of rate from which the weights are found are so expressed.

The following tables contain every essential part of the process.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

Chronometer A.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					18. 6. 4·4	+ 1.27·83	5.55.25	11.60·17		
									+0·49	+0·38
21. 7	20. 8.15	8. 4.30·4	+ 1.27·76							
				−0·12						
22.19	7.30.59	19.21.28·8	+ 1.27·59							
				+0·59					+0·49	+0·60
23. 7					6.59.16·0	+ 1.27·89	18.58.37	11.59·88		
									+0·63	
23.18					18. 8.22·8	+ 1.28·17	6. 9.34	11.59·87		
				+0·59					+0·64	+0·58
24. 8	19.57.12	7.41.44·8	+ 1.28·50							
				+1·10						
24.19	7.45.57	19.28.34·0	+ 1.29·06							
				+0·68					+0·64	+0·70
25. 8					8.11.47·6	+ 1.29·49	20.19.15	11.59·94		
									+1·17	
25.18					18.19. 4·4	+ 1.29·85	6.28.12	11.59·81		
				+0·68					+0·59	+0·66
26. 8	20.25.31	8. 2. 8·4	+ 1.30·30							
				+1·11						
26.19	7.16.36	18.51.26·8	+ 1.30·80							
				+0·66					+0·59	+0·52
27. 9					8.55.30·8	+ 1.31·35	21.11. 0	11.60·12		
									+1·71	
27.18					18.13.15·6	+ 1.31·70	6.30.17	11.59·81		
				+0·66						+0·80
28. 8	20.21.24	7.49.10·8	+ 1.32·22							

Concluded Longitude of Liverpool from Greenwich = 11m. 59s·87 West.

Chronometer B.

Sep.										
20.18					17.56.33·6	+13.22·71	5.57.49	11.60·64		
									+5·81	+5·62
21. 7	20. 9.52	7.54. 9·6	+13.25·30							
				+4·40						
22.19	7.32.19	19.10.44·4	+13.31·77							
				+5·82					+5·81	+6·00
23. 7					6.50. 2·8	+13.34·31	19. 1.31	11.59·57		
									+4·44	
23.18					17.59.20·8	+13.36·83	6.12.41	11.60·04		
				+5·82					+5·40	+5·64
24. 8	19.58.24	7.30.45·2	+13.39·90							
				+4·78						
24.19	7.47.10	19.17.33·6	+13.42·27							
				+5·52					+5·40	+5·16
25. 8					8. 1.20·8	+13.45·05	20.21. 4	11.59·99		
									+4·84	
25.18					18. 8.56·0	+13.47·27	6.30.21	11.60·18		
				+5·52					+5·97	+5·88
26. 8	20.26.20	7.50.37·2	+13.50·37							
				+4·07						
26.19	7.17.44	18.40.13·2	+13.52·21							
				+5·94					+5·97	+6·06
27. 9					8.45.24·8	+13.55·53	21.13.19	11.59·67		
									+5·15	
27.18					18. 4.42·0	+13.57·72	6.34.10	11.59·87		
				+5·94						+5·82
28. 8	20.22.29	7.37.46·8	+14. 1·04							

Concluded Longitude of Liverpool from Greenwich = 11m. 59s·87.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

CHRONOMETER C.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					18. 4. 30·0	+ 8. 5·45	6. 0. 30	11. 59·22		
									+2·58	+1·97
21. 7	20. 10. 48	8. 0. 23·2	+ 8. 7·55							
				+3·55						
22. 19	7. 33. 37	19. 17. 21·2	+ 8. 12·76						+2·58	+3·19
				+2·95						
23. 7					6. 58. 50·8	+ 8. 14·22	19. 4. 59	11. 60·05	+3·24	
23. 18					18. 6. 39·6	+ 8. 15·65	6. 14. 39	11. 59·98		
				+2·95					+2·49	+2·71
24. 8	19. 59. 26	7. 37. 9·6	+ 8. 17·34							
				+4·37						
24. 19	7. 49. 24	19. 25. 10·0	+ 8. 19·51						+2·49	+2·27
				+2·90						
25. 8					8. 8. 36·0	+ 8. 21·21	20. 22. 55	11. 60·66	+4·10	
25. 18					18. 16. 50·4	+ 8. 22·56	6. 32. 51	11. 60·29		
				+2·90					+3·18	+3·53
26. 8	20. 27. 15	7. 56. 58·0	+ 8. 24·42							
				+4·29						
26. 19	7. 19. 12	18. 47. 6·8	+ 8. 26·36						+3·18	+2·83
				+2·48						
27. 9					8. 53. 0·4	+ 8. 28·06	21. 15. 27	11. 60·16	+4·24	
27. 18					18. 15. 38·4	+ 8. 29·20	6. 39. 39	11. 59·64		
				+2·48						+2·13
28. 8	20. 23. 31	7. 44. 18·8	+ 8. 30·87							

Concluded Longitude of Liverpool from Greenwich = 12m. 0s·12.

CHRONOMETER D.

Sep.										
20. 18					18. 8. 57·2	+ 6. 30·76	6. 3. 21	11. 61·20		
									+6·10	+6·78
21. 7	20. 12. 0	8. 3. 9·6	+ 6. 32·94							
				+3·72						
22. 19	7. 34. 36	19. 19. 54·4	+ 6. 38·40						+6·10	+5·42
				+5·10						
23. 7					7. 1. 53·2	+ 6. 40·81	19. 6. 29	11. 59·28	+4·89	
23. 18					18. 11. 4·0	+ 6. 43·21	6. 17. 32	11. 59·41		
				+5·10					+5·13	+4·78
24. 8	20. 1. 15	7. 40. 29·6	+ 6. 46·03							
				+5·48						
24. 19	7. 50. 25	19. 27. 41·6	+ 6. 48·74						+5·13	+5·48
				+5·53						
25. 8					8. 13. 52·8	+ 6. 51·27	20. 26. 44	11. 59·14	+3·00	
25. 18					18. 26. 6·0	+ 6. 53·31	6. 40. 39	11. 59·91		
				+5·53					+5·56	+5·58
26. 8	20. 28. 18	7. 59. 29·2	+ 6. 56·05							
				+4·21						
26. 19	7. 20. 33	18. 49. 56·0	+ 6. 57·95						+5·56	+5·54
				+5·46						
27. 9					8. 56. 41·2	+ 7. 0·78	21. 17. 42	11. 59·05	+3·09	
27. 18					18. 19. 37·6	+ 7. 2·68	6. 42. 12	11. 59·74		
				+5·46						+5·38
28. 8	20. 24. 57	7. 47. 10·0	+ 7. 5·44							

Concluded Longitude of Liverpool from Greenwich = 11m. 59s·48.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

CHRONOMETER E.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					18. 20. 4·8	+ 0. 4·70	6. 8. 4	11. 60·52		
21. 7	20. 13. 18	8. 10. 55·6	+ 0. 4·74						+1·04	+1·26
22. 19	7. 35. 39	19. 27. 30·8	+ 0. 4·84	+0·07						
23. 7				+0·82	7. 10. 30·0	+ 0. 5·28	19. 8. 30	11. 59·89	+1·04	+0·82
23. 18					18. 19. 33·6	+ 0. 5·71	6. 19. 24	11. 59·82	+1·08	
24. 8	20. 2. 45	7. 48. 39·2	+ 0. 6·20	+0·82					+0·40	+0·82
24. 19	7. 51. 57	19. 35. 55·6	+ 0. 6·49	+0·55						
25. 8				+0·12	8. 22. 38·0	+ 0. 6·48	20. 28. 44	11. 59·87	+0·40	−0·02
25. 18					18. 35. 1·6	+ 0. 6·47	6. 42. 48	11. 60·02	−0·38	
26. 8	20. 29. 29	8. 7. 29·6	+ 0. 6·46	+0·12					+0·47	+0·26
26. 19	7. 21. 45	18. 57. 58·8	+ 0. 6·95	+1·08						
27. 9				+0·10	9. 6. 14·0	+ 0. 6·92	21. 20. 21	11. 59·43	+0·47	+0·68
27. 18					18. 30. 29·6	+ 0. 6·90	6. 46. 9	11. 59·61	−0·51	
28. 8	20. 25. 59	7. 55. 10·4	+ 0. 6·87	+0·10						−0·48

Concluded Longitude of Liverpool from Greenwich = 11ᵐ. 59ˢ·85.

CHRONOMETER F.

Sep.										
20. 18					18. 20. 16·0	+ 2. 46·06	6. 10. 56	11. 61·55		
21. 7	20. 14. 23	8. 9. 19·2	+ 2. 45·95						+2·82	+2·80
22. 19	7. 36. 46	19. 25. 56·8	+ 2. 45·66	−0·20						
23. 7				+2·24	7. 10. 0·8	+ 2. 46·49	19. 10. 43	11. 59·26	+2·82	+2·84
23. 18					18. 19. 29·6	+ 2. 47·30	6. 22. 2	11. 59·84	+0·50	
24. 8	20. 3. 40	7. 46. 52·0	+ 2. 48·24	+2·24					+1·49	+1·64
24. 19	7. 53. 13	19. 34. 29·2	+ 2. 48·68	+0·86						
25. 8				+1·39	8. 22. 45·6	+ 2. 49·09	20. 31. 35	11. 59·56	+1·49	+1·34
25. 18					8. 35. 12·4	+ 2. 49·42	6. 45. 42	11. 60·25	−0·85	
26. 8	20. 30. 51	8. 6. 8·0	+ 2. 49·84	+1·39					+1·17	+1·44
26. 19	7. 23. 8	18. 56. 38·0	+ 2. 50·52	+1·51						
27. 9				+1·07	9. 5. 18·0	+ 2. 50·89	21. 22. 9	11. 59·68	+1·17	+0·90
27. 18					18. 34. 40·8	+ 2. 51·14	6. 53. 5	11. 60·19	−0·66	
28. 8	20. 27. 7	7. 53. 33·6	+ 2. 51·49	+1·07						+1·24

Concluded Longitude of Liverpool from Greenwich = 11ᵐ. 59ˢ·85.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

Chronometer G.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					18. 20. 8·0	+ 5.14·24	6.13.18	11.60·11		
21. 7	20.15.49	8. 8.15·2	+ 5.15·73						+3·23	+2·60
22. 19	7.37.38	19.24.14·8	+ 5.19·51	+2·57						
23. 7				+3·28	7.10.19·2	+ 5.21·23	19.13.36	11.59·87	+3·23	+3·86
23. 18					18.19. 8·4	+ 5.22·91	6.24.17	11.59·61	+4·20	
24. 8	20. 4.34	7.45. 9·2	+ 5.24·89	+3·28					+2·70	+2·70
24. 19	7.54.13	19.32.51·2	+ 5.26·52	+3·28						
25. 8				+2·97	8.26.37·2	+ 5.28·11	20.38. 6	11.60·24	+2·70	+2·70
25. 18					18.33.41·2	+ 5.29·38	6.46.51	11.60·20	+3·12	
26. 8	20.31.46	8. 4.21·6	+ 5.31·09	+2·97					+2·90	+3·24
26. 19	7.24.24	18.55.11·6	+ 5.32·71	+3·58						
27. 9				+3·15	9. 5.15·6	+ 5.34·70	21.24.50	11.60·54	+2·90	+2·56
27. 18					18.34.13·6	+ 5.36·03	6.55.23	11.60·26	+4·08	
28. 8	20.28. 4	7.51.44·0	+ 5.37·93	+3·15						+3·74

Concluded Longitude of Liverpool from Greenwich = 12m. 0s·07.

Chronometer H.

Sep.										
20. 18					18. 12. 55·6	+18. 10·48	6. 19. 3	11.59·89		
21. 7	20.16.45	7.56.12·4	+18.14·38						+6·98	+6·97
22. 19	7.38.46	19.12.18·0	+18.24·13	+6·65						
23. 7				+6·80	7. 2. 6·0	+18.27·46	19.18.30	11.59·71	+6·98	+6·99
23. 18					18. 9.12·0	+18.30·71	6.27.29	11.59·55	+7·38	
24. 8	20. 5.46	7.33.11·2	+18.34·70	+6·80					+6·72	+6·61
24. 19	7.55.18	19.20.44·4	+18.38·14	+6·94						
25. 8				+6·98	8.15.16·8	+18.41·75	20.40. 0	11.59·79	+6·72	+6·83
25. 18					18.23.55·2	+18.44·55	6.50.21	11.59·94	+6·30	
26. 8	20.33. 8	7.52.26·0	+18.48·47	+6·98					+6·90	+7·13
26. 19	7.25.45	18.43.13·6	+18.51·49	+6·69						
27. 9				+6·60	8.54. 4·8	+18.55·53	21.27. 1	11.59·93	+6·90	+6·67
27. 18					18.23.33·2	+18.58·24	6.58. 6	11.59·50	+7·97	
28. 8	20.29. 4	7.39.19·6	+19. 2·17	+6·60						+6·53

Concluded Longitude of Liverpool from Greenwich = 11m. 59s·76.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

Chronometer I.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					18. 30. 48·0	+ 2. 32·73	6. 21. 17	11. 60·91		
21. 7	20. 17. 41	8. 12. 50·0	+ 2. 32·62						+1·51	+1·39
22. 19	7. 41. 11	19. 30. 34·4	+ 2. 32·33	−0·20						
23. 7				+1·51	7. 20. 29·2	+ 2. 32·75	19. 20. 59	11. 59·61	+1·51	+1·63
23. 18					18. 27. 2·0	+ 2. 33·16	6. 29. 21	11. 60·30	−0·61	
24. 8	20. 7. 24	7. 50. 50·0	+ 2. 33·63	+1·51					+1·22	+1·39
24. 19	7. 56. 14	19. 37. 44·8	+ 2. 33·58	−0·14						
25. 8				+1·34	8. 33. 59·2	+ 2. 33·98	20. 42. 35	11. 59·84	+1·22	+1·05
25. 18					18. 42. 43·6	+ 2. 34·29	6. 52. 59	11. 60·51	−0·85	
26. 8	20. 34. 12	8. 9. 43·6	+ 2. 34·69	+1·34					+1·48	+1·63
26. 19	7. 27. 11	19. 0. 56·4	+ 2. 34·45	−0·53						
27. 9				+0·96	9. 13. 47·6	+ 2. 34·82	21. 30. 24	11. 59·57	+1·48	+1·33
27. 18					18. 42. 34·4	+ 2. 35·06	7. 0. 44	11. 59·95	−0·36	
28. 8	20. 30. 5	7. 56. 47·2	+ 2. 35·41	+0·96						+0·59

Concluded Longitude of Liverpool from Greenwich = 11m. 59s·99.

Chronometer J.

Sep.										
20. 18					18. 32. 2·0	+ 3. 57·93	6. 23. 57	11. 60·54		
21. 7	20. 19. 34	8. 13. 16·4	+ 3. 58·90						+3·06	+2·93
22. 19	7. 42. 11	19. 30. 5·2	+ 4. 1·37	+1·68						
23. 7				+2·99	7. 21. 32·8	+ 4. 2·70	19. 23. 33	11. 59·58	+3·06	+3·19
23. 18					18. 27. 50·4	+ 4. 3·97	6. 31. 41	11. 59·89	+2·08	
24. 8	20. 8. 26	7. 50. 20·0	+ 4. 5·47	+2·99					+2·48	+2·79
24. 19	7. 57. 22	19. 37. 19·6	+ 4. 6·60	+2·26						
25. 8				+2·52	8. 34. 54·0	+ 4. 7·77	20. 45. 4	11. 59·85	+2·48	+2·17
25. 18					18. 44. 14·4	+ 4. 8·71	6. 56. 5	11. 60·24	+1·31	
26. 8	20. 35. 19	8. 9. 15·2	+ 4. 9·91	+2·52					+2·95	+2·87
26. 19	7. 28. 27	19. 0. 36·0	+ 4. 10·66	+1·67						
27. 9				+2·76	9. 14. 48·8	+ 4. 12·11	21. 33. 3	11. 59·49	+2·95	+3·03
27. 18					18. 44. 47·6	+ 4. 13·09	7. 4. 36	11. 59·82	+1·65	
28. 8	20. 30. 59	7. 56. 2·0	+ 4. 14·46	+2·76						+2·49

Concluded Longitude of Liverpool from Greenwich = 11m. 59s·83.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

CHRONOMETER K.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					18. 37. 27·6	+ 1. 6·19	6. 26. 31	11. 60·82		
									+3·85	+4·23
21. 7	20. 20. 47	8. 17. 20·8	+ 1. 7·31							
				+1·95						
22. 19	7. 43. 20	19. 34. 5·2	+ 1. 10·18						+3·85	+3·47
				+3·03						
23. 7					7. 26. 45·2	+ 1. 11·38	19. 25. 55	11. 59·05	+1·10	
23. 18					18. 33. 21·2	+ 1. 12·53	6. 34. 21	11. 59·69		
				+3·03					+2·28	+2·59
24. 8	20. 9. 37	7. 54. 22·4	+ 1. 13·87							
				+2·44						
24. 19	7. 59. 16	19. 42. 4·8	+ 1. 15·09						+2·28	+1·97
				+2·35						
25. 8					8. 40. 4·0	+ 1. 16·23	20. 47. 23	11. 59·68	+1·51	
25. 18					18. 50. 1·2	+ 1. 17·15	6. 59. 1	11. 59·96		
				+2·35					+2·91	+2·73
26. 8	20. 41. 30	8. 18. 16·8	+ 1. 18·31							
				+3·34						
26. 19	7. 29. 58	19. 4. 57·6	+ 1. 19·82						+2·91	+3·09
				+2·62						
27. 9					9. 22. 7·6	+ 1. 21·15	21. 37. 32	11. 59·07	+1·24	
27. 18					18. 50. 40·8	+ 1. 22·05	7. 7. 39	11. 59·48		
				+2·62						+2·15
28. 8	20. 32. 0	7. 59. 54·0	+ 1. 23·29							

Concluded Longitude of Liverpool from Greenwich = 11ᵐ. 59ˢ·56.

CHRONOMETER K*.

Sep.										
20. 18					18. 37. 47·8	+ 5. 57·26	6. 31. 43	11. 60·94		
									+4·47	+4·85
21. 7	20. 22. 3	8. 13. 45·0	+ 5. 58·92							
				+2·90						
22. 19	7. 45. 44	19. 31. 35·8	+ 6. 3·18						+4·47	+4·09
				+3·65						
23. 7					7. 25. 28·6	+ 6. 5·30	19. 29. 32	11. 59·95	+5·96	
23. 18					18. 31. 45·4	+ 6. 7·35	6. 37. 41	11. 59·26		
				+3·65					+3·67	+3·21
24. 8	20. 11. 27	7. 51. 16·2	+ 6. 9·76							
				+5·18						
24. 19	8. 0. 14	19. 38. 5·4	+ 6. 12·33						+3·67	+4·13
				+4·95						
25. 8					8. 37. 57·4	+ 6. 15·09	20. 50. 15	11. 60·41	+5·60	
25. 18					18. 47. 7·0	+ 6. 17·25	7. 1. 7	11. 60·21		
				+4·95					+5·38	+5·77
26. 8	20. 42. 25	8. 14. 9·8	+ 6. 20·16							
				+3·63						
26. 19	7. 31. 18	19. 1. 15·4	+ 6. 21·80						+5·38	+4·99
				+4·31						
27. 9					9. 19. 19·4	+ 6. 24·67	21. 39. 47	11. 59·76	+6·60	
27. 18					18. 49. 30·2	+ 6. 26·65	7. 11. 34	11. 59·13		
				+4·31						+3·63
28. 8	20. 32. 58	7. 55. 45·8	+ 6. 29·33							

Concluded Longitude of Liverpool from Greenwich = 11ᵐ. 59ˢ·85.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

CHRONOMETER M.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					18. 46. 28·0	+ 0. 34·99	6. 35. 2	11. 60·42		
21. 7	20. 23. 34	8. 20. 40·0	+ 0. 34·66						−0·03	−0·23
22. 19	7. 46. 49	19. 38. 10·0	+ 0. 33·81	−0·58						
23. 7				−0·14	7. 34. 59·6	+ 0. 33·85	19. 33. 32	11. 60·16	−0·03	+0·17
23. 18					18. 40. 32·0	+ 0. 33·89	6. 40. 54	11. 59·93	+0·59	
24. 8	20. 12. 56	7. 58. 20·8	+ 0. 33·93	−0·14					−0·76	−0·45
24. 19	8. 1. 45	19. 45. 14·0	+ 0. 34·49	+1·10						
25. 8				−0·50	8. 46. 2·0	+ 0. 34·22	20. 52. 39	11. 60·54	−0·76	−1·07
25. 18					18. 55. 1·2	+ 0. 34·01	7. 3. 18	11. 60·53	−0·48	
26. 8	20. 43. 43	8. 21. 14·0	+ 0. 33·74	−0·50					+0·18	+0·07
26. 19	7. 32. 37	19. 8. 22·4	+ 0. 33·58	−0·35						
27. 9				+0·03	9. 27. 26·4	+ 0. 33·64	21. 42. 3	11. 60·10	+0·18	+0·29
27. 18					18. 59. 30·4	+ 0. 33·67	7. 15. 41	11. 60·01	+0·30	
28. 8	20. 34. 12	8. 2. 55·2	+ 0. 33·73	+0·03						−0·23

Concluded Longitude of Liverpool from Greenwich = 12m. 0s·21.

CHRONOMETER N.

Sep.										
20. 18					18. 47. 8·0	+ 2. 53·13	6. 38. 1	11. 60·04		
21. 7	20. 25. 25	8. 20. 10·4	+ 2. 54·96						+3·75	+4·14
22. 19	7. 48. 20	19. 37. 14·8	+ 2. 59·77	+3·27						
23. 7				+3·16	7. 34. 58·0	+ 3. 1·34	19. 35. 59	11. 59·45	+3·75	+3·36
23. 18					18. 40. 53·2	+ 3. 2·79	6. 43. 45	11. 59·48	+3·07	
24. 8	20. 14. 16	7. 57. 10·0	+ 3. 4·51	+3·16					+3·68	+2·96
24. 19	8. 2. 44	19. 43. 40·0	+ 3. 7·34	+5·70						
25. 8				+4·17	9. 14. 8·4	+ 3. 9·50	21. 23. 27	11. 59·26	+3·68	+4·40
25. 18					18. 55. 12·8	+ 3. 11·07	7. 6. 8	11. 59·65	+2·93	
26. 8	20. 44. 37	8. 19. 28·4	+ 3. 13·20	+4·17					+3·54	+3·94
26. 19	7. 39. 4	19. 12. 8·0	+ 3. 13·93	+1·62						
27. 9				+3·48	9. 27. 47·2	+ 3. 15·88	21. 45. 7	11. 59·63	+3·54	+3·14
27. 18					18. 58. 54·4	+ 3. 17·16	7. 17. 49	11. 59·85	+2·68	
28. 8	20. 35. 19	8. 1. 16·8	+ 3. 18·95	+3·48						+3·82

Concluded Longitude of Liverpool from Greenwich = 11m. 59s·56.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

Chronometer O.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					18. 37. 2·0	+15. 49·33	6. 40. 52	11. 59·71		
									+3·33	+3·08
21. 7	20. 26. 42	8. 8. 30·8	+15. 51·35							
				+3·57						
22. 19	7. 49. 25	19. 25. 22·8	+15. 56·59							
				+3·45					+3·33	+3·58
23. 7					7. 25. 2·0	+15. 58·31	19. 39. 0	11. 59·92		
									+3·76	
23. 18					18. 30. 14·0	+15. 59·97	6. 46. 3	11. 59·85		
				+3·45					+2·82	+3·32
24. 8	20. 15. 26	7. 45. 22·4	+16. 1·93							
				+2·36						
24. 19	8. 4. 4	19. 32. 4·0	+16. 3·11							
				+2·62					+2·82	+2·32
25. 8					9. 3. 40·8	+16. 4·77	21. 25. 54	11. 60·34		
									+3·93	
25. 18					18. 44. 50·8	+16. 5·97	7. 8. 41	11. 59·96		
				+2·62					+3·00	+2·92
26. 8	20. 45. 42	8. 7. 38·8	+16. 7·62							
				+3·50						
26. 19	7. 39. 53	19. 0. 1·6	+16. 9·20							
				+2·76					+3·00	+3·08
27. 9					9. 17. 10·0	+16. 10·93	21. 47. 25	11. 59·86		
									+3·45	
27. 18					19. 4. 27·2	+16. 12·12	7. 36. 20	11. 59·65		
				+2·76						+2·44
28. 8	20. 36. 42	7. 49. 44·8	+16. 13·72							

Concluded Longitude of Liverpool from Greenwich = $11^m. 59^s·94$.

Chronometer P.

Sep.										
20. 18					19. 14. 2·0	−13. 40·62	6. 48. 23	11. 59·99		
									−5·25	−5·32
21. 7	20. 3. 27	8. 14. 54·0	−13. 43·07							
				−4·60						
22. 19	7. 31. 4	19. 36. 51·2	−13. 49·82							
				−5·27					−5·25	−5·18
23. 7					7. 57. 58·8	−13. 52·91	19. 42. 6	11. 60·01		
									−7·28	
23. 18					19. 3. 52·8	−13. 55·61	6. 49. 46	11. 60·68		
				−5·27					−5·20	−5·36
24. 8	19. 57. 20	7. 57. 20·0	−13. 58·72							
				−6·12						
24. 19	7. 45. 47	19. 43. 54·8	−14. 1·71							
				−4·70					−5·20	−5·04
25. 8					9. 37. 4·8	−14. 4·52	21. 29. 9	11. 60·58		
									−5·49	
25. 18					19. 18. 13·6	−14. 6·58	7. 11. 51	11. 60·73		
				−4·70					−4·45	−4·36
26. 8	20. 47. 23	8. 39. 36·4	−14. 9·25							
				−5·65						
26. 19	7. 41. 1	19. 31. 30·4	−14. 11·79							
				−4·68					−4·45	−4·54
27. 9					9. 51. 34·4	−14. 14·81	21. 51. 24	11. 60·17		
									−5·90	
27. 18					19. 36. 26·8	−14. 16·87	7. 37. 50	11. 60·50		
				−4·68						−4·82
28. 8	20. 22. 57	8. 6. 35·2	−14. 19·43							

Concluded Longitude of Liverpool from Greenwich = $12^m. 0^s·40$.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

CHRONOMETER Q.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					19. 0.54·4	+ 2.41·00	6.51.38	11.59·54		
									−3·90	−5·11
21. 7	20. 6.18	8. 1.22·0	+ 2.39·47							
				−2·82						
22.19	7.32.39	19.22. 0·8	+ 2.35·32							
				−3·94					−3·90	−2·69
23. 7					7.45.46·0	+ 2.33·16	19.46.20	11.59·97		
									−4·90	
23.18					18.51. 2·0	+ 2.31·19	6.53.23	11.60·27		
				−3·94					−4·28	−5·19
24. 8	19.58.21	7.41.53·2	+ 2.28·91							
				−1·71						
24.19	7.47. 3	19.28.40·8	+ 2.28·09							
				−2·51					−4·28	−3·37
25. 8					9.22.56·0	+ 2.26·82	21.31.31	11.61·51		
									−1·19	
25.18					19. 4.28·0	+ 2.25·95	7.14.38	11.61·12		
				−2·51					−3·08	−1·65
26. 8	20.48.24	8.24. 3·2	+ 2.24·77							
				−2·90						
26.19	7.42. 0	19.15.54·0	+ 2.23·46							
				−3·45					−3·08	−4·51
27. 9					9.37.40·0	+ 2.21·94	21.54. 5	11.61·97		
									+0·02	
27.18					19.23.44·8	+ 2.20·90	7.41.46	11.60·92		
				−3·45						−2·39
28. 8	20.24. 1	7.51. 0·0	+ 2.19·60							

Concluded Longitude of Liverpool from Greenwich = 12ᵐ. 0ˢ·82.

CHRONOMETER R.

Sep.										
20.18					19. 5. 5·6	+ 0.42·08	6.53.50	11.60·18		
									+6·52	+6·03
21. 7	20. 8. 4	8. 5. 2·0	+ 0.45·18							
				+5·70						
22.19	7.33.39	19.24.42·4	+ 0.53·56							
				+6·65					+6·52	+7·01
23. 7					7.49.41·6	+ 0.57·09	19.48.40	11.59·88		
									+7·38	
23.18					18.55.40·8	+ 1. 0·26	6.56.32	11.59·65		
				+6·65					+6·09	+6·29
24. 8	19.59.27	7.44.24·0	+ 1. 3·93							
				+7·60						
24.19	7.48.16	19.31.14·0	+ 1. 7·68							
				+6·28					+6·09	+5·89
25. 8					9.26.26·8	+ 1.11·38	21.33.48	11.60·24		
									+6·82	
25.18					19. 7.49·6	+ 1.14·02	7.16.49	11.60·14		
				+6·28					+6·51	+6·67
26. 8	20.49.47	8.26.33·2	+ 1.17·55							
				+6·01						
26.19	7.43. 5	19.18. 2·0	+ 1.20·27							
				+6·45					+6·51	+6·35
27. 9					9.41.16·4	+ 1.24·38	21.56.46	11.60·24		
									+7·85	
27.18					19.27.26·0	+ 1.27·12	7.44.35	11.59·80		
				+6·45						+6·55
28. 8	20.24.53	7.52.40·8	+ 1.30·66							

Concluded Longitude of Liverpool from Greenwich = 11ᵐ. 59ˢ·97.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

Chronometer S.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					18. 57. 38·8	+11. 10·87	6. 56. 53	11. 59·67		
									+7·65	+7·52
21. 7	20. 9. 19	7. 55. 46·8	+11. 15·18							
				+7·88						
22. 19	7. 34. 56	19. 15. 26·0	+11. 26·75						+7·65	+7·78
				+7·19						
23. 7					7. 49. 29·2	+11. 30·09	19. 59. 3	11. 59·17	+4·81	
23. 18					18. 46. 56·0	+11. 33·02	6. 58. 20	11. 59·91		
				+7·19					+6·80	+6·60
24. 8	20. 0. 45	7. 35. 9·2	+11. 36·53							
				+9·13						
24. 19	7. 49. 50	19. 22. 14·4	+11. 41·04							
				+7·46					+6·80	+7·00
25. 8					9. 18. 4·4	+11. 44·93	21. 36. 0	11. 59·74		
									+5·02	
25. 18					19. 0. 2·8	+11. 47·73	7. 19. 36	11. 60·51		
				+7·46					+7·50	+7·92
26. 8	20. 51. 6	8. 17. 18·0	+11. 51·53							
				+8·20						
26. 19	7. 44. 37	19. 8. 58·8	+11. 55·23							
				+7·12					+7·50	+7·08
27. 9					9. 36. 24·0	+11. 59·14	22. 2. 30	11. 59·54		
									+4·92	
27. 18					19. 18. 58·4	+12. 1·75	7. 46. 42	11. 60·17		
				+7·12						+7·16
28. 8	20. 26. 25	7. 43. 38·0	+12. 5·20							

Concluded Longitude of Liverpool from Greenwich = 11m. 59s·86.

Chronometer T.

Sep.										
20. 18					19. 14. 29·2	− 2. 30·76	7. 0. 2	11. 59·96		
									−7·00	−7·41
21. 7	20. 11. 1	8. 11. 18·4	− 2. 34·69							
				−7·30						
22. 19	7. 36. 6	19. 30. 48·0	− 2. 45·43						−7·00	−6·59
				−6·88						
23. 7					8. 8. 53·2	− 2. 49·02	20. 4. 8	11. 59·90	−6·63	
23. 18					19. 5. 20·4	− 2. 52·10	7. 2. 20	11. 59·84		
				−6·88					−7·18	−7·17
24. 8	20. 2. 17	7. 51. 13·2	− 2. 55·73							
				−6·70						
24. 19	7. 51. 15	19. 38. 19·2	− 2. 59·00							
				−6·70					−7·18	−7·19
25. 8					9. 35. 18·4	− 3. 2·83	21. 38. 26	11. 60·39		
									−6·06	
25. 18					19. 19. 10·0	− 3. 5·49	7. 23. 51	11. 60·18		
				−6·70					−6·45	−6·21
26. 8	20. 52. 14	8. 33. 26·4	− 3. 9·05							
				−7·45						
26. 19	7. 46. 10	19. 25. 39·2	− 3. 12·42							
				−6·72					−6·45	−6·69
27. 9					9. 54. 35·6	− 3. 16·20	22. 5. 26	11. 60·28		
									−5·08	
27. 18					19. 37. 24·0	− 3. 18·79	7. 49. 48	11. 59·74		
				−6·72						−6·75
28. 8	20. 27. 40	8. 0. 20·0	− 3. 21·99							

Concluded Longitude of Liverpool from Greenwich = 12m. 0s·01.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

Chronometer U.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					19. 6.50·0	+ 8.18·69	7. 3.12	11.60·72		
									+6·70	+7·62
21. 7	20. 12. 2	8. 1.22·8	+ 8.21·74							
				+5·60						
22. 19	7. 37. 22	19. 20. 48·4	+ 8. 29·95						+6·70	+5·78
				+5·39	7. 59. 53·6	+ 8. 32·85	20. 6. 31	11. 59·55		
23. 7									+6·12	
23. 18					18. 56. 8·0	+ 8. 35·43	7. 4. 36	11. 59·34		
				+5·39					+4·82	+5·00
24. 8	20. 3. 41	7. 41. 2·8	+ 8. 38·44							
				+9·50						
24. 19	7. 53. 1	19. 28. 22·8	+ 8. 43·12						+4·82	+4·64
				+4·67	9. 26. 13·6	+ 8. 46·02	21. 41. 11	11. 59·89		
25. 8									+5·84	
25. 18					19. 9. 52·4	+ 8. 48·01	7. 26. 28	11. 59·51		
				+4·67					+5·23	+4·70
26. 8	20. 56. 53	8. 26. 4·8	+ 8. 50·79							
				+5·79						
26. 19	7. 47. 18	19. 14. 41·2	+ 8. 53·40						+5·23	+5·76
				+5·58	9. 44. 25·6	+ 8. 56·39	22. 7. 30	11. 59·21		
27. 9									+3·32	
27. 18					19. 27. 17·6	+ 8. 58·38	7. 51. 59	11. 59·86		
				+5·58						+5·40
28. 8	20. 28. 54	7. 49. 10·8	+ 9. 1·00							

Concluded Longitude of Liverpool from Greenwich = $11^m.59^s.67$.

Chronometer W.

Sep.										
20. 18					19. 33. 23·0	−16. 49·90	7. 4. 38	11. 59·37		
									−6·37	−6·28
21. 7	20. 13. 24	8. 27. 59·4	−16. 53·08							
				−6·09						
22. 19	7. 38. 30	19. 47. 28·2	−17. 2·03						−6·37	−6·46
				−6·45	8. 28. 31·4	−17. 5·56	20. 9. 31	11. 59·44		
23. 7									−6·84	
23. 18					19. 24. 19·8	−17. 8·52	7. 7. 4	11. 59·59		
				−6·45					−7·00	−6·44
24. 8	20. 4. 49	8. 8. 1·0	−17. 11·95							
				−6·38						
24. 19	7. 54. 6	19. 55. 25·8	−17. 15·06						−7·00	−7·56
				−7·49	9. 56. 59·0	−17. 19·43	21. 45. 52	11. 59·61		
25. 8									−6·91	
25. 18					19. 38. 1·4	−17. 22·40	7. 28. 27	11. 59·43		
				−7·49					−6·93	−7·42
26. 8	20. 59. 10	8. 54. 38·6	−17. 26·38							
				−6·44						
26. 19	7. 49. 5	19. 42. 50·6	−17. 29·30						−6·93	−6·44
				−6·70	10. 12. 58·2	−17. 33·21	22. 9. 33	11. 59·55		
27. 9									−5·48	
27. 18					19. 55. 37·8	−17. 35·83	7. 53. 46	11. 59·15		
				−6·70						−6·96
28. 8	20. 30. 20	8. 17. 16·6	−17. 39·03							

Concluded Longitude of Liverpool from Greenwich = $11^m.59^s.45$.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

Chronometer X.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					19. 20. 41·8	— 1. 22·63	7. 7. 24	11. 59·89		
21. 7	20. 14. 36	8. 13. 40·6	— 1. 22·48						+0 22	+0·59
22. 19	7. 41. 4	19. 34. 21·8	— 1. 22·05	+0·29						
23. 7				−0·16	8. 16. 50·6	— 1. 22·14	20. 13. 34	11. 59·72	+0·22	−0·15
23. 18					19. 11. 20·2	— 1. 22·23	7. 9. 51	11. 59·74	−0·24	
24. 8	20. 5. 56	7. 53. 18·2	— 1. 22·33	−0·16					−0·25	−0·17
24. 19	7. 55. 9	19. 40. 35·4	— 1. 21·83	+0·98						
25. 8				−0·48	9. 44. 12·2	— 1. 22·02	21. 49. 3	11. 59·74	−0·25	−0·33
25. 18					19. 23. 49·0	— 1. 22·14	7. 30. 15	11. 59·57	+0·12	
26. 8	21. 0. 5	8. 39. 29·4	— 1. 22·33	−0·48					−0·46	−0·63
26. 19	7. 50. 26	19. 28. 4·2	— 1. 22·13	+0·44						
27. 9				−0·41	9. 59. 41·0	— 1. 22·39	22. 12. 27	11. 59·64	−0·46	−0·29
27. 18					19. 42. 10·6	— 1. 22·57	7. 56. 32	11. 59·66	−0·50	
28. 8	20. 31. 16	8. 1. 56·2	— 1. 22·79	−0·41						−0·53

Concluded Longitude of Liverpool from Greenwich = 11m. 59s·72.

Chronometer Y.

Sep.										
20. 18					19. 14. 21·0	+ 7. 20·75	7. 9. 46	11. 60·87		
21. 7	20. 15. 39	8. 5. 58·2	+ 7. 22·75						+4·79	+4·95
22. 19	7. 42. 6	19. 26. 33·4	+ 7. 28·19	+3·70						
23. 7				+4·65	8. 11. 7·8	+ 7. 30·59	20. 16. 44	11. 60·17	+4·79	+4·63
23. 18					19. 5. 3·4	+ 7. 32·65	7. 12. 29	11. 60·25	+4·38	
24. 8	20. 7. 2	7. 45. 26·6	+ 7. 35·09	+4·65					+4·95	+4·67
24. 19	7. 56. 14	19. 32. 40·2	+ 7. 38·18	+6·25						
25. 8				+4 97	9. 38. 53·8	+ 7. 41·10	21. 52. 48	11. 60·08	+4·95	+5·23
25. 18					19. 17. 1·8	+ 7. 43·15	7. 32. 33	11. 60·04	+5·22	
26. 8	21. 1. 1	8. 31. 17·0	+ 7. 45·92	+4·97					+4·60	+4·71
26. 19	7. 52. 1	19. 20. 28·6	+ 7. 48·22	+5·10						
27. 9				+4·75	9. 53. 5·8	+ 7. 50·83	22. 15. 5	11. 60·09	+4·60	+4·49
27. 18					19. 35. 7·0	+ 7. 52·57	7. 58. 43	11. 60·56	+3·15	
28. 8	20. 32. 29	7. 53. 51·4	+ 7. 54·81	+4·75						+5·01

Concluded Longitude of Liverpool from Greenwich = 12m. 0s·20.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

CHRONOMETER Z.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					19. 21. 3·4	+ 4. 18·86	7. 13. 28	11. 59·98		
									+1·94	+0·31
21. 7	20. 16. 50	8. 10. 12·6	+ 4. 19·16							
				+0·57						
22. 19	7. 43. 10	19. 30. 45·4	+ 4. 20·00							
				+2·77					+1·94	+3·57
23. 7					8. 16. 53·0	+ 4. 21·29	20. 19. 21	11. 59·50		
									+1·63	
23. 18					19. 11. 7·8	+ 4. 22·42	7. 15. 24	11. 59·89		
				+2·77					+1·01	+1·97
24. 8	20. 8. 22	7. 49. 57·8	+ 4. 23·68							
				+0·61						
24. 19	7. 57. 24	19. 37. 4·2	+ 4. 24·00							
				+1·22					+1·01	+0·05
25. 8					9. 44. 57·4	+ 4. 24·83	21. 55. 35	11. 60·86		
									+1·93	
25. 18					19. 23. 46·6	+ 4. 25·39	7. 36. 0	11. 60·65		
				+1·22					+2·03	+2·39
26. 8	21. 1. 59	8. 35. 34·6	+ 4. 26·16							
				+1·71						
26. 19	7. 53. 46	19. 25. 34·6	+ 4. 26·93							
				+1·62					+2·03	+1·67
27. 9					9. 59. 18·2	+ 4. 27·98	22. 17. 55	11. 60·10		
									+1·98	
27. 18					19. 40. 29·0	+ 4. 28·67	8. 0. 42	11. 59·99		
				+1·62						+1·57
28. 8	20. 34. 8	7. 58. 55·4	+ 4. 29·55							

Concluded Longitude of Liverpool from Greenwich = 12m. 0s·09.

CHRONOMETER *a*.

Sep.										
20. 18					19. 26. 17·4	+ 1. 17·84	7. 15. 40	11. 61·33		
									+2·00	+1·37
21. 7	20. 17. 46	8. 14. 10·2	+ 1. 17·40							
				−0·70						
22. 19	7. 44. 40	19. 35. 19·0	+ 1. 16·16							
				+1·58					+2·00	+2·63
23. 7					8. 22. 20·0	+ 1. 16·25	20. 21. 44	11. 58·85		
									−3·14	
23. 18					19. 16. 23·0	+ 1. 16·32	7. 17. 33	11. 60·35		
				+1·58					+1·42	+0·53
24. 8	20. 10. 1	7. 54. 43·8	+ 1. 16·40							
				−0·49						
24. 19	7. 58. 44	19. 41. 31·8	+ 1. 16·18							
				+2·17					+1·42	+2·31
25. 8					9. 50. 50·6	+ 1. 16·94	21. 58. 22	11. 59·62		
									−1·19	
25. 18					19. 29. 59·0	+ 1. 17·46	7. 39. 5	11. 60·62		
				+2·17					+0·77	+2·03
26. 8	21. 3. 6	8. 39. 49·4	+ 1. 18·17							
				−1·44						
26. 19	7. 55. 4	19. 30. 1·8	+ 1. 17·52							
				+0·98					+0·77	−0·49
27. 9					10. 4. 50·6	+ 1. 17·83	22. 20. 17	11. 60·74		
									−0·82	
27. 18					19. 46. 51·4	+ 1. 18·03	8. 3. 53	11. 61·27		
				+0·98						+2·45
28. 8	20. 35. 45	8. 3. 43·4	+ 1. 18·29							

Concluded Longitude of Liverpool from Greenwich = 12m. 0s·21.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

CHRONOMETER *b*.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					19. 26. 28·2	+ 4. 36·11	7. 19. 11	11. 59·96		
21. 7	20. 19. 1	8. 12. 5·0	+ 4. 37·40						+3·01	+2·59
22 19	7. 46. 3	19. 33. 17·0	+ 4. 40·93	+2·40						
23. 7				+3·13	8. 22. 3·0	+ 4. 42·27	20. 24. 53	11. 59·38	+3·01	+3·43
23. 18					19. 21. 26·2	+ 4. 43·44	7. 26. 5	11. 60·07	+1·05	
24. 8	20. 11. 38	7. 52. 52·2	+ 4. 44·73	+3·13					+2·81	+2·83
24. 19	8. 0. 17	19. 39. 35·0	+ 4. 45·73	+1·99						
25. 8				+2·84	9. 49. 57·0	+ 4. 47·24	22. 0. 59	11. 59·75	+2·81	+2·79
25. 18					19. 28. 54·2	+ 4. 48·29	7. 41. 32	11. 60·06	+1·85	
26. 8	21. 8. 30	8. 41. 41·0	+ 4. 49·71	+2·84					+2·49	+2·89
26. 19	7. 56. 6	19. 27. 31·0	+ 4. 50·15	+0·98						
27. 9				+2·33	10. 3. 17·8	+ 4. 51·40	22. 22. 19	11. 59·83	+2·49	+2·09
27. 18					19. 46. 8·6	+ 4. 52·22	8. 6. 46	11. 60·13	+1·29	
28. 8	20. 37. 1	8. 1. 24·2	+ 4. 53·28	+2·33						+2·57

Concluded Longitude of Liverpool from Greenwich = 11m. 59s·88.

CHRONOMETER *d*.

Sep.										
20. 18					19. 33. 3·0	+ 3. 25·90	7. 24. 37	11. 59·44		
21. 7	20. 24. 48	8. 18. 59·625	+ 3. 28·835						+5·40	+5·05
22. 19	7. 47. 11	19. 35. 28·875	+ 3. 36·885	+5·49						
23. 7				+5·39	8. 26. 51·0	+ 3. 39·84	20. 28. 39	11. 59·57	+5·40	+5·75
23. 18					19. 29. 7·5	+ 3. 42·37	7. 32. 47	11. 59·40	+5·88	
24. 8	20. 12. 39	7. 54. 52·5	+ 3. 45·28	+5·39					+4·78	+5·03
24. 19	8. 1. 44	19. 42. 0·0	+ 3. 47·50	+4·47						
25. 8				+5·10	9. 56. 57·0	+ 3. 50·65	22. 7. 3	11. 60·15	+4·78	+4·53
25. 18					19. 32. 59·0	+ 3. 52·82	7. 44. 42	11. 59·90	+6·05	
26. 8	21. 9. 44	8. 43. 48·75	+ 3. 55·75	+5·10					+5·42	+5·67
26. 19	7. 57. 29	19. 29. 45·375	+ 3. 58·555	+6·22						
27. 9				+4·80	10. 6. 12·0	+ 4. 1·80	22. 24. 24	11. 59·78	+5·42	+5·17
27. 18					19. 49. 7·5	+ 4. 3·97	8. 8. 58	11. 59·14	+6·95	
28. 8	20. 37. 53	8. 3. 2·625	+ 4. 6·715	+4·80						+4·43

Concluded Longitude of Liverpool from Greenwich = 11m. 59s·68.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM GREENWICH.

Chronometer *e*.

Comparisons at Greenwich.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Sep. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 18					19. 42. 7·5	— 2. 12·30	7. 28. 5	11. 58·31		
21. 7	20. 26. 9	8. 26. 6·0	—2. 16·76						−8·37	−10·66
22. 19	7. 48. 48	19. 43. 11·625	—2. 29·135	−8·42						
23. 7				−7·34	8. 37. 22·5	— 2. 32·25	20. 32. 59	11. 59·70	−8·37	−6·08
23. 18					19. 37. 51·0	— 2. 34·91	7. 35. 15	11. 58·01	−2·12	
24. 8	20. 14. 12	8. 2. 48·375	—2. 37·855	−7·34					−7·86	−8·60
24. 19	8. 2. 51	19. 49. 35·625	—2. 41·305	−7·05						
25. 8				−6·18	10. 7. 23·0	— 2. 44·94	22. 10. 54	11. 60·19	−7·86	−7·12
25. 18					19. 42. 30·0	— 2. 47·44	7. 47. 33	11. 60·12	−6·08	
26. 8	21. 10. 43	8. 51. 34·125	—2. 50·785	−6·18					−6·42	−5·24
26. 19	7. 59. 0	19. 38. 10·5	—2. 55·82	−11·18						
27. 9				−5·42	10. 16. 19·5	— 2. 58·68	22. 27. 30	11. 61·32	−6·42	−7·60
27. 18					19. 58. 51·0	— 3. 0·62	8. 11. 36	11. 60·49	−2·75	
28. 8	20. 39. 3	8. 11. 22·125	—3. 2·985	−5·42						−3·24

Concluded Longitude of Liverpool from Greenwich = 11ᵐ. 59ˢ·61.

Chronometer *f*.

Sep.										
20. 18					19. 52. 6·0	— 6. 7·27	7. 34. 7	11. 60·83		
21. 7	20. 27. 34	8. 31. 24·75	—6. 10·75						−5·15	−5·19
22. 19	7. 50. 25	19. 48. 39·75	—6. 20·53	−6·66						
23. 7				−5·50	8. 43. 52·5	— 6. 23·67	20. 35. 38	11. 59·71	−5·15	−5·11
23. 18					19. 46. 42·5	— 6. 26·27	7. 40. 14	11. 59·97	−6·23	
24. 8	20. 15 28	8. 7. 55·5	—6. 29·18	−5·50					−5·08	−5·89
24. 19	8. 3. 57	19. 54. 33·0	—6. 32·87	−7·54						
25. 8				−4·27	10. 17. 13·5	— 6. 36·02	22. 16. 55	11. 59·59	−5·08	−4·27
25. 18					19. 53. 33·0	— 6. 38·08	7. 54. 46	11. 60·66	−7·85	
26. 8	21. 12. 4	8. 56. 45·0	—6. 40·88	−4·27					−4·95	−4·27
26. 19	8. 0. 8	19. 43. 6·375	—6. 43·885	−6·66						
27. 9				−5·10	10. 29. 10·5	— 6. 47·18	22. 36. 35	11. 60·29	−4·95	−5·63
27. 18					20. 7. 39·0	— 6. 49·38	8. 16. 36	11. 60·55	−6·12	
28. 8	20. 40. 22	8. 16. 30·0	—6. 52·07	−5·10						−4·57

Concluded Longitude of Liverpool from Greenwich = 12ᵐ. 0ˢ·11.

In the following Table, the Results from all the Chronometers are collected.

Reference to Chronometer.	Longitude of Liverpool West of Greenwich.	Sum of Squares of Changes of Travelling Rates.	Sum of Squares of Changes of Stationary Rates.	Weight of Result.
	m s			
A	11. 59 ·87	0 ·1628	1 ·1519	730
B	11. 59 ·87	1 ·1128	1 ·8801	297
C	11. 60 ·12	4 ·4800	1 ·4845	134
D	11. 59 ·48	2 ·7864	10 ·5859	70
E	11. 59 ·85	2 ·4996	6 ·8256	98
F	11. 59 ·85	1 ·9488	13 ·8222	61
G	11. 60 ·07	5 ·0796	3 ·9905	93
H	11. 59 ·76	0 ·5144	2 ·9266	277
I	11. 59 ·99	1 ·2048	1 ·0244	380
J	11. 59 ·83	1 ·4192	1 ·2249	321
K	11. 59 ·56	3 ·3272	11 ·1419	64
*K**	11. 59 ·85	7 ·3460	22 ·8502	31
M	11. 60 ·21	2 ·5472	4 ·5648	126
N	11. 59 ·56	4 ·1560	17 ·4695	43
O	11. 59 ·94	2 ·1128	4 ·6484	134
P	11. 60 ·40	0 ·7276	9 ·0130	100
Q	11. 60 ·82	31 ·0512	26 ·2234	15
R	11. 59 ·97	2 ·3896	7 ·5209	93
S	11. 59 ·86	3 ·1784	65 ·8502	14
T	11. 60 ·01	2 ·2036	8 ·4124	88
U	11. 59 ·67	5 ·3804	31 ·1938	26
W	11. 59 ·45	2 ·5376	2 ·1975	179
X	11. 59 ·72	0 ·8368	3 ·4949	217
Y	11. 60 ·20	1 ·0068	8 ·8371	98
Z	11. 60 ·09	22 ·8780	4 ·0277	29
a	11. 60 ·21	24 ·2384	13 ·9130	22
b	11. 59 ·88	1 ·9476	3 ·5787	162
d	11. 59 ·68	3 ·3556	5 ·1984	103
e	11. 59 ·61	57 ·6308	162 ·0107	4
f	11. 60 ·11	6 ·2124	3 ·7048	83

The sum of weights is 4092

The result for the Longitude of Liverpool Observatory West of the Royal Observatory, Greenwich... } ..... $11^m.59^s\cdot886$

The probable error of this determination, as depending on the travelling chronometers .. $\pm 0^s\cdot0102$

It will be remembered that this determination is based upon Greenwich transits observed by Mr. Henry, and Liverpool transits observed by Mr. Hartnup, and that no correction is yet applied for Personal Equation.

X. — *Comparisons and Calculations for the Longitude of Liverpool, as determined with reference to Kingstown.*

THE comparisons at Kingstown were made at nearly the same hour on each of the five days on which comparisons were made, leaving an interval of very nearly forty-eight hours between one comparison and another. The comparisons at Liverpool were made at nearly the same hour on three of the four days on which comparisons were made there, that on the remaining day being nearly six hours later. These circumstances were represented nearly enough by the following assumptions:—

	h
First Interval	18
Second	30
Third	18
Fourth	30
Fifth	24
Sixth	24
Seventh	18
Eighth	30

Using the same notation as in Section VIII., we obtain the following equations:—

$$3x_1 + 5x_2 = 8a_1, \text{ or } x_2 = \frac{8}{5}a_1 - \frac{3}{5}x_1$$

$$5x_2 + 3x_3 = 8b_2, \text{ or } x_3 = \frac{8}{3}b_2 - \frac{5}{3}x_2 = \frac{8}{3}b_2 - \frac{8}{3}a_1 + x$$

$$3x_3 + 5x_4 = 8a_3, \text{ or } x_4 = \frac{8}{5}a_3 - \frac{3}{5}x_3 = \frac{8}{5}a_3 - \frac{8}{5}b_2 + \frac{8}{5}a_1 - \frac{3}{5}x_1$$

$$5x_4 + 4x_5 = 9b_4, \text{ or } x_5 = \frac{9}{4}b_4 - \frac{5}{4}x_4 = \frac{9}{4}b_4 - \frac{8}{4}a_3 + \frac{8}{4}b_2 - \frac{8}{4}a_1 + \frac{3}{4}x_1$$

$$4x_5 + 4x_6 = 8a_5, \text{ or } x_6 = 2a_5 - x_5 = \frac{8}{4}a_5 - \frac{9}{4}b_4 + \frac{8}{4}a_3 - \frac{8}{4}b_2 + \frac{8}{4}a_1 - \frac{3}{4}x_1$$

$$4x_6 + 3x_7 = 7b_6, \text{ or } x_7 = \frac{7}{3}b_6 - \frac{4}{3}x_6 = \frac{7}{3}b_6 - \frac{8}{3}a_5 + \frac{9}{3}b - \frac{8}{3}a_3 + \frac{8}{3}b_2 - \frac{8}{3}a_1 + x_1$$

$$3x_7 + 5x_8 = 8a_7, \text{ or } x_8 = \frac{8}{5}a_7 - \frac{3}{5}x_7 = \frac{8}{5}a_7 - \frac{7}{5}b_6 + \frac{8}{5}a_5 - \frac{9}{5}b_4 + \frac{8}{5}a_3 - \frac{8}{5}b_2 + \frac{8}{5}a_1 - \frac{3}{5}x_1$$

Hence,

$$x_1 - x_2 = \frac{8}{5}x_1 - \frac{8}{5}a_1$$

$$x_3 - x_2 = \frac{8}{5}x_1 - \frac{64}{15}a_1 + \frac{8}{3}b_2$$

$$x_3 - x_4 = \frac{8}{5}x_1 - \frac{64}{15}a_1 + \frac{64}{15}b_2 - \frac{8}{5}a_3$$

$$x_5 - x_4 = \frac{27}{20}x_1 - \frac{72}{20}a_1 + \frac{72}{20}b_2 - \frac{72}{20}a_3 + \frac{9}{4}b_4$$

$$x_5 - x_6 = \frac{3}{2}x_1 - 4a_1 + 4b_2 - 4a_3 + \frac{9}{2}b_4 - 2a_5$$

$$x - x_6 = \frac{7}{4}x_1 - \frac{56}{12}a_1 + \frac{56}{12}b_2 - \frac{56}{12}a_3 + \frac{63}{12}b_4 - \frac{56}{12}a_5 + \frac{7}{3}b_6$$

$$x_7 - x_8 = \frac{8}{5}x_1 - \frac{64}{15}a_1 + \frac{64}{15}b_2 - \frac{64}{15}a_3 + \frac{72}{15}b_4 - \frac{64}{15}a_5 + \frac{56}{15}b_6 - \frac{8}{5}a_7$$

In order to form the equation which makes the sum of squares of these quantities minimum, each equation ought to be multiplied by the co-efficient of x_1 before taking their sum. But as these co-efficients do not differ much, I have thought it sufficient to take the sum of the equations as they stand. This gives,

$$0 = 11x_1 - \frac{80}{3}a_1 + \frac{352}{15}b_2 - \frac{272}{15}a_3 + \frac{252}{15}b_4 - \frac{164}{15}a_5 + \frac{91}{15}b_6 - \frac{8}{5}a_7$$

Or,

$$x_1 = \frac{1}{165}\left\{400 \,.\, a_1 - 352 \,.\, b_2 + 272 \,.\, a_3 - 252 \,.\, b_4 + 164 \,.\, a_5 - 91 \,.\, b_6 + 24 \,.\, a_7\right\}$$

from which x_2, x_3, &c., are found by the equations above.

Then forming the sum of squares of the differences $x_1 - x_2$, $x_3 - x_2$, &c., the probable value of a change of rate will be

$$\frac{\pm\, 0{\cdot}6745}{7} \times \sqrt{\text{sum of squares.}}$$

The weight W has been made $= \frac{1000}{\text{sum of squares}}$, so that the probable value of a change of rate

$$= \frac{\pm\, 0{\cdot}6745 \times \sqrt{1000}}{7} \times \frac{1}{\sqrt{W}}.$$

The probable error of the first rate is $\frac{5}{6}$ of this quantity; and the time through which it applies is $\frac{3}{4}$ of a day: therefore, the probable error of the result of one chronometer for longitude is

$$\pm \frac{15}{32} \times \frac{0{\cdot}6745 \times \sqrt{1000}}{7} \times \frac{1}{\sqrt{W}}.$$

And from this, as before, it is found that the probable error of the result derived from all the chronometers, combining their results in the proportion of the weights, W_A, W_B, W_C, &c., is

$$\pm \frac{15}{32} \times \frac{0{\cdot}6745 \times \sqrt{1000}}{7} \times \frac{1}{\sqrt{(W_A + W_B + \&c.)}}.$$

It will be remarked, that there are in this process some slight inaccuracies; not only because the mathematical theory is not strictly followed, but also because the rate while stationary and the rate while travelling are united in one mixed rate. But I conceive the effect of these to be insignificant.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM KINGSTOWN.

Chronometer A.

Comparisons at Kingstown.					Comparisons at Liverpool.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by $\frac{1}{2}\Sigma$.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3	11. 56. 2·5	3. 35. 33·6	−23. 43·15							
				+1·90						+2·21
27. 21					19. 54. 25·6	−23. 41·82	4. 6. 42	12. 31·78		
				+1·90					+1·57	+1·72
29. 3	11. 40. 30·5	3. 12. 12·0	−23. 39·37							
				+1·23					+1·57	+1·33
29. 20					19. 37. 48·4	−23. 38·50	3. 57. 56	12. 31·59		
				+1·23					+1·42	+1·17
31. 3	11. 53. 37·0	3. 17. 24·4	−23. 36·90							
				+1·52					+1·42	+1·73
Aug. 1. 3					1. 27. 16·8	−23. 35·47	9. 56. 15	12. 31·76		
				+1·52					+1·07	+1·31
2. 3	11. 56. 45·0	3. 12. 39·6	−23. 33·87							
				+1·18					+1·07	+0·75
2. 20					19. 18. 38·0	−23. 33·06	3. 54. 28	12. 31·23		
				+1·18						+1·44
4. 3	11. 45. 31·0	2. 53. 35·2	−23. 31·52							

Concluded Longitude of Liverpool from Kingstown = $12^m.\ 31^s.55$ East.

Chronometer B.

July 27. 3	11. 57. 10·0	3. 29. 2·8	−16. 5·03							
				+4·00						+4·73
27. 21					19. 50. 12·4	−16. 2·25	4. 10. 9	12. 31·84		
				+4·00					+4·16	+3·56
29. 3	11. 41. 55·0	3. 5. 54·0	−15. 57·10							
				+4·30					+4·16	+5·15
29. 20					19. 32. 31·2	−15. 54·10	4. 0. 24	12. 31·99		
				+4·30					+4·04	+3·79
31. 3	11. 54. 46·0	3. 10. 44·8	−15. 48·48							
				+5·25					+4·04	+4·36
Aug. 1. 3					1. 31. 7·2	−15. 43·53	10. 7. 58	12. 30·50		
				+5·25					+5·19	+6·15
2. 3	11. 58. 36·0	3. 6. 34·4	−15. 37·97							
				+4·34					+5·19	+3·92
2. 20					19. 14. 17·6	−15. 34·98	3. 58. 6	12. 30·95		
				+4·34						+4·59
4. 3	11. 46. 43·0	2. 46. 44·8	−15. 29·32							

Concluded Longitude of Liverpool from Kingstown = $12^m.\ 31^s.34$.

Chronometer C.

July 27. 3	11. 59. 19·0	3. 34. 29·6	−19. 23·18							
				+2·37						+2·69
27. 21					19. 58. 36·0	−19. 21·53	4. 15. 14	12. 31·69		
				+2·37					+2·86	+2·18
29. 3	11. 43. 3·0	3. 10. 23·2	−19. 18·49							
				+3·38					+2·86	+4·00
29. 20					19. 39. 37·6	−19. 16·11	4. 4. 9	12. 31·98		
				+3·38					+3·00	+3·01
31. 3	11. 56. 7·0	3. 15. 28·8	−19. 11·71							
				+2·73					+3·00	+2·99
Aug. 1. 3					1. 37. 42·0	−19. 9·13	10. 11. 9	12. 31·78		
				+2·73					+1·89	+2·47
2. 3	11. 59. 9·0	3. 10. 35·6	−19. 6·26							
				+2·64					+1·89	+1·11
2. 20					19. 20. 33·2	−19. 4·44	4. 0. 52	12. 30·38		
				+2·64						+3·56
4. 3	11. 47. 49·5	2. 51. 22·8	−19. 1·00							

Concluded Longitude of Liverpool from Kingstown = $12^m.\ 31^s.49$.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM KINGSTOWN.

Chronometer D.

Comparisons at Kingstown.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3	12. 1. 1·0	3. 38. 34·8	−21. 46·67							
				+3·28						+4·36
27. 21					20. 4. 28·0	−21. 44·38	4. 18. 45	12. 32·98		
				+3·28					+2·77	+2·63
29. 3	11. 44. 15·5	3. 13. 57·2	−21. 40·18						+2·77	+3·00
				+2·88						
29. 20					19. 44. 12·0	−21. 38·15	4. 6. 22	12. 32·27	+2·74	+2·81
				+2·88						
31. 3	11. 57. 20·5	3. 19. 4·8	−21. 34·40						+2·74	+2·66
				+2·38						
Aug. 1. 3					1. 43. 30·8	−21. 32·13	10. 14. 36	12. 32·42		
				+2·38					+1·54	+2·10
2. 3	12. 0. 13·0	3. 14. 2·8	−21. 29·63						+1·54	+0·79
				+1·67						
2. 20					19. 26. 23·6	−21. 28·48	4. 4. 20	12. 31·45		
				+1·67						+2·20
4. 3	11. 49. 12·0	2. 55. 10·4	−21. 26·31							

Concluded Longitude of Liverpool from Kingstown = 12m. 32s·20.

Chronometer E.

July 27. 3	12. 1. 30·0	3. 42. 0·8	−24. 43·75							
				−1·20						−0·33
27. 21					20. 10. 26·4	−24. 44·60	4. 21. 43	12. 32·31		
				−1·20					−1·03	−1·72
29. 3	11. 45. 45·0	3. 18. 32·4	−24. 46·13						−1·03	+0·13
				−0·90						
29. 20					19. 50. 12·0	−24. 46·77	4. 9. 14	12. 32·42	−1·33	−1·52
				−0·90						
31. 3	11. 58. 46·0	3. 23. 43·6	−24. 47·94						−1·33	−1·10
				−0·22						
Aug. 1. 3					1. 49. 32·0	−24. 48·15	10. 17. 20	12. 30·80	−0·36	+0·66
				−0·22						
2. 3	12. 1. 38·5	3. 18. 46·8	−24. 48·37						−0·36	−1·72
				−0·99						
2. 20					19. 31. 47·2	−24. 49·05	4. 6. 23	12. 31·08		
				−0·99						−0·55
4. 3	11. 51. 9·5	3. 0. 31·6	−24. 50·34							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·65.

Chronometer F.

July 27. 3	12. 2. 56·5	3. 41. 12·4	−22. 29·06							
				−0·12						+0·57
27. 21					20. 10. 59·6	−22. 29·14	4. 24. 32	12. 32·19		
				−0·12					−0·14	−0·53
29. 3	11. 46. 44·0	3. 17. 14·4	−22. 29·29						−0·14	+0·52
				+0·11						
29. 20					19. 50. 48·4	−22. 29·21	4. 12. 8	12. 31·99	+0·33	−0·13
				+0·11						
31. 3	12. 0. 11·5	3. 22. 50·0	−22. 29·06						+0·33	+0·91
				+1·14						
Aug. 1. 3					1. 52. 51·2	−22. 27·97	10. 23. 1	12. 31·49		
				+1·14					+0·46	+1·37
2. 3	12. 3. 32·0	3. 18. 18·4	−22. 26·78						+0·46	−0·75
				+0·03						
2. 20					19. 32. 36·4	−22. 26·76	4. 9. 35	12. 31·08		
				+0·03						+0·50
4. 3	12. 0. 49·5	3. 7. 46·4	−22. 26·72							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·69.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM KINGSTOWN.

Chronometer G.

Comparisons at Kingstown.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3	12. 4.11·5	3.42. 8·8	−22.10·67							
				+3·53						+3·41
27.21					20.12.55·2	−22. 8·19	4.26.48	12.31·27		
				+3·53					+3·60	+3·60
29. 3	11.47.51·0	3.17.55·6	−22. 3·68							
				+3·10					+3·60	+3·60
29.20					19.53.40·4	−22. 1·49	4.15.28	12.31·72		
				+3·10					+2·83	+2·80
31. 3	12. 1.18·5	3.23.25·2	−21.57·45							
				+2·77					+2·83	+2·87
Aug. 1. 3					1.56.34·4	−21.54·81	10.27.18	12.31·43		
				+2·77					+2·56	+2·67
2. 3	12. 4.21·0	3.18.32·4	−21.51·91							
				+2 80					+2·56	+2·41
2.20					19.36. 2·0	−21.49·97	4.13.38	12.31·03		
				+2·80						+3·03
4. 3	12. 2. 4·5	3. 8.20·8	−21.46·32							

Concluded Longitude of Liverpool from Kingstown = $12^m.31^s.34$.

Chronometer H.

July 27. 3	12. 5.31·0	3.33.41·6	−12.24·19							
				+6·10						+6·52
27.21					20. 5.32·0	−12.19·94	4.29.14	12.31·82		
				+6·10					+6·25	+5·85
29. 3	11.50.31·0	3.10.43·6	−12.12·10							
				+5·69					+6·25	+6·92
29.20					19.46.48·8	−12. 8·10	4.18.31	12.32·44		
				+5·69					+5·18	+4·95
31. 3	12. 3.56·5	3.16. 6·0	−12. 0·68							
				+5·90					+5·18	+5·47
Aug. 1. 3					1.49.52·4	−11.55·06	10.30.36	12.31·14		
				+5·90					+5·76	+6·34
2. 3	12. 5.23·0	3. 9.31·2	−11.48·87							
				+6·24					+5·76	+4·99
2.20					19.29.30·4	−11.44·57	4.17.12	12.30·64		
				+6·24						+6·99
4. 3	12. 3.45·5	2.59.51·6	−11.36·40							

Concluded Longitude of Liverpool from Kingstown = $12^m.31^s.55$.

Chronometer I.

July 27. 3	12.11.11·0	3.50. 0·4	−23. 3·91							
				+1·58						+2·42
27.21					20.24.49·2	−23. 2·79	4.37.50	12.32·07		
				+1·58					+1·23	+1·08
29. 3	11.51.28·5	3.22.29·6	−23. 0·76							
				+0·32					+1·23	+1·49
29.20					20. 0.12·0	−23. 0·53	4.21. 2	12.32·26		
				+0·32					+0·05	−0·38
31. 3	12. 5.22·5	3.28.31·2	−23. 0·11							
				+1·07					+0·05	+0·59
Aug. 1. 3					2. 3.39·2	−22.59·09	10.33.19	12.30·93		
				+1·07					+0·67	+1·55
2. 3	12. 6.38·5	3.21.55·6	−22.57·98							
				+0·44					+0·67	−0·51
2.20					19.44.48·8	−22.57·68	4.21.18	12.30·69		
				+0·44						+1·01
4. 3	12. 4.24·5	3.11.51·2	−22.57·11							

Concluded Longitude of Liverpool from Kingstown = $12^m.31^s.42$.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM KINGSTOWN.

Chronometer J.

Comparisons at Kingstown.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by $\frac{1}{2}\Sigma$.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3	12. 12. 26·0	3. 51. 25·6	−23. 14·32							
				+2·20						+2·48
27. 21					20. 29. 54·0	−23. 12·75	4. 42. 45	12. 31·42		
				+2·20					+2·74	+2·03
29. 3	11. 52. 41·5	3. 23. 51·6	−23. 9·95							
				+2·87					+2·74	+3·92
29. 20					20. 4. 6·0	−23. 7·91	4. 24. 49	12. 32·02		
				+2·87					+2·46	+2·24
31. 3	12. 6. 27·0	3. 29. 39·6	−23. 4·18							
				+3·39					+2·46	+2·74
Aug. 1. 3					2. 5. 58·0	−23. 0·94	10. 35. 36	12. 30·60		
				+3·39					+3·15	+4·05
2. 3	12. 8. 43·0	3. 23. 59·2	−22. 57·42							
				+2·66					+3·15	+1·96
2. 20					19. 47. 47·2	−22. 55·56	4. 24. 19	12. 30·68		
				+2·66						+3·08
4. 3	12. 5. 42·5	3. 13. 4·0	−22. 52·12							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·22.

Chronometer K.

July 27. 3	12. 13. 52·5	3. 55. 11·2	−25. 33·66							
				−0·12						−0·28
27. 21					20. 37. 13·2	−25. 33·74	4. 47. 44	12. 31·40		
				−0·12					0·00	−0·02
29. 3	11. 55. 54·5	3. 29. 28·0	−25. 33·89							
				−0·02					0·00	+0·04
29. 20					20. 10. 32·8	−25. 33·90	4. 28. 50	12. 31·56		
				−0·02					+0·50	−0·06
31. 3	12. 7. 57·5	3. 33. 39·6	−25. 33·93							
				+0·75					+0·50	+1·20
Aug. 1. 3					2. 16. 19·6	−25. 33·20	10. 43. 28	12. 31·99		
				+0·75					−0·05	+0·31
2. 3	12. 9. 59·0	3. 27. 50·0	−25. 32·42							
				+0·26					−0·05	−0·52
2. 20					19. 52. 55·2	−25. 32·24	4. 26. 51	12. 30·94		
				+0·26						+0·73
4. 3	12. 6. 50·5	3. 16. 51·6	−25. 31·90							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·53.

Chronomoter K*.

July 27. 3	12. 15. 35·5	3. 54. 1·0	−22. 40·74							
				+3·73						+3·23
27. 21					20. 43. 3·8	−22. 38·07	4. 56. 32	12. 31·70		
				+3·73					+5·28	+4·03
29. 3	11. 56. 59·0	3. 27. 31·8	−22. 33·36							
				+6·37					+5·28	+7·37
29. 20					20. 9. 47·0	−22. 28·82	4. 31. 11	12. 32·90		
				+6·37					+5·45	+5·77
31. 3	12. 9. 20·5	3. 31. 49·0	−22. 20·56							
				+5·45					+5·45	+5·05
Aug. 1. 3					2. 15. 18·6	−22. 15·30	10. 45. 45	12. 31·71		
				+5·45					+5·17	+5·86
2. 3	12. 11. 25·0	3. 25. 53·0	−22. 9·65							
				+4·88					+5·17	+4·26
2. 20					19. 51. 40·2	−22. 6·23	4. 29. 3	12. 31·59		
				+4·88						+5·25
4. 3	12. 9. 19·5	3. 15. 48·2	−21. 59·91							

Concluded Longitude of Liverpool from Kingstown = 12m. 32s·09.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM KINGSTOWN.

CHRONOMETER M.

Comparisons at Kingstown.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3	12.17.45·5	3.57.33·2	−24. 3·29							
				+0·16						+0·86
27.21					20.49. 2·8	−24. 3·17	5. 1. 7	12.32·06		
				+0·16					−0·21	−0·26
29. 3	12. 1.56·0	3.33.57·6	−24. 2·97							
				+0·07					−0·21	−0·13
29.20					20.13.51·2	−24. 2·92	4.33.40	12.31·39		
				+0·07					−0·28	+0·19
31. 3	12.11.38·0	3.35.48·4	−24. 2·83							
				−1·21					−0·28	−0·87
Aug. 1. 3					2.26.47·6	−24. 3·99	10.55.27	12.31·83		
				−1·21					−1·41	−1·56
2. 3	12.13.44·0	3.30. 7·2	−24. 5·24							
				−0·65					−1·41	−1·22
2.20					19.55.50·8	−24. 5·69	4.31.14	12.31·09		
				−0·65						−0·31
4. 3	12.10. 4·0	3.18.39·2	−24. 6·53							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·53.

CHRONOMETER N.

July 27. 3	12.18.55·5	3.58. 5·2	−23.25·48							
				+0·46						+0·27
27.21					20.52.31·6	−23.25·15	5. 5.14	12.31·56		
				+0·46					+0·12	+0·57
29. 3	12. 6.56·0	3.38.18·4	−23.24·57							
				−0·05					+0·12	−0·64
29.20					20.15.49·6	−23.24·61	4.36.17	12.31·25		
				−0·05					+0·82	+0·30
31. 3	12.13. 6·0	3.36.38·0	−23.24·67							
				+0·71					+0·82	+1·47
Aug. 1. 3					2.34.17·6	−23.23·98	11. 3.39	12.32·49		
				+0·71					+0·06	−0·05
2. 3	12.16.14·0	3.31.54·8	−23.23·24							
				+0·51					+0·06	+0·20
2.20					19.57.23·2	−23.22·89	4.33.30	12.31·51		
				+0·51						+0·69
4. 3	12.11.20·5	3.19.11·2	−23.22·23							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·71.

CHRONOMETER O.

July 27. 3	12.20.46·0	3.47.52·0	−11.22·08							
				+1·17						+1·39
27.21					20.44.48·8	−11.21·25	5. 9.36	12.31·74		
				+1·17					+1·64	+1·04
29. 3	12. 8.35·5	3.27.52·8	−11.19·76							
				+1·77					+1·64	+2·64
29.20					20. 6.52·0	−11.18·52	4.39.27	12.32·25		
				+1·77					+1·53	+1·25
31. 3	12.14.37·5	3.26. 0·8	−11.16·22							
				+2·80					+1·53	+1·89
Aug. 1. 3					2.25.16·4	−11.13·52	11. 6.47	12.30·72		
				+2·80					+3·12	+3·72
2. 3	12.17.22·0	3.20.50·0	−11.10·64							
				+2·82					+3·12	+2·33
2.20					19.47.52·8	−11. 8·69	4.36.14	12.31·27		
				+2·82						+3·12
4. 3	12.12.29·5	3. 8. 2·8	−11. 5·02							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·60.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM KINGSTOWN.

Chronometer P.

Comparisons at Kingstown.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3	12. 24. 5·0	4. 12. 55·2	−33. 6·81							
				−5·43						−4·65
27. 21					21. 24. 16·0	−33. 10·82	5. 27. 17	12. 32·23		
				−5·43					−6·10	−5·90
29. 3	12. 10. 44·0	3. 51. 58·8	−33. 17·60							
				−6·54					−6·10	−6·43
29. 20					20. 55. 46·0	−33. 22·40	5. 6. 21	12. 31·74		
				−6·54					−6·13	−6·60
31. 3	12. 18. 4·0	3. 51. 41·2	−33. 30·68							
				−5·68					−6·13	−5·54
Aug. 1. 3					3. 47. 5·6	−33. 36·48	12. 6. 24	12. 31·77		
				−5·68					−6·10	−5·82
2. 3	12. 19. 45·0	3. 45. 44·0	−33. 42·02							
				−5·47					−6·10	−6·47
2. 20					20. 41. 32·4	−33. 46·02	5. 7. 21	12. 30·92		
				−5·47						−4·87
4. 3	12. 19. 58·0	3. 38. 18·0	−33. 52·95							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·64.

Chronometer Q.

July 27. 3	12. 25. 22·0	4. 3. 22·4	−22. 17·22							
				+3·46						+3·07
27. 21					21. 18. 58·4	−22. 14·68	5. 32. 55	12. 30·77		
				+3·46					+3·22	+3·70
29. 3	12. 12. 19·5	3. 42. 26·8	−22. 10·36							
				+1·99					+3·22	+2·43
29. 20					20. 49. 56·0	−22. 8·91	5. 11. 45	12. 31·37		
				+1·99					+1·61	+1·73
31. 3	12. 19. 53·0	3. 42. 5·6	−22. 6·38							
				+0·78					+1·61	+1·46
Aug. 1. 3					3. 37. 48·4	−22. 5·59	12. 8. 38	12. 31·72		
				+0·78					+0·28	+0·10
2. 3	12. 20. 54·0	33. 5. 15·62	−22. 4·82							
				+0·73					+0·28	+0·52
2. 20					20. 38. 59·2	−22. 4·29	5. 16. 31	12. 30·90		
				+0·73						+0·85
4. 3	12. 21. 53·5	3. 28. 23·6	−22. 3·36							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·05.

Chronometer R.

July 27. 3	12. 26. 25·0	4. 9. 58·8	−27. 50·79							
				−1·80						−1·14
27. 21					21. 33. 4·8	−27. 52·13	5. 41. 27	12. 32·43		
				−1·80					−2·65	−2·20
29. 3	12. 13. 34·5	3. 49. 25·6	−27. 54·37							
				−2·70					−2·65	−3·41
29. 20					20. 59. 22·8	−27. 56·35	5. 15. 25	12. 31·42		
				−2·70					−1·90	−2·28
31. 3	12. 21. 3·0	3. 49. 8·8	−27. 59·77							
				−1·73					−1·90	−1·43
Aug. 1. 3					3. 45. 56·4	−28. 1·52	12. 10. 51	12. 32·29		
				−1·73					−2·03	−2·03
2. 3	12. 23. 32·0	3. 43. 51·6	−28. 3·22							
				−1·92					−2·03	−2·03
2. 20					20. 48. 10·0	−28. 4·63	5. 19. 43	12. 31·93		
				−1·92						−1·85
4. 3	12. 23. 6·0	3. 35. 39·6	−28. 7·05							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·98.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM KINGSTOWN.

Chronometer S.

Comparisons at Kingstown.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3	12. 27. 56 ·5	4. 2. 37 ·6	−18. 58 ·34							
				+2 ·59						+3 ·01
27. 21					21. 32. 7 ·6	−18. 56 ·41	5. 49. 26	12. 31 ·61		
				+2 ·59					+2 ·29	+2 ·34
29. 3	12. 15. 36 ·0	3. 42. 25 ·6	−18. 53 ·20						+2 ·29	
				+3 ·19	20. 53. 35 ·6	−18. 50 ·87	5. 18. 43	12. 30 ·59		+2 ·21
29. 20									+4 ·85	
				+3 ·19						+3 ·78
31. 3	12. 22. 37 ·0	3. 41. 29 ·6	−18. 46 ·82						+4 ·85	
				+6 ·24						+6 ·19
Aug. 1. 3					3. 41. 9 ·6	−18. 40 ·48	12. 15. 25	12. 31 ·30		
				+6 ·24					+5 ·28	+6 ·29
2. 3	12. 24. 55 ·5	3. 35. 46 ·0	−18. 34 ·35						+5 ·28	
				+3 ·26	20. 45. 2 ·4	−18. 31 ·97	5. 26. 9	12. 31 ·82		+3 ·93
2. 20										
				+3 ·26						+2 ·86
4. 3	12. 26. 10 ·5	3. 29. 4 ·4	−18. 27 ·85							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·33.

Chronometer T.

July 27. 3	12. 29. 4 ·5	4. 8. 15 ·2	−23. 28 ·13							
				+1 ·33						+1 ·85
27. 21					21. 41. 37 ·2	−23. 27 ·13	5. 54. 26	12. 31 ·92		
				+1 ·33					+0 ·86	+1 ·02
29. 3	12. 16. 39 ·5	3. 48. 1 ·2	−23. 25 ·48						+0 ·86	
				+0 ·54	21. 0. 54 ·4	−23. 25 ·08	5. 21. 29	12. 31 ·56		+0 ·60
29. 20									+0 ·20	
				+0 ·54						+0 ·51
31. 3	12. 24. 55 ·0	3. 48. 24 ·8	−23. 24 ·39						+0 ·20	
				−0 ·34						−0 ·18
Aug. 1. 3					3. 48. 52 ·0	−23. 24 ·74	12. 18. 24	12. 31 ·68		
				−0 ·34					−0 ·55	−0 ·50
2. 3	12. 26. 15 ·0	3. 41. 56 ·0	−23. 25 ·07						−0 ·55	
				−0 ·61	20. 52. 48 ·8	−23. 25 ·51	5. 29. 2	12. 31 ·50		−0 ·62
2. 20										
				−0 ·61						−0 ·60
4. 3	12. 27. 31 ·5	3. 35. 23 ·6	−23. 26 ·28							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·52.

Chronometer U.

July 27. 3	12. 30. 24 ·5	4. 6. 37 ·6	−20. 30 ·74							
				+5 ·57						+5 ·20
27. 21					21. 41. 52 ·0	−20. 26 ·57	5. 57. 41	12. 31 ·02		
				+5 ·57					+5 ·70	+5 ·79
29. 3	12. 17. 45 ·5	3. 46. 1 ·2	−20. 19 ·66						+5 ·70	
				+5 ·72	21. 2. 14 ·4	−20. 15 ·48	5. 25. 59	12. 31 ·22		+5 ·55
29. 20									+6 ·30	
				+5 ·72						+5 ·82
31. 3	12. 25. 44 ·5	3. 45. 58 ·0	−20. 8 ·22						+6 ·30	
				+6 ·49						+6 ·89
Aug. 1. 3					3. 49. 13 ·2	−20. 1 ·63	12. 22. 9	12. 31 ·76		
				+6 ·49					+5 ·58	+6 ·09
2. 3	12. 27. 23 ·0	3. 39. 34 ·0	−19. 55 ·25						+5 ·58	
				+4 ·64	20. 51. 12 ·8	−19. 51 ·85	5. 31. 0	12. 31 ·51		+4 ·91
2. 20										
				+4 ·64						+4 ·48
4. 3	12. 29. 59 ·0	3. 34. 10 ·4	−19. 45 ·98							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·33.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM KINGSTOWN.

Chronometer W.

Comparisons at Kingstown.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3	12. 31. 35·5	4. 21. 30·2	−34. 12·53							
				−8·18						−8·23
27. 21					22. 2. 1·4	−34. 18·73	6. 4. 0	12. 31·75		
				−8·18					−7·72	−8·15
29. 3	12. 19. 54·5	4. 2. 19·0	−34. 28·81							
				−8·15					−7·72	−7·00
29. 20					21. 19. 49·8	−34. 34·87	5. 29. 17	12. 32·68		
				−8·15					−8·19	−8·84
31. 3	12. 26. 52·0	4. 1. 42·2	−34. 45·11							
				−7·52					−8·19	−7·38
Aug. 1. 3					4. 6. 31·8	−34. 52·82	12. 24. 37	12. 31·94		
				−7·52					−8·63	−7·66
2. 3	12. 28. 28·5	3. 55. 44·2	−35. 0·13							
				−8·44					−8·63	−9·92
2. 20					21. 14. 31·8	−35. 6·44	5. 39. 5	12. 30·78		
				−8·44						−7·55
4. 3	12. 30. 45·5	3. 50. 27·8	−35. 17·00							

Concluded Longitude of Liverpool from Kingstown = 12ᵐ. 31ˢ·81.

Chronometer X.

July 27. 3	12. 32. 46·0	4. 13. 26·2	−24. 58·23							
				−0·76						−0·92
27. 21					22. 4. 27·8	−24. 58·81	6. 15. 48	12. 31·51		
				−0·76					−0·64	−0·67
29. 3	12. 22. 1·5	3. 54. 56·6	−24. 59·74							
				−0·98					−0·64	−0·60
29. 20					21. 17. 21·0	−25. 0·47	5. 36. 23	12. 31·92		
				−0·98					−0·82	−1·21
31. 3	12. 28. 8·0	3. 53. 14·6	−25. 1·71							
				−0·26					−0·82	−0·33
Aug. 1. 3					4. 3. 50·2	−25. 1·97	12. 31. 47	12. 31·53		
				−0·26					−0·49	−0·19
2. 3	12. 29. 37·0	3. 46. 54·6	−25. 2·22							
				−0·63					−0·49	−0·89
2. 20					21. 7. 3·0	−25. 2·68	5. 41. 41	12. 31·40		
				−0·63						−0·47
4. 3	12. 31. 48·0	3. 41. 16·6	−25. 3·47							

Concluded Longitude of Liverpool from Kingstown = 12ᵐ. 31ˢ·62.

Chronometer Y.

July 27. 3	12. 34. 36·5	4. 11. 12·6	−20. 54·42							
				+3·87						+4·18
27. 21					22. 4. 7·0	−20. 51·49	6. 19. 35	12. 31·38		
				+3·87					+3·23	+3·69
29. 3	12. 23. 17·5	3. 51. 59·4	−20. 46·74							
				+3·06					+3·23	+2·47
29. 20					21. 15. 35·8	−20. 44·46	5. 38. 53	12. 30·70		
				+3·06					+3·74	+3·41
31. 3	12. 29. 22·5	3. 50. 7·8	−20. 40·61							
				+3·65					+3·74	+4·15
Aug. 1. 3					4. 4. 6·2	−20. 36·86	12. 36. 29	12. 31·66		
				+3·65					+3·16	+3·15
2. 3	12. 31. 27·0	3. 44. 15·4	−20. 33·32							
				+3·21					+3·16	+3·17
2. 20					21. 4. 28·2	−20. 30·94	5. 43. 38	12. 31·14		
				+3·21						+3·13
4. 3	12. 33. 18·0	3. 38. 9·8	−20. 26·91							

Concluded Longitude of Liverpool from Kingstown = 12ᵐ. 31ˢ·17.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM KINGSTOWN.

Chronometer Z.

Comparisons at Kingstown.					Comparisons at Liverpool.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3	12. 35. 55·0	4. 13. 32·2	−21. 55·74							
				+2·08						+1·71
27. 21					22. 8. 15·0	−21. 54·16	6. 22. 41	12. 31·53		
				+2·08					+2·60	+2·30
29. 3	12. 24. 22·0	3. 54. 8·6	−21. 51·61							
				+1·90					+2·60	+3·10
29. 20					21. 19. 0·2	−21. 50·20	5. 41. 14	12. 32·67		
				+1·90					+1·55	+1·18
31. 3	12. 30. 35·5	3. 52. 27·8	−21. 47·81							
				+2·05					+1·55	+2·01
Aug. 1. 3					4. 7. 30·6	−21. 45·71	12. 38. 45	12. 31·74		
				+2·05					+1·27	+2·09
2. 3	12. 34. 31·5	3. 48. 29·8	−21. 43·72							
				+0·80					+1·27	+0·18
2. 20					21. 10. 29·4	−21. 43·13	5. 48. 28	12. 31·33		
				+0·80						+1·17
4. 3	12. 34. 33·0	3. 40. 39·8	−21. 42·12							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·79.

Chronometer *a*.

July 27. 3	12. 39. 18·0	4. 20. 28·2	−25. 29·28							
				−0·51						−0·78
27. 21					22. 19. 33·0	−25. 29·67	6. 30. 24	12. 30·79		
				−0·51					−0·42	−0·35
29. 3	12. 25. 29·5	3. 58. 54·6	−25. 30·30							
				−0·35					−0·42	−0·54
29. 20					21. 26. 9·8	−25. 30·56	5. 44. 42	12. 30·85		
				−0·35					−0·11	−0·24
31. 3	12. 31. 42·5	3. 57. 17·8	−25. 30·99							
				−0·25					−0·11	+0·05
Aug. 1. 3					4. 13. 40·2	−25. 31·24	12. 41. 9	12. 31·27		
				−0·25					−0·48	−0·55
2. 3	12. 36. 46·5	3. 54. 32·2	−25. 31·48							
				−0·32					−0·48	−0·39
2. 20					21. 16. 45·0	−25. 31·72	5. 50. 55	12. 30·93		
				−0·32						−0·28
4. 3	12. 35. 48·0	3. 45. 44·6	−25. 32·12							

Concluded Longitude of Liverpool from Kingstown = 12m. 30s·99.

Chronometer *b*.

July 27. 3	12. 41. 15·5	4. 19. 44·2	−22. 48·10							
				+2·09						+2·16
27. 21					22. 20. 5·8	−22. 46·50	6. 33. 41	12. 31·29		
				+2·09					+2·08	+2·05
29. 3	12. 26. 54·5	3. 57. 33·0	−22. 43·94							
				+1·43					+2·08	+2·13
29. 20					21. 24. 39·0	−22. 42·90	5. 46. 0	12. 31·79		
				+1·43					+1·21	+1·01
31. 3	12. 32. 53·0	3. 55. 38·2	−22. 41·09							
				+1·50					+1·21	+1·46
Aug. 1. 3					4. 13. 0·2	−22. 39·55	12. 43. 21	12. 31·22		
				+1·50					+1·35	+1·54
2. 3	12. 38. 6·5	3. 52. 58·6	−22. 38·10							
				+1·88					+1·35	+1·10
2. 20					21. 16. 23·8	−22. 36·70	5. 53. 29	12. 30·69		
				+1·88						+2·35
4. 3	12. 37. 42·5	3. 44. 41·0	−22. 34·34							

Concluded Longitude of Liverpool from Kingstown = 12m. 31s·26.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF LIVERPOOL FROM KINGSTOWN.

Chronometer *d.*

Comparisons at Kingstown.					Comparisons at Liverpool.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Liverpool Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3	12. 42. 46 ·5	4. 18. 6 ·37	−19. 39 ·53							
				+4 ·55						+5 ·57
27. 21					23. 54. 1 ·5	−19. 35 ·75	8. 11. 5	12. 32 ·96		
				+4 ·55					+3 ·91	+3 ·94
29. 3	12. 28. 8 ·5	3. 55. 33 ·36	−19. 30 ·50							
				+2 ·97					+3 ·91	+3 ·86
29. 20					21. 53. 3 ·0	−19. 28 ·23	6. 17. 45	12. 32 ·94		
				+2 ·97					+2 ·73	+2 ·44
31. 3	12. 36. 57 ·5	3. 56. 25 ·5	−19. 24 ·54							
				+3 ·53					+2 ·73	+3 ·10
Aug. 1. 3					4. 21. 53 ·0	−19. 20 ·89	12. 55. 35	12. 31 ·77		
				+3 ·53					+3 ·24	+3 ·96
2. 3	12. 40. 21 ·0	3. 51. 52 ·13	−19. 17 ·49							
				+2 ·96					+3 ·24	+2 ·28
2. 20					21. 18. 35 ·5	−19. 15 ·29	5. 59. 4	12. 31 ·69		
				+2 ·96						+3 ·37
4. 3	12. 39. 15 ·5	3. 42. 51 ·0	−19. 11 ·58							

Concluded Longitude of Liverpool from Kingstown = $12^{m}.32^{s}\cdot21$.

Chronometer *e.*

July 27. 3	12. 45. 0 ·0	4. 24. 30 ·0	−23. 50 ·01							
				−0 ·11						+0 ·45
27. 21					24. 6. 36 ·0	−23. 50 ·10	8. 19. 25	12. 31 ·45		
				−0 ·11					−0 ·52	−0 ·44
29. 3	12. 30. 10 ·5	4. 1. 54 ·75	−23. 50 ·22							
				−1 ·33					−0 ·52	−0 ·65
29. 20					22. 8. 52 ·5	−23. 51 ·24	6. 29. 12	12. 31 ·59		
				−1 ·33					−1 ·29	−1 ·74
31. 3	12. 39. 46 ·5	4. 3. 42 ·38	−23. 52 ·88							
				−1 ·34					−1 ·29	−0 ·73
Aug. 1. 3					4. 32. 25 ·5	−23. 54 ·26	13. 1. 35	12. 31 ·68		
				−1 ·34					−2 ·75	−1 ·95
2. 3	12. 41. 27 ·0	3. 57. 36 ·0	−23. 55 ·54							
				−2 ·46					−2 ·75	−3 ·81
2. 20					21. 30. 15 ·0	−23. 57 ·38	6. 6. 1	12. 30 ·12		
				−2 ·46						−1 ·65
4. 3	12. 40. 46 ·0	3. 49. 10 ·13	−24. 0 ·46							

Concluded Longitude of Liverpool from Kingstown = $12^{m}.31^{s}\cdot06$.

Chronometer *f.*

July 27. 3	12. 47. 12 ·5	4. 30. 18 ·38	−27. 26 ·26							
				−2 ·88						−2 ·66
27. 21					24. 28. 49 ·5	−27. 28 ·71	8. 38. 3	12. 31 ·53		
				−2 ·88					−2 ·85	−3 ·01
29. 3	12. 31. 44 ·0	4. 7. 9 ·75	−27. 31 ·97							
				−2 ·81					−2 ·85	−2 ·58
29. 20					22. 18. 34 ·5	−27. 34 ·15	6. 35. 12	12. 31 ·52		
				−2 ·81					−2 ·93	−2 ·95
31. 3	12. 40. 22 ·5	4. 8. 3 ·0	−27. 37 ·60							
				−3 ·10					−2 ·93	−2 ·91
Aug. 1. 3					4. 40. 23 ·5	−27. 40 ·81	13. 5. 47	12. 31 ·53		
				−3 ·10					−3 ·53	−3 ·29
2. 3	12. 44. 28 ·0	4. 4. 24 ·75	−27. 43 ·79							
				−3 ·20					−3 ·53	−3 ·85
2. 20					21. 52. 48 ·0	−27. 46 ·23	6. 24. 49	12. 30 ·91		
				−3 ·20						−2 ·81
4. 3	12. 42. 52 ·5	3. 55. 6 ·0	−27. 50 ·18							

Concluded Longitude of Liverpool from Kingstown = $12^{m}.31^{s}\cdot36$.

The following Table contains the Results from all the Chronometers.

Reference to Chronometer.	Longitude of Liverpool East of Kingstown.	Sum of Squares of Changes of Rates.	Weight of Result.
	m s		
A	12. 31 ·55	1 ·6975	589
B	12. 31 ·34	14 ·6974	68
C	12. 31 ·49	12 ·6755	79
D	12. 32 ·20	7 ·2062	139
E	12. 31 ·65	18 ·3844	54
F	12. 31 ·69	10 ·0851	99
G	12. 31 ·34	1 ·1730	852
H	12. 31 ·55	12 ·3245	81
I	12. 31 ·42	13 ·8771	72
J	12. 31 ·22	14 ·1856	70
K	12. 31 ·53	4 ·7123	212
*K**	12. 32 ·09	19 ·0702	52
M	12. 31 ·53	3 ·9171	255
N	12. 31 ·71	6 ·4196	156
O	12. 31 ·60	10 ·9293	91
P	12. 31 ·64	6 ·0568	165
Q	12. 31 ·05	4 ·7076	212
R	12. 31 ·98	4 ·9795	201
S	12. 31 ·33	15 ·4633	65
T	12. 31 ·52	1 ·4667	682
U	12. 31 ·33	3 ·8408	260
W	12. 31 ·81	17 ·6490	57
X	12. 31 ·62	1 ·8999	526
Y	12. 31 ·17	4 ·1637	240
Z	12. 31 ·79	9 ·9980	100
a	12. 30 ·99	0 ·7928	1261
b	12. 31 ·26	3 ·2379	309
d	12. 32 ·21	9 ·8654	101
e	12. 31 ·06	12 ·6580	79
f	12. 31 ·36	1 ·9855	504

The sum of weights is 7631

The result for the Longitude of Liverpool Observatory East of the temporary observatory at Kingstown } ..... $12^m. 31^s \cdot 413$

The probable error of this determination, as depending on the unsteadiness of rate of the travelling chronometers ..... } $\pm 0^s \cdot 0164$

It must be borne in mind that this determination is based upon Kingstown transits as observed by Mr. Hind, and Liverpool transits as observed by Mr. Hartnup, and that no correction is yet applied for Personal Equation.

XI. — *Comparisons and Calculations for the Longitude of Kingstown, as determined immediately with reference to Greenwich.*

The chronometers on arriving at Greenwich in the evening, were immediately compared with the transit-clock (in every instance except on July $25^d.\ 10^h$); and immediately before leaving Greenwich in the morning they were again compared with the transit-clock. They reached Kingstown the next morning; but at Kingstown they were compared only once (excepting on July 20 and 21, when they were detained a day longer than usual). They left Kingstown in the evening, and arrived at Greenwich the next evening. Thus, in general, a stationary rate was obtained from the comparisons at Greenwich, but none was obtained from those at Kingstown.

For the calculation, it was supposed that the stationary rates were independent of the travelling rates, and that (so far as they were unknown) they might be assumed to follow the same law as that assumed for travelling rates, namely, that the sum of squares of change of rate is minimum. This evidently gave, for every stationary rate at Kingstown, a value equal to the mean of the stationary rates preceding and following it at Greenwich. In the first instance of all, the first Greenwich stationary rate was carried back for use in the first Kingstown stationary interval; and in the last instances of all (the last Greenwich stationary rate having been lost for want of the comparison at July $25^d.\ 10^h$), the stationary rate between July $22^d.\ 10^h$ and $22^d.\ 19^h$ was used for the subsequent rests both at Greenwich and at Kingstown. And the Kingstown stationary rate derived from the Kingstown comparisons at July $20^d.\ 9^h$ and $21^d.\ 5^h$ was used for the whole Kingstown rest, from July $19^d.\ 19^h$ to July $21^d.\ 7^h$. In this way the whole of the stationary rates were adopted.

The next point was, to fix upon the intervals which should be used respectively for the stationary rates and for the travelling rates. Upon examining the times of arrival and departure of the chronometers, it appeared that the journey from Greenwich to Kingstown occupied nearly 24 hours,

while that from Kingstown to Greenwich occupied nearly 27 hours. For convenience, therefore, the following supposition was made. It was assumed that the applicability of the Greenwich stationary rate terminated at the moment of the chronometer's comparison before leaving Greenwich, and that the travelling rate then applied for 24 hours exactly. It was also assumed that the next travelling rate applied for 27 hours exactly before the moment of the chronometer's comparison on arrival at Greenwich. To the space intervening between the end of the 24 hours and the beginning of the 27 hours, the Kingstown stationary rate was supposed to apply.

In the particular case of July $25^d.\ 10^h$, when no comparison was made at Greenwich, the adoption of a time for the end of the 27 hours was unimportant, because the same stationary rate was held to apply to the rests at Kingstown and Greenwich which preceded and followed it.

The intervals to which the stationary rates applied being thus adopted, and proportionate parts of the stationary rates for these intervals being taken, and being subtracted from the whole chronometer's loss between two comparisons at the same place, the remainder was the chronometer's loss in 51 hours, from which an apparent travelling rate was obtained. This was then treated on the principles explained in Section VIII., the successive equations being,

$$24\,x_1 + 27\,x_2 = 51\,a_1$$
$$27\,x_2 + 24\,x_3 = 51\,b_2$$
$$24\,x_3 + 27\,x_4 = 51\,a_3,$$
$$\&c.\quad \&c.$$

and therefore, if we make

$$A_1 = a_1$$
$$A_2 = -\frac{9}{8}(b_2 - a_1)$$
$$A_3 = a_3 - b_2 + a_1$$
$$A_4 = -\frac{9}{8}(b_4 - a_3 + b_2 - a_1)$$
$$A_5 = a_5 - b_4 + a_3 - b_2 + a_1$$
$$A_6 = -\frac{9}{8}(b_6 - a_5 + b_4 - a_3 + b_2 - a_1),$$
$$\&c.\quad \&c.$$

we obtain

$$x_1 - x_2 = \frac{17}{9} x_1 - \frac{17}{9} A_1$$

$$x_3 - x_2 = \frac{17}{9} x_1 - \frac{17}{9} (A_2 + A_1)$$

$$x_3 - x_4 = \frac{17}{9} x_1 - \frac{17}{9} (A_3 + A_2)$$

$$x_5 - x_4 = \frac{17}{9} x_1 - \frac{17}{9} (A_4 + A_3)$$

$$x_5 - x_6 = \frac{17}{9} x_1 - \frac{17}{9} (A_5 + A_4),$$

&c. &c.

and making the sum of the squares minimum,

$$(n-1)\, x_1 = 2A_1 + 2A_2 + \text{\&c.}, + A_{n-1},$$

from which x_1 is determined; and x_2, x_3, &c., are immediately found by the first equations.

The probable error of change of rate will be,

$$\frac{\pm\, 0{\cdot}6745}{17} \times \sqrt{\text{minimum sum of squares of changes of rate}};$$

Now the weight W has been taken,

$$= \frac{1000}{\text{minimum sum of squares of changes of rate}};$$

and hence the probable error of change of rate,

$$= \frac{\pm\, 0{\cdot}6745}{17} \times \sqrt{\frac{1000}{W}}.$$

And the probable error of x_1

$$= \pm \frac{9}{17} \times \frac{0{\cdot}6745}{17} \times \sqrt{\frac{1000}{W}}.$$

The rate x_1 is used for 24 hours exactly; and hence the probable error of the longitude determined from it is,

$$\pm \frac{9}{17} \times \frac{0{\cdot}6745}{17} \times \sqrt{\frac{1000}{W}}.$$

And from this we deduce, in the same manner as before, that the probable error in the result obtained by combining the results of all the chronometers with the respective weights, W_A, W_B, &c., is

$$\pm \frac{9}{17} \times \frac{0{\cdot}6745}{17} \times \sqrt{\frac{1000}{W_A + W_B + \&c.}}.$$

In explanation of the following tables it is necessary to remark that several comparisons of each chronometer, with the transit clock or with the stationary chronometer $\frac{1}{2}\,\Sigma$ at Kingstown, were usually taken at the same time, and that in some instances there was a trifling discordance among them, so that no one could be selected for printing which gave the same result as the mean of all, and then a small addition has sometimes been made in the second place of decimals.

The chronometer L failed before the last double trip; and the sum of squares was increased by $\frac{1}{4}$ part before its weight was taken.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

Chronometer A.

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
June d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
26. 19	1. 4. 49	18. 43. 4·4	+0. 0·63							
				+1·11						+0·82
27. 19										
									+2·88	
27. 22					22. 18. 4·8	+0. 2·31	4. 43. 12·5	24. 31·62		
									+2·88	
28. 7										
				+1·11					+1·60	+1·37
29. 10	17. 15. 23	10. 43. 6·4	+0. 4·54							
				+2·88						
30. 19	1. 32. 12	18. 54. 35·6	+0. 8·40						+1·60	+1·86
				+1·26						
July 1. 19										
									+2·34	
2. 1					1. 22. 32·0	+0. 10·28	8. 4. 1·0	24. 30·56		
									+2·34	
2. 7										
				+1·26					+1·20	+0·73
3. 10	17. 15. 9	10. 27. 5·2	+0. 12·30							
				+1·79						
3. 19	2. 8. 19	19. 18. 47·6	+0. 12·96						+1·20	+1·73
				+1·58						
4. 19									+1·02	
					1. 47. 28·8	+0. 14·85	8. 40. 52·5	24. 31·05		
5. 2									+1·02	
5. 7									+1·15	+1·45
				+1·58						
6. 10	17. 27. 3	10. 27. 8·4	+0. 16·85							
				+0·25						
7. 19	2. 34. 45	19. 29. 26·0	+0. 17·19							
				+1·17					+1·15	+0·82
8. 19										
									+1·32	
9. 3					3. 5. 22·4	+0. 18·75	10. 14. 44·0	24. 31·50		
									+1·32	
9. 7										
				+1·17					+1·41	+1·48
10. 10	17. 32. 42	10. 17. 4·0	+0. 20·31							
				+2·38						
10. 19	2. 43. 9	19. 26. 0·4	+0. 21·22							
				+1·56					+1·41	+1·33
11. 19										
									+1·41	
12. 3					2. 57. 48·0	+0. 23·22	10. 18. 58·5	24. 31·38		
									+1·41	
12. 7										
				+1·56					+1·29	+1·76
13. 10	17. 42. 59	10. 15. 30·4	+0. 25·23							
				+0·43						
14. 19	3. 3. 1	19. 30. 5·6	+0. 25·83							
				+1·04					+1·29	+0·76
15. 19										
									+0·50	
16. 4					4. 3. 20·4	+0. 27·10	11. 40. 27·0	24. 31·48		
									+0·50	
16. 7										
				+1·04					+0·96	+1·30
17. 10	17. 52. 57	10. 9. 44·8	+0. 28·28							
				+0·56						
18. 19	3. 18. 4	19. 29. 24·4	+0. 29·06							
				+1·16					+0·96	+0·59
19. 19										
									+1·12	

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER A.—*continued.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 9					9. 11. 18·0	+0. 30·84	17. 5. 0·5	24. 31·72		
21. 7									+1·12	
22. 10	18. 28. 20	10. 25. 24·4	+0. 33·19	+1·16					+2·30	+1·67
				+2·46						
18. 19	3. 18. 4	19. 29. 24·4	+0. 29·06							
19. 19				+1·16					+0·96	+0·59
21. 5							(Kingstown Transit Clock)		+1·12	
21. 7					5. 23. 26·0	+0. 31·81	12. 56. 29·0	24. 31·75	+1·12	
22. 10	18. 28. 20	10. 25. 24·4	+0. 33·19	+1·16					+2·30	+1·67
				+2·46						
22. 19	3. 19. 1	19. 14. 38·0	+0. 34·10	+2·33					+2·30	+3·01
23. 19							($\frac{1}{2}\Sigma$.)		+2·46	
24. 3					2. 55. 8·46	+0. 37·22	11. 3. 39·0	24. 30·49	+2·46	
24. 7				+2·33					+1·82	+1·73
25. 10				+2·46						
25. 19	3. 19. 54	19. 3. 39·6	+0. 41·20						+1·82	+1·93
26. 19									+2·46	
27. 3					3. 34. 57·2	+0. 44·35	11. 55. 26·0	24. 31·53		

Concluded Longitude of Kingstown from Greenwich = $24^{m}.31^{s}\cdot18$ West.

CHRONOMETER B.

June 26. 19	1. 6. 11	18. 38. 5·0	+6. 21·81							
27. 19				+3·45						+3·30
27. 22					22. 14. 31·2	+6. 25·48	4. 46. 3·0	24. 31·16	+2·24	
28. 7									+2·24	
29. 10	17. 16. 33	10. 37. 50·4	+6. 30·35	+3·45					+3·73	+3·59
30. 19	1. 33. 44	18. 49. 42·4	+6. 33·35	+2·24						
July 1. 19				+3·52					+3·73	+3·90
2. 1					1. 18. 50·0	+6. 37·52	8. 6. 46·5	24. 30·76	+2·30	
2. 7									+2·30	
				+3·52					+4·35	+3·18

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER B.—*continued.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
3. 10	17. 16. 45	10. 22. 11 ·2	+6. 42 ·04							
				+2 ·36						
3. 19	2. 9. 48	19. 13. 46 ·4	+6. 42 ·91							
				+5 ·69					+4 ·35	+5 ·66
4. 19										
									+2 ·14	
5. 2					1. 47. 14 ·0	+6. 49 ·29	8. 47. 13 ·0	24. 31 ·23		
									+2 ·14	
5. 7										
				+5 ·69					+4 ·88	+5 ·72
6. 10	17. 28. 10	10. 21. 36 ·0	+6. 56 ·06							
				+1 ·92						
7. 19	2. 36. 30	19. 24. 29 ·2	+6. 58 ·71							
				+3 ·86					+4 ·88	+3 ·94
8. 19										
									+2 ·15	
9. 3					3. 1. 26 ·4	+7. 3 ·36	10. 17. 33 ·5	24. 31 ·07		
									+2 ·15	
9. 7										
				+3 ·86					+4 ·34	+3 ·79
10. 10	17. 33. 43	10. 11. 17 ·2	+7. 7 ·95							
				+2 ·38						
10. 19	2. 44. 8	19. 20. 11 ·6	+7. 8 ·86							
				+5 ·13					+4 ·34	+4 ·96
11. 19										
									+2 ·26	
12. 3					2. 52. 54 ·0	+7. 14 ·86	10. 20. 56 ·5	24. 31 ·34		
									+2 ·26	
12. 7										
				+5 ·13					+4 ·98	+5 ·28
13. 10	17. 44. 10	10. 9. 45 ·6	+7. 20 ·83							
				+2 ·13						
14. 19	3. 4. 34	19. 24. 40 ·4	+7. 23 ·77							
				+5 ·00					+4 ·98	+4 ·64
15. 19										
									+2 ·25	
16. 4					3 58. 20 ·4	+7. 29 ·82	11. 42. 30 ·0	24. 31 ·54		
									+2 ·25	
16. 7										
				+5 ·00					+5 ·60	+5 ·32
17. 10	17. 54. 14	10. 3. 54 ·4	+7. 35 ·47							
				+2 ·37						
18. 19	3. 19. 54	19. 24. 4 ·4	+7. 38 ·76							
				+6 ·10					+5 ·60	+5 ·91
19. 19										
									+3 ·12	
20. 9					9. 9. 21 ·2	+7. 46 ·36	17. 10. 21 ·0	24. 30 ·81		
									+3 ·12	
21. 7										
				+6 ·10					+6 ·44	+6 ·27
22. 10	18. 29. 33	10. 19. 14 ·0	+7. 56 ·39							
				+3 ·77						
18. 19	3. 19. 54	19. 24. 4 ·4	+7. 38 ·76							
				+6 ·10					+5 ·60	+5 ·91
19. 19							(Kingstown Transit Clock)			
									+3 ·12	
21. 5					5. 20. 15 ·2	+7. 50 ·46	13. 0. 37 ·0	24. 32 ·28		
									+3 ·12	
21. 7										
				+6 ·10					+6 ·44	+6 ·27
22. 10	18. 29. 33	10. 19. 14 ·0	+7. 56 ·39							

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER B.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
22. 19	3. 20. 55	19. 9. 8·0	+7. 57·78	+3·77						
23. 19				+6·70					+6·44	+6·64
24. 3									+3·77	
24. 7					2. 51. 4·4	+8. 5·45	11. 7. 3·5	24. 30·71	+3·77	
25. 10				+6·70					+6·03	+6·76
25. 19	3. 20. 53	18. 57. 4·4	+8. 15·25	+3·77						
26. 19									+6·03	+5·21
27. 3					3. 29. 2·8	+8. 23·00	11. 57. 10·0	24. 32·06	+3·77	

Concluded Longitude of Kingstown from Greenwich = $24^{m}.31^{s}\cdot02$ West.

CHRONOMETER C.

June										
26. 19	1. 7. 25	18. 42. 26·0	+3. 14·60	+3·04						
27. 19										+2·96
27. 22					22. 19. 58·0	+3. 18·59	4. 48. 23·0	24. 31·45	+5·23	
28. 7				+3·04					+5·23	
29. 10	17. 18. 6	10. 42. 29·6	+3. 23·90	+5·23					+3·17	+3·11
30. 19	1. 36. 26	18. 55. 26·4	+3. 30·92	+2·19						
July 1. 19									+3·17	+3·24
2. 1					1. 24. 58·0	+3. 34·37	8. 9. 52·5	24. 30·11	+4·78	
2. 7				+2·19					+4·78	
3. 10	17. 17. 44	10. 26. 14·0	+3. 38·08	+4·32					+2·71	+1·26
3. 19	2. 11. 19	19. 18. 20·4	+3. 39·67	+3·66						
4. 19									+2·71	+4·34
5. 2					1. 52. 4·0	+3. 44·30	8. 48. 59·0	24. 30·53	+3·48	
5. 7				+3·66					+3·48	
6. 10	17. 29. 37	10. 26. 9·6	+3. 49·23	+2·64					+2·90	+3·05
7. 19	2. 39. 15	19. 30. 19·6	+3. 52·86	+3·22						
8. 19									2·90	+2·73
9. 3					3. 5. 34·0	+3. 57·21	10. 18. 34·5	24. 31·69	+3·64	
9. 7				+3·22					+3·64	
10. 10	17. 35. 20	10. 16. 0·4	+4. 1·50						+3·47	+3·66

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER C.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
				+4·64						
10. 19	2. 45. 17	19. 24. 26·0	+4. 3·27	+3·45					+3·47	+3·28
11. 19									+4·20	
12. 3					2. 58. 18·0	+4. 7·94	10. 23. 14·0	24. 31·30	+4·20	
12. 7				+3·45					+2·75	+3·62
13. 10	17. 45. 16	10. 13. 59·6	+4. 12·66	+3·75						
14. 19	3. 5. 35	19. 28. 47·2	+4. 17·81	+2·57					+2·75	+1·77
15. 19									+4·05	
16. 4					4. 4. 4·4	+4. 21·68	11. 45. 6·0	24. 31·82	+4·05	
16. 7				+2·57					+2·93	+3·28
17. 10	17. 55. 40	10. 8. 30·4	+4. 25·24	+4·34						
18. 19	3. 20. 43	19. 28. 0·8	+4. 31·23	+3·32					+2·93	+2·54
19. 19									+2·08	
20. 9					9. 13. 59·2	+4. 35·61	17. 11. 47·5	24. 31·81	+2·08	
21. 7				+3·32					+4·70	+4·02
22. 10	18. 30. 45	10. 23. 40·8	+4. 41·39	+3·47						
18. 19	3. 20. 43	19. 28. 0·8	+4. 31·23							
19. 19				+3·32			(Kingstown Transit Clock)		+2·93	+2·54
21. 5					5. 26. 10·4	+4. 37·98	13. 3. 20·0	24. 32·43	+2·08	
21. 7									+2·08	
22. 10	18. 30. 45	10. 23. 40·8	+4. 41·39	+3·32					+4·70	+4·02
				+3·47						
22. 19	3. 21. 38	19. 13. 6·0	+4. 42·67	+5·38					+4·70	+5·47
23. 19							($\frac{1}{2}\Sigma$.)		+3·47	
24. 3					2. 55. 48·8	+4. 48·99	11. 8. 31·5	24. 30·89	+3·47	
24. 7				+5·38					+5·42	+5·30
25. 10				+3·47						
25. 19	3. 21. 45	19. 1. 14·4	+4. 57·11						+5·42	+5·55
26. 19									+3·47	
27. 3					3. 34. 29·6	+5. 3·51	11. 59. 19·0	24. 30·72		

Concluded Longitude of Kingstown from Greenwich = 24m. 31s·22 West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER D.

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
June d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
26. 19	1. 8.54	18.45.34·4	+1.34·97							
				+0·89						+1·42
27. 19										
									+0·37	
27. 22					22.23.48·0	+1.35·87	4.50.31·5	24.30·58		
									+0·37	
28. 7										
				+0·89					+0·32	+0·42
29. 10	17.19.33	10.45.43·2	+1.37·06							
				+0·37						
30. 19	1.37.26	18.58.19·6	+1.37·56							
				+0·13					+0·32	+0·21
July 1. 19										
									+0·81	
2. 1					1.27.50·8	+1.37·90	8.10.48·0	24.31·08		
									+0·81	
2. 7										
				+0·13					+1·01	+0·06
3. 10	17.19. 6	10.29.35·6	+1.38·26							
				+1·25						
3. 19	2.12. 9	19.21.11·2	+1.38·72						+1·01	+2·08
				+1·07						
4. 19									+1·55	
5. 2					1.56. 4·4	+1.40·20	8.50.56·0	24.30·14		
									+1·55	
5. 7										
				+1·07					+0·97	+0·17
6. 10	17.31. 7	10.29.46·8	+1.41·78							
				+1·84						
7. 19	2.40. 9	19.33.22·0	+1.44·31						+0·97	+1·87
				+2·40						
8. 19									+3·02	
9. 3					3.10.27·6	+1.47·63	10.21.19·0	24.31·66		
									+3·02	
9. 7										
				+2·40					+2·96	+2·87
10. 10	17.36.34	10.19.24·8	+1.50·89							
				+4·20						
10. 19	2.46.20	19.27.39·6	+1.52·49						+2·96	+3·06
				+2·73						
11. 19									+2·82	
12. 3					3. 2.40·0	+1.56·12	10.25.25·0	24.30·84		
									+2·82	
12. 7										
				+2·73					+2·53	+2·44
13. 10	17.46.18	10.17.14·4	+1.59·68							
				+1·44						
14. 19	3. 6.27	19.31.55·2	+2. 1·67						+2·53	+2·63
				+3·06						
15. 19									+1·51	
16. 4					4. 7.16·4	+2. 5·40	11.46. 2·0	24.31·70		
									+1·51	
16. 7										
				+3·06					+3·12	+3·44
17. 10	17.56.33	10.11.39·6	+2. 8·89							
				+1·58						
18. 19	3.21.37	19.31.14·8	+2.11·08							
				+3·68					+3·12	+2·76
19. 19										

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER D.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 9					9.20.40·8	+2.15·83	17.16.10·0	24.31·84	+2·16	
									+2·16	
21. 7				+3·68					+4·69	+4·50
22.10	18.32.30	10.27.44·8	+2.22·10	+2·80						
18.19	3.21.37	19.31.14·8	+2.11·08							
				+3·68					+3·12	+2·76
19.19							(Kingstown Transit Clock)			
21. 5					5.31.49·6	+2.18·38	13. 6.40·0	24.32·57	+2·16	
									+2·16	
21. 7				+3·68					+4·69	+4·50
22.10	18.32.30	10.27.44·8	+2.22·10							
				+2·80						
22.19	3.22.25	19.16.12·4	+2.23·13	+5·27					+4·69	+4·91
23.19							($\frac{1}{2}\Sigma$.)			
24. 3					3. 0.47·6	+2.29·11	11.11.10·5	24.31·24	+2·80	
									+2·80	
24. 7				+5·27					+4·18	+5·59
25.10				+2·80						
25.19	3.22.36	19. 4.25·6	+2.36·76						+4·18	+2·59
26.19									+2·80	
27. 3					3.38. 0·4	+2.42·81	12. 0.26·5	24.33·51		

Concluded Longitude of Kingstown from Greenwich = $24^{m}.31^{s}\cdot16$ West.

CHRONOMETER E.

June 26.19	1.10.56	18.49.14·8	−0. 3·77							
				+0·94						+0·92
27.19									−1·75	
27.22					22.27.51·2	−0. 3·32	4.52.55·5	24.30·97	−1·75	
28. 7				+0·94					+0·99	+0·96
29.10	17.21.54	10.49.43·6	−0. 2·72	−1·75						
30.19	1.38.44	19. 1.20·0	−0. 5·06	+0·90					+0·99	+1·03
July 1.19									−1·54	
2. 1					1.31.42·4	−0. 4·52	8.12.57·5	24.31·11	−1·54	
2. 7				+0·90					+0·67	+0·79

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER E.—*continued.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
3. 10	17. 20. 14	10. 32. 25·6	−0. 3·94							
				−1·33						
3. 19	2. 13. 6	19. 23. 51·2	−0. 4·43						+0·67	+0·54
				+0·70						
4. 19									−1·45	
					1. 59. 49·6	−0. 4·07	8. 52. 56·0	24. 31·41		
5. 2									−1·45	
5. 7									+0·57	+0·84
				+0·70						
6. 10	17. 32. 41	10. 33. 6·0	−0. 3·68							
				−1·56						
7. 19	2. 41. 3	19. 36. 6·0	−0. 5·84						+0·57	+0·26
				+0·27						
8. 19									−1·82	
					3. 13. 41·2	−0. 5·99	10. 22. 39·5	24. 31·36		
9. 3									−1·82	
9. 7									−0·29	+0·28
				+0·27						
10. 10	17. 38. 2	10. 22. 49·6	−0. 6·16							
				−2·07						
10. 19	2. 47. 52	19. 31. 10·8	−0. 6·95						−0·29	−0·93
				−0·51						
11. 19									−1·21	
					3. 6. 48·4	−0. 7·80	10. 27. 29·0	24. 31·65		
12. 3									−1·21	
12. 7									−0·21	−0·14
				−0·51						
13. 10	17. 48. 14	10. 21. 18·4	−0. 8·63							
				−0·34						
14. 19	3. 7. 30	19. 35. 8·8	−0. 9·10						−0·21	−0·28
				−0·82						
15. 19									−1·00	
					4. 12. 11·6	−0. 10·26	11. 48. 43·0	24. 30·67		
16. 4									−1·00	
16. 7									−0·58	−1·30
				−0·82						
17. 10	17. 57. 53	10. 15. 19·6	−0. 11·33							
				−1·65						
18. 19	3. 23. 27	19. 35. 29·2	−0. 13·62						−0·58	+0·22
				−0·20						
19. 19									−0·69	
					9. 26. 2·8	−0. 14·25	17. 19. 3·5	24. 30·72		
20. 9									−0·69	
21. 7									−0·32	−0·57
				−0·20						
22. 10	18. 33. 35	10. 31. 26·8	−0. 15·08							
				−1·95						
18. 19	3. 23. 27	19. 35. 29·2	−0. 13·62							
				−0·20					−0·58	+0·22
19. 19							(Kingstown Transit Clock)		−0·69	
					5. 36. 33·6	−0. 14·59	13. 8. 53·0	24. 30·96		
21. 5									−0·69	
21. 7									−0·32	−0·57
				−0·20						
22. 10	18. 33. 35	10. 31. 26·8	−0. 15·08							

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

Chronometer E.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
22. 19	3. 23. 13	19. 19. 39·2	−0. 15·80	−1·95						
23. 19				+0·41					−0·32	−0·04
24. 3					3. 4. 52·4	−0. 16·16	11. 12. 30·0	24. 31·49	−1·95	
24. 7									−1·95	
25. 10				+0·41					+0·77	+0·81
25. 19	3. 23. 42	19. 8. 24·8	−0. 16·62	−1·95						
26. 19									+0·77	+0·73
27. 3					3. 42. 0·8	−0. 16·98	12. 1. 30·0	24. 30·78	−1·95	

Concluded Longitude of Kingstown from Greenwich = $24^{m}.\ 31^{s}\cdot17$ West.

Chronometer F.

June 26. 19	1. 11. 56	18. 48. 32·0	+1. 38·86	+0·64						
27. 19										+0·09
27. 22					22. 28. 32·8	+1. 39·57	4. 55. 19·5	24. 31·85	+0·51	
28. 7									+0·51	
29. 10	17. 23. 1	10. 49. 7·2	+1. 40·50	+0·64					+1·89	+1·13
30. 19	1. 39. 40	19. 0. 29·6	+1. 41·19	+0·51						
July 1. 19				−1·67					+1·89	+2·75
2. 1					1. 32. 9·6	+1. 43·07	8. 15. 13·5	24. 30·27	+0·64	
2. 7									+0·64	
3. 10	17. 21. 26	10. 31. 48·4	+1. 45·07	+1·67					+0·06	+0·71
3. 19	2. 14. 30	19. 23. 25·2	+1. 45·35	+0·76						
4. 19				−0·22					+0·06	−0·68
5. 2					2. 0. 33·2	+1. 45·25	8. 55. 29·0	24. 31·74	+0·49	
5. 7									+0·49	
6. 10	17. 33. 54	10. 32. 30·0	+1. 45·14	−0·22					+0·06	+0·18
7. 19	2. 41. 52	19. 35. 3·6	+1. 45·43	+0·21						
8. 19				+0·59					+0·06	−0·08
9. 3					3. 13. 46·4	+1. 46·15	10. 24. 36·5	24. 32·01	+0·34	
9. 7									+0·34	
10. 10	17. 39. 14	10. 22. 8·4	+1. 46·85	+0·59					+1·86	+1·19

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER F.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
10. 19	2. 50. 26	19. 31. 50·4	+1. 47·03	+0·47						
11. 19				+2·63					+1·86	+2·62
12. 3									−0·21	
12. 7					3. 7. 10·8	+1. 49·80	10. 29. 49·5	24. 31·53	−0·21	
13. 10	17. 49. 43	10. 20. 46·0	+1. 52·52	+2·63					+1·47	+2·64
14. 19	3. 8. 47	19. 34. 25·2	+1. 51·29	−0·89						
15. 19				+0·83					+1·47	+0·15
16. 4					4. 11. 14·0	+1. 52·10	11. 49. 46·5	24. 32·12	−0·40	
16. 7									−0·40	
17. 10	17. 59. 11	10. 14. 33·2	+1. 52·86	+0·83					+1·49	+1·43
18. 19	3. 24. 31	19. 34. 26·4	+1. 53·00	+0·10						
19. 19				+0·60					+1·49	+1·56
20. 9					9. 25. 29·6	+1. 53·24	17. 20. 38·5	24. 30·27	−0·47	
21. 7									−0·47	
22. 10	18. 34. 31	10. 30. 14·0	+1. 53·57	+0·60					+0·23	−0·25
				−0·84						
18. 19	3. 24. 31	19. 34. 26·4	+1. 53·00							
19. 19				+0·60			(Kingstown Transit Clock)		+1·49	+1·56
21. 5									−0·47	
21. 7					5. 35. 4·38	+1. 53·38	13. 9. 32·0	24. 30·80	−0·47	
22. 10	18. 34. 31	10. 30. 14·0	+1. 53·57	+0·60					+0·23	−0·25
				−0·84						
22. 19	3. 24. 5	19. 18. 22·0	+1. 53·26	+1·27					+0·23	+0·77
23. 19							($\frac{1}{2}\Sigma$.)		−0·84	
24. 3					3. 4. 36·0	+1. 54·11	11. 14. 24·0	24. 31·67	−0·84	
24. 7				+1·27					+2·46	+1·71
25. 10				−0·84						
25. 19	3. 24. 36	19. 7. 6·8	+1. 55·23						+2·46	+3·30
26. 19									−0·84	
27. 3					3. 41. 12·4	+1. 56·10	12. 2. 56·5	24. 29·18		

Concluded Longitude of Kingstown from Greenwich = 24m. 31s·31 West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER G.

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
June d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
26. 19	1. 14. 26	18. 51. 34·4	+1. 6·07							
				+1·41						+1·32
27. 19									+1·98	
27. 22					22. 31. 22·4	+1. 7·84	4. 57. 38·5	24. 31·10	+1·98	
28. 7									+1·80	+1·49
29. 10	17. 25. 15	10. 51. 51·2	+1. 10·13	+1·41						
				+1·98						
30. 19	1. 40. 53	19. 2. 10·8	+1. 12·79						+1·80	+2·15
July 1. 19				+1·81					+1·75	
2. 1					1. 35. 42·4	+1. 15·07	8. 18. 18·5	24. 30·57	+1·75	
2. 7									+1·64	+1·51
3. 10	17. 22. 25	10. 33. 14·8	+1. 17·53	+1·81						
				+1·51						
3. 19	2. 16. 3	19. 25. 25·2	+1. 18·09						+1·64	+1·79
4. 19				+1·77					+1·72	
5. 2					2. 2. 32·0	+1. 20·33	8. 57. 4·0	24. 30·87	+1·72	
5. 7									+1·69	+1·75
6. 10	17. 35. 15	10. 34. 13·2	+1. 22·72	+1·77						
				+1·92						
7. 19	2. 43. 35	19. 37. 6·4	+1. 25·36						+1·69	+1·62
8. 19				+1·97					+1·95	
9. 3					3. 16. 36·4	+1. 27·96	10. 27. 9·5	24. 31·23	+1·95	
9. 7									+2·34	+2·28
10. 10	17. 40. 5	10. 23. 15·6	+1. 30·52	+1·97						
				+1·97						
10. 19	2. 51. 22	19. 33. 2·0	+1. 31·27						+2·34	+2·40
11. 19				+2·20					+1·89	
12. 3					3. 9. 44·8	+1. 34·09	10. 32. 9·0	24. 30·70	+1·89	
12. 7									+2·29	+2·02
13. 10	17. 51. 6	10. 22. 24·4	+1. 36·89	+2·20						
				+1·81						
14. 19	3. 10. 33	19. 36. 22·8	+1. 39·40						+2·29	+2·60
15. 19				+2·41					+1·97	
16. 4					4. 14. 15·2	+1. 42·55	11. 52. 40·0	24. 30·73	+1·97	
16. 7									+1·56	+2·24
17. 10	18. 0. 13	10. 15. 42·4	+1. 45·49	+2·41						
				+2·13						
18. 19	3. 25. 33	19. 35. 32·8	+1. 48·44						+1·56	+0·79
19. 19				+2·08						

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER G.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 9					9. 28. 5·6	+1. 52·24	17. 23. 12·0	24. 32·19	+2·93	
21. 7									+2·93	
22. 10	18. 36. 41	10. 32. 20·0	+1. 57·23	+2·08					+4·32	+3·23
				+2·42						
18. 19	3. 25. 33	19. 35. 32·8	+1. 48·44							
19. 19				+2·08					+1·56	+0·79
21. 5							(Kingstown Transit Clock)		+2·93	
21. 7					5. 37. 49·0	+1. 54·29	13. 12. 17·0	24. 31·78	+2·93	
22. 10	18. 36. 41	10. 32. 20·0	+1. 57·23	+2·08					+4·32	+3·23
22. 19	3. 24. 58	19. 19. 10·0	+1. 58·12	+2·42						
23. 19				+5·22					+4·32	+5·55
24. 3							($\frac{1}{2}\Sigma$.)		+2·42	
24. 7					3. 7. 40·8	+2. 3·87	11. 17. 40·5	24. 30·25	+2·42	
25. 10				+5·22					+4·45	+4·93
25. 19	3. 25. 27	19. 7. 41·6	+2. 11·30	+2·42						
26. 19									+4·45	+3·91
27. 3					3. 42. 8·8	+2. 17·16	12. 4. 11·5	24. 31·86	+2·42	

Concluded Longitude of Kingstown from Greenwich = 24m. 30s·91 West.

CHRONOMETER H.

June 26. 19	1. 15. 28	18. 44. 46·4	+8. 55·90							
27. 19				+7·62						+7·42
27. 22					22. 26. 5·6	+9. 3·90	5. 0. 18·5	24. 30·80	+4·68	
28. 7									+4·68	
29. 10	17. 27. 13	10. 45. 44·4	+9. 14·62	+7·62					+6·47	+7·80
30. 19	1. 42. 45	18. 55. 54·4	+9. 20·89	+4·68						
July 1. 19				+5·37					+6·47	+4·98
2. 1					1. 28. 10·4	+9. 27·71	8. 18. 58·5	24. 31·32	+5·39	
2. 7									+5·39	
				+5·37					+5·98	+5·72

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER H.—*continued.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
3. 10	17. 23. 53	10. 26. 25·0	+ 9. 35·08							
				+6·10						
3. 19	2. 17. 0	19. 18. 2·8	+ 9. 37·34							
				+6·82						
4. 19									+5·98	+6·27
5. 2					1. 56. 12·0	+ 9. 45·66	8. 59. 9·0	24. 31·55	+5·25	
5. 7									+5·25	
				+6·82						
6. 10	17. 36. 19	10. 26. 45·2	+ 9. 54·54						+7·35	+7·31
				+4·40						
7. 19	2. 44. 38	19. 29. 34·0	+10. 0·59							
				+7·02					+7·35	+7·40
8. 19										
9. 3					3. 10. 57·6	+10. 9·25	10. 30. 13·0	24. 30·72	+4·82	
9. 7									+4·82	
				+7·02						
10. 10	17. 41. 21	10. 15. 44·0	+10. 17·90						+6·54	+6·68
				+5·24						
10. 19	2. 52. 24	19. 25. 15·2	+10 19·90							
				+6·48					+6·54	+6·38
11. 19										
12. 3					3. 2. 50·8	+10. 28·20	10. 34. 9·0	24. 31·13	+5·70	
12. 7									+5·70	
				+6·48						
13. 10	17. 52. 37	10. 14. 55·6	+10. 36·45						+6·81	+6·57
				+6·15						
14. 19	3. 12. 10	19. 28. 54·0	+10. 44·93							
				+6·32					+6·81	+7·08
15. 19										
16. 4					4. 6. 29·2	+10. 53·31	11. 54. 5·5	24. 30·21	+5·65	
16. 7									+5·65	
				+6·32						
17. 10	18. 1. 16	10. 7. 29·6	+11. 1·12						+6·27	+5·64
				+5·15						
18. 19	3. 26. 35	19. 27. 14·8	+11. 8·28							
				+6·59					+6·27	+6·97
19. 19										
20. 9					9. 20. 39·2	+11. 18·63	17. 25. 14·0	24. 30·51	+6·52	
21. 7									+6·52	
				+6·59						
22. 10	18. 37. 38	10. 23. 42·0	+11. 32·07						+6·80	+6·25
				+5·79						
18. 19	3. 26. 35	19. 27. 14·8	+11. 8·28							
				+6·59					+6·27	+6·97
19. 19							(Kingstown Transit Clock)			
21. 5					5. 31. 20·42	+11. 24·08	13. 15. 20·0	24. 30·48	+6·52	
21. 7									+6·52	
				+6·59						
22. 10	18. 37. 38	10. 23. 42·0	+11. 32·07						+6·80	6·25

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER H.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
22. 19	3. 25. 47	19. 10. 22·8	+11. 34·19	+5·79						
23. 19				+7·31					+6·80	+7·42
24. 3					2. 59. 39·6	+11. 43·19	11. 19. 18·5	24. 30·64	+5·79	
24. 7									+5·79	
25. 10				+7·31					+6·60	+7·21
25. 19	3. 26. 23	18. 58. 54·0	+11. 54·76	+5·79						
26. 19									+6·60	+5·91
27. 3					3. 33. 41·6	+12. 3·90	12. 5. 31·0	24. 32·12	+5·79	

Concluded Longitude of Kingstown from Greenwich = 24m. 31s·05 West.

CHRONOMETER I.

June 26. 19	1. 16. 52	18. 54. 36·8	+ 0. 29·27							
27. 19				+3·30						+3·02
27. 22					22. 36. 20·0	+ 0. 32·71	5. 2. 1·5	24. 31·28	+1·74	
28. 7									+1·74	
29. 10	17. 28. 19	10. 55. 27·6	+ 0. 37·23	+3·30					+2·93	+3·55
30. 19	1. 43. 47	19. 5. 37·56	+ 0. 39·56	+1·74						
July 1. 19				+2·77					+2·93	+2·23
2. 1					1. 39. 22·4	+ 0. 42·68	8. 21. 25·5	24. 31·68	+1·22	
2. 7									+1·22	
3. 10	17. 26. 19	10. 37. 39·6	+ 0. 46·08	+2·77					+2·93	+3·25
3. 19	2. 18. 16	19. 28. 9·6	+ 0. 46·34	+0·70						
4. 19				+3·19					+2·93	+2·57
5. 2					2. 7. 22·8	+ 0. 49·74	9. 1. 24·0	24. 31·80	+0·53	
5. 7									+0·53	
6. 10	17. 38. 39	10. 38. 6·0	+ 0. 53·36	+3·19					+3·53	+3·74
7. 19	2. 45. 33	19. 39. 35·6	+ 0. 53·84	+0·35						
8. 19				+2·90					+3·53	+3·30
9. 3					3. 22. 3·2	+ 0. 57·01	10. 32. 6·5	24. 30·88	+0·24	
9. 7									+0·24	
10. 10	17. 42. 29	10. 26. 9·6	+ 1. 0·12	+2·90					+1·79	+2·54
				+0·13						

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER I.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
10. 19	2. 53. 14	19. 35. 24 ·8	+1. 0·17							
				+0·93					+1·79	+0·94
11. 19										
									+0·87	
12. 3					3. 15. 5 ·6	+1. 1·37	10. 36. 57 ·5	24. 31 ·06		
12. 7									+0·87	
				+0·93					+1·81	+0·92
13. 10	17. 54 ·17	10. 26. 9 ·2	+1. 2·57							
				+1·60						
14. 19	3. 13. 0	19. 39. 24 ·0	+1. 4·79							
				+1·64					+1·81	+2·81
15. 19										
									+1·65	
16. 4					4. 19. 1 ·2	+1. 7·01	11. 56. 52 ·0	24. 29 ·87		
									+1·65	
16. 7										
				+1·64					+0·87	+0·60
17. 10	18. 2. 43	10. 18. 48 ·4	+1. 9·08							
				+1·69						
18. 19	3. 28. 4	19. 38. 40 ·4	+1. 11·43							
				+0·97					+0·87	+1·17
19. 19										
									+2·56	
20. 9					9. 33. 0 ·4	+1. 13·98	17. 27. 30 ·5	24. 30 ·93		
									+2·56	
21. 7										
				+0·97					+1·15	+0·79
22. 10	18. 38. 33	10. 34. 51 ·6	+1. 17·32							
				+1·46						
18. 19	3. 28. 4	19. 38. 40 ·4	+1. 11·43							
				+0·97					+0·87	+1·17
19. 19							(Kingstown Transit Clock)			
									+2·56	
21. 5					5. 43. 58 ·4	+1. 15·36	13. 17. 50 ·0	24. 30 ·16		
									+2·56	
21. 7										
				+0·97					+1·15	+0·79
22. 10	18. 38. 33	10. 34. 51 ·6	+1. 17·32							
				+1·46						
22. 19	3. 26. 38	19. 21. 30 ·0	+1. 17·86							
				+1·26					+1·15	+1·55
23. 19							($\frac{1}{2}\Sigma$.)			
									+1·46	
24. 3					3. 11. 25 ·6	+1. 19·58	11. 20. 41 ·0	24. 30 ·74		
									+1·46	
24. 7										
				+1·26					+0·90	+1·00
25. 10				+1·46						
25. 19	3. 27. 13	19. 10. 16 ·8	+1. 21·82							
									+0·90	+0·79
26. 19										
									+1·46	
27. 3					3. 50. 34 ·8	+1. 23·58	12. 11. 45 ·5	24. 31 ·51		

Concluded Longitude of Kingstown from Greenwich = $24^{m}.\ 31^{s}\cdot 10$ West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER J.

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
June d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
26. 19	1. 18. 18	18. 56. 28·0	+0. 3·83	+2·90						+2·73
27. 19									+0·81	
27. 22					22. 40. 6·4	+0. 6·68	5. 5. 22·5	24. 31·20	+0·81	
28. 7				+2·90					+2·75	+3·05
29. 10	17. 29. 42	10. 57. 17·2	+0. 10·41	+0·81						
30. 19	1. 45. 12	19. 7. 30·4	+0. 11·49	+2·52					+2·75	+2·41
July 1. 19									+1·07	
2. 1					1. 42. 44·4	+0. 14·32	8. 24. 20·0	24. 31·30	+1·07	
2. 7				+2·52					+2·57	+2·62
3. 10	17. 27. 55	10. 39. 44·0	+0. 17·41	+1·33						
3. 19	2. 19. 43	19. 30. 4·8	+0. 17·90	+2·82					+2·57	+2·52
4. 19									+1·71	
5. 2					2. 10. 54·0	+0. 21·23	9. 4. 27·5	24. 31·49	+1·71	
5. 7				+2·82					+2·64	+3·09
6. 10	17. 39. 49	10. 39. 44·4	+0. 24·77	+2·08						
7. 19	2. 46. 43	19. 41. 11·6	+0. 27·64	+2·13					+2·64	+2·13
8. 19									+1·45	
9. 3					3. 24. 34·4	+0. 30·27	10. 34. 11·0	24. 31·18	+1·45	
9. 7				+2·13					+1·99	+2·13
10. 10	17. 44. 2	10. 28. 9·6	+0. 32·86	+0·81						
10. 19	2. 54. 26	19. 37. 3·6	+0. 33·17	+1·94					+1·99	+1·84
11. 19									+1·42	
12. 3					3. 16. 38·4	+0. 35·59	10. 38. 4·5	24. 31·26	+1·42	
12. 7				+1·94					+2·09	+2·03
13. 10	17. 55. 33	10. 27. 49·6	+0. 37·98	+2·02						
14. 19	3. 14. 23	19. 41. 10·8	+0. 40·78	+2·32					+2·09	+2·16
15. 19									+2·00	
16. 4					4. 21. 50·4	+0. 43·83	11. 59. 17·0	24. 31·28	+2·00	
16. 7				+2·32					+2·89	+2·46
17. 10	18. 5. 9	10. 21. 36·4	+0. 46·69	+1·98						
18. 19	3. 29. 11	19. 40. 9·2	+0. 49·45	+2·74					+2·89	+3·37
19. 19									+1·93	

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER J.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 9					9. 37. 20·0	+0. 53·25	17. 31. 30·5	24. 30·45		
21. 7									+1·93	
22. 10	18. 39. 38	10. 36. 15·6	+0. 58·15	+2·74					+2·71	+2·18
				+2·57						
18. 19	3. 29. 11	19. 40. 9·2	+0. 49·45							
19. 19				+2·74			(Kingstown Transit Clock)		+2·89	+3·37
21. 5					5. 46. 42·8	+0. 55·25	13. 20. 14·0	24. 30·83	+1·93	
21. 7									+1·93	
22. 10	18. 39. 38	10. 36. 15·6	+0. 58·15	+2·74					+2·71	+2·18
22. 19	3. 27. 37	19. 22. 47·6	+0. 59·09	+2·57						
23. 19				+3·32			($\frac{1}{2}\Sigma$.)		+2·71	+3·30
24. 3					3. 13. 40·0	+1. 3·16	11. 22. 39·0	24. 31·05	+2·57	
24. 7									+2·57	
25. 10				+3·32					+3·40	+3·34
25. 19	3. 28. 43	19. 12. 0·0	+1. 8·37	+2·57						
26. 19									+3·40	+3·47
27. 3					3. 52. 0·0	+1. 12·56	12. 13. 0·5	24. 30·90	+2·57	

Concluded Longitude of Kingstown from Greenwich = 24m. 31s·18 West.

CHRONOMETER K.

June 26. 19	1. 20. 22	18. 59. 45·2	−1. 9·71							
27. 19				0·00						−0·46
27. 22					22. 42. 50·8	−1. 9·69	5. 6. 51·0	24. 30·97	+0·10	
28. 7									+0·10	
29. 10	17. 31, 23	11. 0. 18·0	−1. 9·67	0·00					+0·29	+0·05
30. 19	1. 46. 32	19. 10. 11·2	−1. 9·53	+0·10						
July 1. 19				−0·41					+0·29	+0·16
2. 1					1. 47. 8·8	−1. 9·93	8. 27. 22·0	24. 29·93	+0·05	
2. 7									+0·05	
				−0·41					−0·28	−0·91

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER K.—*continued.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
3. 10	17. 29. 3	10. 42. 19·6	−1. 10·37							
3. 19	2. 21. 21	19. 33. 10·8	−1. 10·37	0·00						
4. 19				+0·34					−0·28	+0·43
5. 2					2. 14. 14·0	−1. 10·12	9. 6. 17·5	24. 30·44	−0·41	
5. 7									−0·41	
6. 10	17. 41. 9	10. 42. 38·8	−1. 9·85	+0·34					+0·37	+0·26
7. 19	2. 47. 59	19. 44. 6·0	−1. 10·96	−0·81						
8. 19				+0·05					+0·37	+0·50
9. 3					3. 29. 3·2	−1. 11·04	10. 37. 0·0	24. 30·13	−0·58	
9. 7									−0·58	
10. 10	17. 45. 15	10. 31. 6·4	−1. 11·13	+0·05					+0·15	−0·35
10. 19	2. 55. 57	19. 40. 18·8	−1. 11·26	−0·34						
11. 19				+1·24					+0·15	+0·71
12. 3					3. 21. 22·4	−1. 9·98	10. 41. 3·5	24. 31·18	−0·21	
12. 7									−0·21	
13. 10	17. 57. 19	10. 31. 22·0	−1. 8·71	+1·24					+1·24	+1·71
14. 19	3. 15. 28	19. 44. 5·2	−1. 8·80	−0·07						
15. 19				+0·57					+1·24	+0·71
16. 4					4. 26. 13·6	−1. 8·13	12. 1. 49·5	24. 30·44	+0·19	
16. 7									+0·19	
17. 10	18. 6. 19	10. 24. 40·4	−1. 7·50	+0·57					+0·39	+0·45
18. 19	3. 30. 6	19. 43. 0·4	−1. 6·89	+0·44						
19. 19				+0·30					+0·39	+0·33
20. 9					9. 41. 36·0	−1. 7·12	17. 33. 46·5	24. 30·45	−0·79	
21. 7									−0·79	
22. 10	18. 40. 45	10. 39. 28·0	−1. 7·44	+0·30					−0·22	+0·27
				−0·16						
18. 19	3. 30. 6	19. 43. 0·4	−1. 6·89							
19. 19				+0·30			(Kingstown Transit Clock)		+0·39	+0·33
21. 5					5. 51. 30·0	−1. 7·25	13. 22. 59·0	24. 30·98	−0·79	
21. 7									−0·79	
22. 10	18. 40. 45	10. 39. 28·0	−1. 7·44	+0·30					−0·22	+0·27

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER K.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
22. 19	3. 28. 49	19. 26. 6·0	−1. 7·50	−0·16						
23. 19				−0·16					−0·22	−0·78
24. 3					3. 16. 56·8	−1. 7·71	11. 23. 45·0	24. 31·15	−0·16	
24. 7									−0·16	
25. 10				−0·16					+0·63	+0·39
25. 19	3. 29. 40	19. 15. 13·2	−1. 7·98	−0·16						
26. 19									+0·63	+0·90
27. 3					3. 55. 11·2	−1. 8·19	12. 13. 52·5	24. 29·47	−0·16	

Concluded Longitude of Kingstown from Greenwich = $24^{m}.30^{s}\cdot52$ West.

CHRONOMETER L.

June 26. 19	1. 21. 38	19. 2. 10·4	−2. 19·11							
27. 19				+0·09						+0·23
27. 22					22. 47. 32·4	−2. 19·27	5. 10. 23·5	24. 31·07	−1·06	
28. 7									−1·06	
29. 10	17. 32. 45	11. 2. 49·61	−2. 19·50	+0·09					−0·16	−0·03
30. 19	1. 47. 44	19. 12. 34·4	−2. 20·92	−1·06						
July 1. 19				−0·06					−0·16	−0·30
2. 1					1. 50. 14·0	−2. 21·32	8. 29. 14·5	24. 31·56	−1·36	
2. 7									−1·36	
3. 10	17. 30. 17	10. 44. 44·8	−2. 21·76	−0·06					−0·20	+0·15
3. 19	2. 22. 38	19. 35. 39·6	−2. 22·37	−1·66						
4. 19				+0·40					−0·20	−0·60
5. 2					2. 17. 50·8	−2. 22·41	9. 8. 40·5	24. 32·34	−1·81	
5. 7									−1·81	
6. 10	17. 42. 23	10. 45. 5·2	−2. 22·45	+0·40					+0·63	+1·29
7. 19	2. 49. 1	19. 46. 22·0	−2. 25·13	−1·95						
8. 19				−0·33					+0·63	−0·11
9. 3					3. 32. 38·8	−2. 25·22	10. 39. 21·0	24. 30·94	+1·05	
9. 7									+1·05	
10. 10	17. 46. 21	10. 33. 26·4	−2. 25·32	−0·33					+0·01	−0·53
				+4·05						

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER L.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
10. 19	2. 57. 46	19. 43. 20·0	−2. 23·77							
				+0·34					+0·01	+0·61
11. 19									+1·50	
12. 3					3. 24. 18·4	−2. 23·04	10. 42. 47·0	24. 30·89		
12. 7									+1·50	
13. 10	17. 58. 30	10. 33. 46·4	−2. 22·30	+0·34					+0·01	+0·10
14. 19	3. 16. 26	19. 46. 18·0	−2. 23·76	−1·05						
15. 19				−0·68					+0·01	−0·09
16. 4					4. 29. 22·4	−2. 24·54	12. 3. 42·0	24. 30·64	−0·18	
16. 7									−0·18	
17. 10	18. 7. 29	10. 27. 8·0	−2. 25·29	−0·68					−0·45	−1·21
18. 19	3. 31. 32	19. 45. 43·6	−2. 24·33	+0·69						
19. 19									−0·45	+0·40
20. 9					9. 44. 40·8	−2. 22·35	17. 35. 35·0	24. 31·82	+1·75	
21. 7									+1·75	
22. 10	18. 41. 36	10. 41. 31·2	−2. 19·78							
18. 19	3. 31. 32	19. 45. 43·6	−2. 24·33							
19. 19							(Kingstown Transit Clock)		−0·45	+0·40
21. 5					5. 54. 29·2	−2. 21·30	13. 24. 44·0	24. 31·40	+1·75	
21. 7									+1·75	
22. 10	18. 41. 36	10. 41. 31·2	−2. 19·78							
22. 19										
23. 19										
24. 3										
24. 7										
25. 10										
25. 19										
26. 19										
27. 3										

Concluded Longitude of Kingstown from Greenwich = $24^{m}.\ 31^{s}\cdot28$ West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER M.

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
June d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
26. 19	1. 25. 58	19. 3. 35·6	+0. 34·98							
				+0·35						+0·05
27. 19										
									−0·68	
27. 22					22. 47. 7·6	+0. 35·14	5. 12. 53·0	24. 31·58		
									−0·68	
28. 7										
				+0·35					−0·31	+0·62
29. 10	17. 34. 55	11. 2. 4·4	+0. 35·36							
				−0·68						
30. 19	1. 49. 6	19. 11. 0·8	+0. 34·45							
				−1·67					−0·31	−1·35
July 1. 19										
									−0·29	
2. 1					1. 49. 39·6	+0. 32·69	8. 31. 35·0	24. 31·04		
									−0·29	
2. 7										
				−1·67					−1·31	−1·95
3. 10	17. 31. 55	10. 43. 30·0	+0. 30·76							
				+0·11						
3. 19	2. 24. 1	19. 34. 9·2	+0. 30·80							
				−0·94					−1·31	−0·59
4. 19										
									−0·33	
5. 2					2. 16. 48·0	+0. 29·76	9. 10. 31·5	24. 31·01		
									−0·33	
5. 7										
				−0·94					−1·54	−1·25
6. 10	17. 44. 20	10. 44. 10·8	+0. 28·63							
				−0·76						
7. 19	2. 50. 42	19. 45. 10·0	+0. 27·59							
				−1·49					−1·54	−1·86
8. 19										
									+0·43	
9. 3					3. 31. 20·4	+0. 26·10	10. 40. 53·5	24. 31·61		
									+0·43	
9. 7										
				−1·49					−0·42	−1·16
10. 10	17. 47. 56	10. 32. 11·2	+0. 24·63							
				+1·62						
10. 19	2. 58. 50	19. 41. 34·8	+0. 25·25							
				+0·08					−0·42	+0·41
11. 19										
									+0·52	
12. 3					3. 25. 18·4	+0. 25·45	10. 46. 36·0	24. 31·00		
									+0·52	
12. 7										
				+0·08					+0·07	−0·21
13. 10	17. 59. 53	10. 32. 21·2	+0. 25·67							
				−0·58						
14. 19	3. 17. 30	19. 44. 33·2	+0. 24·87							
				+0·13					+0·07	+0·39
15. 19										
									−0·45	
16. 4					4. 28. 19·2	+0. 24·90	12. 5. 28·0	24. 31·17		
									−0·45	
16. 7										
				+0·13					−0·79	−0·10
17. 10	18. 8. 37	10. 25. 25·6	+0. 24·93							
				−0·32						
18. 19	3. 32. 37	19. 43. 59·6	+0. 24·48							
				−1·34					−0·79	−1·57
19. 19										
									+0·17	

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER M.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 9					9.45.34·4	+0.23·36	17.39.15·0	24.31·73		
									+0·17	
21. 7				−1·34					−0·39	−1·14
22. 10	18.42.33	10.39.46·4	+0.21·87	−1·19						
18. 19	3.32.37	19.43.59·6	+0.24·48							
				−1·34					−0·79	−1·57
19. 19							(Kingstown Transit Clock)			
									+0·17	
21. 5					5.53.46·4	+0.22·75	13.26.46·0	24.30·98		
21. 7									+0·17	
				−1·34					−0·39	−1·14
22. 10	18.42.33	10.39.46·4	+0.21·87							
				−1·19						
22. 19	3.31.40	19.27.27·6	+0.21·43							
				+1·23					−0·39	+0·45
23. 19							($\frac{1}{2}\Sigma$.)			
									−1·19	
24. 3					3.18.50·8	+0.22·13	11.27. 8·5	24.32·05		
24. 7									−1·19	
				+1·23					+1·74	+1·92
25. 10				−1·19						
25. 19	3.34.27	19.18.28·4	+0.23·03							
									+1·74	+1·54
26. 19									−1·19	
27. 3					3.57.33·2	+0.23·78	12.17.45·5	24.31·08		

Concluded Longitude of Kingstown from Greenwich = $24^m.31^s·38$ West.

CHRONOMETER N.

June 26. 19	1.27.20	19. 4.38·8	+0.53·56							
				−0·30						−0·67
27. 19									−0·79	
27. 22					22.49. 3·2	+0.53·11	5.15. 7·5	24.31·01		
28. 7									−0·79	
				−0·30					+0·55	+0·03
29. 10	17.36.28	11. 3.20·0	+0.52·50							
				−0·79						
30. 19	1.52.48	19.14.25·2	+0.51·45							
				+0·06					+0·55	+1·14
July 1. 19										
									−0·40	
2. 1					1.52.32·4	+0.51·41	8.34.48·5	24.29·59		
2. 7									−0·40	
				+0·06					−0·29	−0·90

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER N.—*continued.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
3. 10	17. 33. 5	10. 44. 19·2	+0. 51·37							
				0·00						
3. 19	2. 25. 23	19. 35. 10·4	+0. 51·37							
				−0·01					−0·29	+0·39
4. 19									+0·21	
5. 2					2. 18. 12·8	+0. 51·41	9. 12. 19·0	24. 30·24		
									+0·21	
5. 7				−0·01					−0·22	−0·37
6. 10	17. 46. 36	10. 46. 3·6	+0. 51·45							
				+0·41						
7. 19	2. 51. 43	19. 45. 46·4	+0. 52·02						−0·22	−0·05
				+0·08						
8. 19									+0·67	
9. 3					3. 33. 36·4	+0. 52·27	10. 43. 37·0	24. 30·72		
									+0·67	
9. 7				+0·08					+0·47	+0·20
10. 10	17. 49. 49	10. 33. 36·0	+0. 52·52							
				+0·92						
10. 19	2. 59. 59	19. 42. 16·0	+0. 52·87						+0·47	+0·78
				+1·46						
11. 19									+0·18	
12. 3					3. 27. 6·4	+0. 54·48	10. 48. 53·0	24. 31·41		
									+0·18	
12. 7				+1·46					+1·42	+2·06
13. 10	18. 1. 8	10. 33. 5·6	+0. 56·07							
				−0·56						
14. 19	3. 18. 37	19. 45. 9·6	+0. 55·29							
				+0·80					+1·42	+0·69
15. 19									+0·22	
16. 4					4. 29. 6·8	+0. 56·23	12. 6. 47·5	24. 30·81		
									+0·22	
16. 7				+0·80					+1·04	+0·90
17. 10	18. 9. 59	10. 26. 15·2	+0. 57·10							
				+0·99						
18. 19	3. 33. 56	19. 44. 44·4	+0. 58·47							
				+1·00					+1·04	+1·20
19. 19									+0·31	
20. 9					9. 47. 34·4	+0. 59·59	17. 41. 53·0	24. 30·38		
									+0·31	
21. 7				+1·00					+0·47	+0·82
22. 10	18. 43. 44	10. 40. 18·0	+1. 1·07							
				−1·63						
18. 19	3. 33. 56	19. 44. 44·4	+0. 58·47							
				+1·00			(Kingstown Transit Clock)		+1·04	+1·20
19. 19									+0·31	
21. 5					5. 55. 8·38	+1. 0·20	13. 28. 46·0	24. 30·73		
									+0·31	
21. 7				+1·00					+0·47	+0·82
22. 10	18. 43. 44	10. 40. 18·0	+1. 1·07							

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER N.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
22.19	3.32.38	19.27.46·4	+1. 0·47	−1·63						
23.19				+0·86					+0·47	+0·07
24. 3					3.20.45·6	+1. 0·66	11.29.43·0	24.31·30	−1·63	
24. 7									−1·63	
25.10				+0·86					+1·23	+1·56
25.19	3.35.23	19.18.46·4	+1. 0·88	−1·63						
26.19									+1·23	+0·86
27. 3					3.58. 5·2	+1. 1·07	12.18.55·5	24.30·56	−1·63	

Concluded Longitude of Kingstown from Greenwich = $24^{m}.30^{s}\cdot65$ West.

CHRONOMETER O.

June 26.19	1.29.27	18.55.28·8	+12.10·22							
27.19				+3·03						+3·31
27.22					22.39.46·8	+12.12·99	5.17.11·5	24.30·83	−0·11	
28. 7									−0·11	
29.10	17.38. 8	10.53.35·6	+12.16·62	+3·03					+2·27	+2·78
30.19	1.53.52	19. 4. 4·0	+12.16·47	−0·11						
July 1.19				+2·84					+2·27	+1·69
2. 1					1.45.29·2	+12.19·39	8.39.11·0	24.32·57	+0·04	
2. 7									+0·04	
3.10	17.34.26	10.34. 8·8	+12.22·55	+2·84					+3·56	+3·86
3.19	2.26.18	19.24.34·0	+12.22·62	+0·19						
4.19				+3·04					+3·56	+3·22
5. 2					2. 9.13·2	+12.26·07	9.14.53·5	24.31·23	+1·31	
5. 7									+1·31	
6.10	17.48.35	10.36.24·0	+12.29·75	+3·04					+2·83	+2·88
7.19	2.52.39	19.35. 1·2	+12.33·08	+2·42						
8.19				+2·72					+2·83	+2·78
9. 3					3.23.45·2	+12.36·35	10.45.29·5	24.31·40	+1·42	
9. 7									+1·42	
10.10	17.50.45	10.22.44·8	+12.39·57	+2·72					+1·28	+2·67

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER O.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
10. 19	3. 0.50	19. 31. 20·0	+12.39·73	+0·42						
11. 19				+1·06					+1·28	−0·28
12. 3					3. 17. 23·6	+12.41·20	10. 50. 56·0	24. 32·66	+1·38	
12. 7									+1·38	
13. 10	18. 2. 20	10. 22. 30·8	+12.42·67	+1·06					+2·22	+2·25
14. 19	3. 19. 43	19. 34. 24·8	+12.45·90	+2·33						
15. 19				+1·79					+2·22	+2·18
16. 4					4. 19. 26·0	+12.48·32	12. 8. 59·0	24. 30·96	+1·73	
16. 7									+1·73	
17. 10	18. 10. 53	10. 15. 15·6	+12.50·55	+1·79					+2·67	+1·44
18. 19	3. 34. 59	19. 33. 53·6	+12.52·10	+1·12						
19. 19				+2·20					+2·67	+4·05
20. 9					9. 38. 40·4	+12.54·00	17. 44. 55·0	24. 29·28	−0·18	
21. 7									−0·18	
22. 10	18. 44. 48	10. 29. 26·4	+12.56·50	+2·20					+1·35	+0·55
				0·00						
18. 19	3. 34. 59	19. 33. 53·6	+12.52·10							
19. 19				+2·20					+2·67	+4·05
21. 5							(Kingstown Transit Clock)		−0·18	
21. 7					5. 44. 56·0	+12.55·03	13. 30. 29·0	24. 30·46	−0·18	
22. 10	18. 44. 48	10. 29. 26·4	+12.56·50	+2·20					+1·35	+0·55
22. 19	3. 33. 39	19. 16. 51·2	+12.56·50	0·00						
23. 19				+2·53					+1·35	+2·25
24. 3							($\frac{1}{2}\Sigma$.)		0·00	
24. 7					3. 10. 10·8	+12.58·87	11. 31. 6·5	24. 31·44	0·00	
25. 10				+2·53					+3·04	+2·78
25. 19	3. 36. 33	19. 7. 55·2	+13. 1·90	0·00						
26. 19									+3·04	+3·33
27. 3									0·00	
					3. 47. 52·0	+13. 4·34	12. 20. 46·0	24. 30·42		

Concluded Longitude of Kingstown from Greenwich = $24^{m}.31^{s}\cdot36$ West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER P.

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
June d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
26. 19	1. 6. 59	18. 50. 36·8	−5. 22·13							−5·84
				−6·40						
27. 19									−5·70	
27. 22					23. 2. 21·2	−5. 29·46	5. 22. 4·5	24. 30·58		
									−5·70	
28. 7				−6·40					−6·98	−6·90
29. 10	17. 15. 28	10. 48. 54·8	−5. 38·87							
				−5·70						
30. 19	1. 32. 52	19. 1. 10·4	−5. 46·51						−6·98	−7·07
				−6·65						
July 1. 19									−6·85	
2. 1					2. 9. 12·8	−5. 55·26	8. 44. 42·0	24. 31·41		
									−6·85	
2. 7				−6·65					−6·38	−6·27
3. 10	17. 16. 19	10. 34. 31·6	−6. 4·29							
				−8·00						
3. 19	2. 8. 22	19. 25. 10·8	−6. 7·25						−6·38	−6·50
				−6·40						
4. 19									−7·68	
5. 2					2. 31. 34·0	−6. 15·85	9. 18. 33·0	24. 31·21		
									−7·68	
5. 7				−6·40					−6·26	−6·31
6. 10	17. 27. 5	10. 33. 52·0	−6. 24·75							
				−7·35						
7. 19	2. 36. 6	19. 37. 38·8	−6. 34·83						−6·26	−6·20
				−6·19						
8. 19									−7·54	
9. 3					3. 47. 58·0	−6. 43·50	10. 50. 23·5	24. 31·15		
									−7·54	
9. 7				−6·19					−6·38	−6·18
10. 10	17. 33. 8	10. 24. 41·99	−6. 51·75							
				−7·72						
10. 19	2. 42. 39	19. 32. 46·4	−6. 54·70						−6·38	−6·61
				−6·46						
11. 19									−7·22	
12. 3					3. 48. 15·6	−7. 3·68	11. 2. 6·5	24. 31·10		
									−7·22	
12. 7				−6·46					−6·13	−6·33
13. 10	17. 42. 12	10. 22. 20·8	−7. 12·04							
				−6·72						
14. 19	3. 2. 55	19. 37. 46·8	−7. 21·35						−6·13	−5·90
				−6·05						
15. 19									−7·05	
16. 4					4. 42. 34·8	−7. 29·95	12. 11. 50·0	24. 30·95		
									−7·05	
16. 7				−6·05					−6·30	−6·18
17. 10	17. 52. 43	10. 17. 36·8	−7. 37·68							
				−7·38						
18. 19	3. 17. 59	19. 37. 36·4	−7. 47·93						−6·30	−6·44
				−6·40						
19. 19									−5·92	

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

Chronometer P.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 9					10. 28. 41·82	−7. 57·93	18. 14. 7·5	24. 31·04		
21. 7									−5·92	
22. 10	18. 45. 50	10. 51. 35·2	−8. 10·47	−6·40					−6·19	−6·37
				−7·09						
18. 19	3. 17. 59	19. 37. 36·4	−7. 47·93							
19. 19				−6·40					−6·30	−6·44
21. 5					5. 29. 50·0	−8. 2·93	13. 18. 17·5	24. 30·73	−5·92	
21. 7									−5·92	
22. 10	18. 45. 50	10. 51. 35·2	−8. 10·47	−6·40					−6·19	−6·37
				−7·09						
22. 19	3. 34. 52	19. 39. 13·6	−8. 13·09	−5·92					−6·19	−5·99
23. 19									−7·09	
24. 3					3. 34. 43·6	−8. 21·46	11. 34. 20·0	24. 30·92	−7·09	
24. 7				−5·92					−5·67	−5·86
25. 10				−7·09						
25. 19	3. 37. 31	19. 30. 26·8	−8. 31·87						−5·67	−5·46
26. 19									−7·09	
27. 3					4. 12. 55·2	−8. 40·08	12. 24. 5·0	24. 30·75		

Concluded Longitude of Kingstown from Greenwich = 24ᵐ. 30ˢ·90 West.

Chronometer Q.

June 26. 19	1. 49. 20	19. 26. 25·56	+1. 3·20							
27. 19				+1·35						+1·25
27. 22					22. 59. 8·4	+1. 5·02	5. 25. 26·5	24. 30·81	+2·70	
28. 7									+2·70	
29. 10	17. 17. 9	10. 43. 49·2	+1. 7·46	+1·35					+2·47	+1·44
30. 19	1. 34. 9	18. 55. 29·6	+1. 11·08	+2·70						
July 1. 19				+3·35					+2·47	+3·63
2. 1					2. 5. 34·0	+1. 14·99	8. 48. 15·0	24. 30·43	+1·68	
2. 7									+1·68	
				+3·35					+2·70	+3·10

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER Q.—*continued.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
3. 10	17. 17. 43	10. 28. 32·0	+1. 19·08							
				+0·65						
3. 19	2. 9. 44	19. 19. 6·0	+1. 19·32							
				+2·01					+2·70	+2·25
4. 19									+1·25	
5. 2					2. 26. 8·8	+1. 21·75	9. 20. 46·5	24. 30·47	+1·25	
5. 7									+1·86	+1·80
				+2·01						
6. 10	17. 28. 19	10. 27. 16·8	+1. 24·24							
				+1·85						
7. 19	2. 37. 15	19. 30. 46·0	+1. 26·79							
				+2·07					+1·86	+1·93
8. 19									+1·89	
9. 3					3. 41. 16·4	+1. 29·52	10. 51. 55·5	24. 30·82	+1·89	
9. 7									+3·25	+2·19
				+2·07						
10. 10	17. 35. 7	10. 18. 16·8	+1. 32·13							
				+1·92						
10. 19	2. 44. 6	19. 25. 45·6	+1. 32·86							
				+3·33					+3·25	+4·44
11. 19									+1·01	
12. 3					3. 41. 1·6	+1. 36·80	11. 3. 34·5	24. 29·81	+1·01	
12. 7									+2·80	+2·35
				+3·33						
13. 10	17. 44. 6	10. 15. 22·0	+1. 40·44							
				+0·09						
14. 19	3. 4. 36	19. 30. 25·6	+1. 40·57							
				+3·38					+2·80	+3·31
15. 19									−0·60	
16. 4					4. 35. 42·0	+1. 44·19	12. 14. 11·5	24. 31·18	−0·60	
16. 7									+1·66	+3·44
				+3·38						
17. 10	17. 54. 18	10. 9. 46·4	+1. 47·46							
				−1·28						
18. 19	3. 19. 10	19. 29. 13·6	+1. 45·68							
				+1·69					+1·66	−0·34
19. 19									+1·90	
20. 9					10. 22. 0·48	+1. 48·57	18. 17. 11·5	24. 32·69	+1·90	
21. 7									+4·08	+3·50
				+1·69						
22. 10	18. 47. 2	10. 42. 44·4	+1. 52·14							
				+3·14						
18. 19	3. 19. 10	19. 29. 13·6	+1. 45·68							
				+1·69					+1·66	−0·34
19. 19									+1·90	
21. 5					5. 22. 5·6	+1. 49·98	13. 20. 24·5	24. 32·59	+1·90	
21. 7									+4·08	+3·50
				+1·69						
22. 10	18. 47. 2	10. 42. 44·4	+1. 52·14							

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER Q.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
22. 19	3. 36. 11	19. 30. 26·0	+1. 53·30	+3·14						
				+4·44					+4·08	+4·74
23. 19									+3·14	
24. 3					3. 26. 4·0	+1. 58·73	11. 36. 1·5	24. 30·29	+3·14	
24. 7				+4·44					+3·52	+4·18
25. 10				+3·14						
25. 19	3. 39. 3	19. 21. 21·2	+2. 5·49						+3·52	+2·78
26. 19									+3·14	
27. 3					4. 3. 22·4	+2. 10·99	12. 25. 22·0	24. 32·22		

Concluded Longitude of Kingstown from Greenwich = $24^{m}.30^{s}\cdot68$ West.

CHRONOMETER R.

June 26. 19	1. 13. 51	18. 54. 30·8	−2. 25·23							
				−1·17						−1·45
27. 19									−4·28	
27. 22					23. 5. 31·6	−2. 27·35	5. 28. 18·0	24. 30·60	−4·28	
28. 7				−1·17					−0·96	−0·92
29. 10	17. 18. 55	10. 49. 12·4	−2. 30·03	−4·28						
30. 19	1. 35. 42	19. 0. 49·2	−2. 35·77	−1·17					−0·96	−1·00
July 1. 19									−4·76	
2. 1					2. 13. 39·6	−2. 38·22	8. 52. 28·0	24. 30·51	−4·76	
2. 7				−1·17					−1·19	−1·32
3. 10	17. 19. 11	10. 33. 59·6	−2. 40·76	−5·23						
3. 19	2. 11. 3	19. 24. 26·8	−2. 42·69	−1·42					−1·19	−1·05
4. 19									−5·30	
5. 2					2. 32. 50·0	−2. 45·51	9. 23. 21·0	24. 30·33	−5·30	
5. 7				−1·42					−1·80	−1·75
6. 10	17. 29. 49	10. 32. 59·2	−2. 48·40	−5·36						
7. 19	2. 38. 15	19. 36. 8·4	−2. 55·78	−1·44					−1·80	−1·85
8. 19									−3·75	
9. 3					3. 49. 4·0	−2. 58·29	10. 55. 15·5	24. 31·16	−3·75	
9. 7				−1·44					−0·94	−1·07
10. 10	17. 36. 30	10. 24. 12·4	−3. 0·70	−2·14						

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER R.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
10. 19	2. 45. 15	19. 31. 28·8	−3. 1·52							
				−0·42					−0·94	−0·79
11. 19									−4·22	
12. 3					3. 47. 58·0	−3. 3·06	11. 5. 50·0	24. 31·22	−4·22	
12. 7				−0·42					+0·16	−0·09
13. 10	17. 44. 58	10. 20. 58·8	−3. 4·50	−6·29						
14. 19	3. 5. 42	19. 36. 25·2	−3. 13·21	−0·15					+0·16	+0·44
15. 19									−4·95	
16. 4					4. 42. 46·8	−3. 14·66	12. 16. 18·5	24. 30·48	−4·95	
16. 7				−0·15					−0·36	−0·68
17. 10	17. 55. 36	10. 16. 7·6	−3. 15·95	−3·60						
18. 19	3. 20. 34	19. 35. 44·0	−3. 20·95	+0·63					−0·36	0·00
19. 19									−4·51	
20. 9					10. 34. 0·0	−3. 23·39	18. 24. 2·0	24. 30·87	−4·51	
21. 7				+0·63					+0·52	+1·19
22. 10	18. 47. 58	10. 48. 58·8	−3. 26·41	−1·39						
18. 19	3. 20. 34	19. 35. 44·0	−3. 20·95							
19. 19				+0·63					−0·36	0·00
21. 5					5. 30. 18·8	−3. 24·60	13. 23. 23·0	24. 33·20	−4·51	
21. 7									−4·51	
22. 10	18. 47. 58	10. 48. 58·8	−3. 26·41	+0·63					+0·52	+1·19
22. 19	3. 37. 29	19. 37. 4·0	−3. 26·92	−1·39						
23. 19				+0·49					+0·52	−0·24
24. 3					3. 34. 19·6	−3. 27·00	11. 38. 51·0	24. 31·11	−1·39	
24. 7									−1·39	
25. 10				+0·49					+2·14	+1·14
25. 19	3. 40. 9	19. 27. 59·6	−3. 27·09	−1·39						
26. 19									+2·14	+3·27
27. 3					4. 9. 58·8	−3. 27·17	12. 26. 25·0	24. 27·62	−1·39	

Concluded Longitude of Kingstown from Greenwich = $24^{m}.30^{s}\cdot45$ West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER S.

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
June d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
26. 19	1. 16. 3	18. 52. 38·0	+1. 39·20							
				+11·19						+11·91
27. 19										
									+ 4·96	
27. 22					23. 8. 30·0	+1. 50·80	5. 35. 37·0	24. 29·34		
									+ 4·96	
28. 7										
				+11·19					+ 9·22	+10·55
29. 10	17. 20. 35	10. 46. 16·4	+2. 5·69							
				+ 4·96						
30. 19	1. 37. 24	18. 57. 42·8	+2. 12·35							
				+ 9·62					+ 9·22	+ 7·72
July 1. 19										
									+ 6·59	
2. 1					2. 10. 17·6	+2. 24·03	8. 54. 6·5	24. 32·54		
									+ 6·59	
2. 7										
				+ 9·62					+ 9·41	+11·31
3. 10	17. 20. 25	10. 29. 56·4	+2. 36·24							
				+ 8·21						
3. 19	2. 12. 30	19. 20. 31·6	+2. 39·27							
				+ 7·38					+ 9·41	+ 7·28
4. 19										
									+ 8·81	
5. 2					2. 29. 43·6	+2. 49·19	9. 25. 49·5	24. 30·54		
									+ 8·81	
5. 7										
				+ 7·38					+ 6·70	+ 7·47
6. 10	17. 33. 9	10. 30. 30·8	+2. 59·45							
				+ 9·41						
7. 19	2. 39. 43	19. 31. 28·0	+3. 12·38							
				+ 8·61					+ 6·70	+ 5·83
8. 19										
									+ 7·42	
9. 3					3. 46. 21·2	+3. 23·63	10. 58. 53·0	24. 33·36		
									+ 7·42	
9. 7										
				+ 8·61					+11·17	+11·08
10. 10	17. 38. 13	10. 19. 20·0	+3. 34·42							
				+ 5·42						
10. 19	2. 46. 22	19. 25. 57·6	+3. 36·49							
				+ 9·40					+11·17	+11·27
11. 19										
									+ 5·47	
12. 3					3. 43. 45·2	+3. 48·09	11. 8. 31·0	24. 29·00		
									+ 5·47	
12. 7										
				+ 9·40					+ 8·18	+ 7·74
13. 10	17. 46. 48	10. 15. 44·8	+3. 59·20							
				+ 5·51						
14. 19	3. 6. 41	19. 30. 4·0	+4. 6·82							
				+ 6·84					+ 8·18	+ 8·68
15. 19										
									+ 4·32	
16. 4					4. 37. 29·2	+4. 15·62	12. 18. 33·0	24. 29·02		
									+ 4·32	
16. 7										
				+ 6·84					+ 5·75	+ 5·20
17. 10	17. 56. 32	10. 9. 24·0	+4. 23·49							
				+ 3·12						
18. 19	3. 21. 55	19. 29. 16·0	+4. 27·83							
				+8·12					+ 5·75	+ 6·36
19. 19										
									+ 8·04	

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER S.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 9					10. 28. 55·6	+4. 40·93	18. 27. 1·0	24. 32·28		
									+8·04	
21. 7										
				+8·12					+9·70	+9·68
22. 10	18. 49. 8	10. 41. 45·0	+4. 57·20							
				+7·18						
18. 19	3. 21. 55	19. 29. 16·0	+4. 27·83							
				+8·12					+5·75	+6·36
19. 19									+8·04	
21. 5					5. 23. 32·8	+4. 47·33	13. 24. 50·0	24. 32·36		
21. 7									+8·04	
				+8·12					+9·70	+9·68
22. 10	18. 49. 8	10. 41. 45·0	+4. 57·20							
				+7·18						
22. 19	3. 38. 54	19. 30. 2·0	+4. 59·85							
				+6·20					+9·70	+9·72
23. 19									+7·18	
24. 3					3. 28. 9·2	+5. 8·47	11. 41. 20·5	24. 27·08		
24. 7									+7·18	
				+6·20					+4·60	+3·07
25. 10				+7·18						
25. 19	3. 41. 26	19. 20. 30·0	+5. 19·30						+4·60	+6·32
26. 19									+7·18	
27. 3					4. 2. 37·6	+5. 28·07	12. 27. 56·5	24. 30·42		

Concluded Longitude of Kingstown from Greenwich = $24^{m}.30^{s}\cdot67$ West.

CHRONOMETER T.

June 26. 19	1. 18. 8	18. 55. 46·8	+0. 35·06							
				+0·56						+0·33
27. 19									+1·00	
27. 22					23. 13. 40·8	+0. 35·82	5. 39. 31·5	24. 31·31		
28. 7									+1·00	
				+0·56					+0·75	+0·76
29. 10	17. 22. 26	10. 49. 36·0	+0. 36·79							
30. 19	1. 38. 40	19. 0. 32·8	+0. 38·14	+1·00						
July 1. 19				+0·28					+0·75	+0·73
									+1·00	
2. 1					2. 15. 2·0	+0. 38·68	8. 57. 8·0	24. 30·57		
2. 7									+1·00	
				+0·28					−0·13	−0·12

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER T.—*continued.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
3. 10	17. 21. 31	10. 32. 59·2	+0. 39·26							
				+1·00						
3. 19	2. 14. 1	19. 24. 2·0	+0. 39·63							
				−0·03					−0·13	−0·14
4. 19										
									+0·72	
5. 2					2. 35. 1·6	+0. 39·78	9. 28. 58·0	24. 31·14		
									+0·72	
5. 7										
				−0·03					+0·18	+0·07
6. 10	17. 33. 54	10. 33. 35·2	+0. 39·93							
				+0·44						
7. 19	2. 41. 9	19. 35. 25·6	+0. 40·54							
				+0·45					+0·18	+0·31
8. 19										
									+0·58	
9. 3					3. 52. 32·4	+0. 41·17	11. 2. 24·5	24. 31·18		
									+0·58	
9. 7										
				+0·45					+0·70	+0·58
10. 10	17. 39. 37	10. 23. 36·4	+0. 41·79							
				+0·71						
10. 19	2. 47. 49	19. 30. 18·8	+0. 42·06							
				+0·64					+0·70	+0·84
11. 19										
									+0·57	
12. 3					3. 49. 2·4	+0. 42·90	11. 10. 41·5	24. 30·87		
									+0·57	
12. 7										
				+0·64					+0·55	+0·46
13. 10	17. 48. 38	10. 20. 50·0	+0. 43·70							
				+0·42						
14. 19	3. 7. 35	19. 34. 20·4	+0. 44·28							
				+0·55					+0·55	+0·65
15. 19										
									+0·85	
16. 4					4. 43. 29·2	+0. 45·11	12. 21. 1·0	24. 30·92		
									+0·85	
16. 7										
				+0·55					+0·02	+0·46
17. 10	17. 57. 59	10. 14. 28·4	+0. 45·86							
				+1·28						
18. 19	3. 23. 5	19. 34. 6·0	+0. 47·64							
				+0·52					+0·02	−0·48
19. 19										
									+1·13	
20. 9					10. 34. 51·6	+0. 48·89	18. 29. 5·5	24. 32·07		
									+1·13	
21. 7										
				+0·52					+2·37	+1·40
22. 10	18. 50. 2	10. 46. 45·6	+0. 50·45							
				+0·03						
18. 19	3. 23. 5	19. 34. 6·0	+0. 47·64							
				+0·52					+0·02	−0·48
19. 19										
									+1·13	
21. 5					5. 32. 6·8	+0. 49·50	13. 29. 27·5	24. 31·79		
									+1·13	
21. 7										
				+0·52					+2·37	+1·40
22. 10	18. 50. 2	10. 46. 45·6	+0. 50·45							

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER T.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
22.19	3.40. 6	19.35.23·2	+0.50·46	+0·03						
				+3·13					+2·37	+3·45
23.19									+0·03	
24. 3					3.34.24·4	+0.53·44	11.43.17·5	24.30·58	+0·03	
24. 7									+2·33	+2·84
25.10				+3·13						
25.19	3.42.20	19.25.46·0	+0.57·15	+0·03					+2·33	+1·75
26.19									+0·03	
27. 3					4. 8.15·2	+1. 0·17	12.29. 4·5	24.32·31		

Concluded Longitude of Kingstown from Greenwich = $24^{m}.31^{s}\cdot07$ West.

CHRONOMETER U.

June 26.19	1.20.45	18.57.30·4	+1.28·03							
				+4·72						+5·09
27.19									+2·78	
27.22					23.17.55·6	+1.33·12	5.44.45·0	24.30·75	+2·78	
28. 7									+4·32	+4·39
29.10	17.23.45	10.49.52·0	+1.39·58	+4·72						
30.19	1.40. 5	19. 0.52·4	+1.43·31	+2·78					+4·32	+4·24
July 1.19				+3·72					+4·16	
2. 1					2.15.40·8	+1.48·26	8.58.56·5	24.30·74	+4·16	
2. 7									+4·14	+3·26
3.10	17.23. 7	10.33.20·8	+1.53·40	+3·72						
3.19	2.15. 7	19.23.52·0	+1.55·44	+5·53					+4·14	+5·13
4.19				+4·97					+4·96	
5. 2					2.35.51·6	+2. 1·86	9.31.10·5	24.31·09	+4·96	
5. 7									+4·60	+4·82
6.10	17.35. 0	10.33.12·4	+2. 8·55	+4·97						
7.19	2.42.10	19.34.52·4	+2.14·58	+4·38					+4·60	+4·35
8.19				+4·77					+4·54	
9. 3					3.52.18·0	+2.20·90	11. 3.49·5	24.31·73	+4·54	
9. 7									+5·00	+5·15
10.10	17.40.48	10.23. 2·0	+2.26·99	+4·77						
				+4·69						

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER U.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
10. 19	2. 49. 30	19. 30. 12·8	+2. 28·78							
				+5·29					+5·00	+4·83
11. 19										
									+4·78	
12. 3					3. 49. 21·6	+2. 35·75	11. 12. 53·0	24. 31·79		
12. 7									+4·78	
				+5·29					+5·14	+5·69
13. 10	17. 49. 32	10. 19. 45·2	+2. 42·36							
				+4·87						
14. 19	3. 8. 46	19. 33. 26·4	+2. 49·09							
				+5·50					+5·14	+4·52
15. 19										
									+5·46	
16. 4					4. 43. 25·6	+2. 56·65	12. 23. 8·0	24. 32·21		
									+5·46	
16. 7										
				+5·50					+5·89	+6·37
17. 10	17. 59. 8	10. 13. 19·6	+3. 3·47							
				+6·05						
18. 19	3. 24. 15	19. 32. 51·6	+3. 11·85							
				+4·40					+5·89	+5·35
19. 19										
									+6·28	
20. 9					10. 36. 26·4	+3. 20·27	18. 33. 14·0	24. 30·42		
									+6·28	
21. 7										
				+4·40					+4·10	+3·56
22. 10	18. 51. 6	10. 45. 9·2	+3. 30·67							
				+5·45						
18. 19	3. 24. 15	19. 32. 51·6	+3. 11·85							
				+4·40					+5·89	+5·35
19. 19										
									+6·28	
21. 5					5. 31. 24·4	+3. 24·40	13. 31. 22·5	24. 29·60		
									+6·28	
21. 7										
				+4·40					+4·10	+3·56
22. 10	18. 51. 6	10. 45. 9·2	+3. 30·67							
				+5·45						
22. 19	3. 41. 10	19. 33. 44·8	+3. 32·68							
				+5·15					+4·10	+4·71
23. 19										
									+5·45	
24. 3					3. 32. 23·2	+3. 39·68	11. 44. 1·5	24. 31·73		
									+5·45	
24. 7										
				+5·15					+5·84	+5·54
25. 10										
				+5·45						
25. 19	3. 43. 23	19. 23. 57·6	+3. 48·38							
									+5·84	+6·17
26. 19										
									+5·45	
27. 3					4. 6. 37·6	+3. 55·47	12. 30. 24·5	24. 30·22		

Concluded Longitude of Kingstown from Greenwich = $24^{m}.\ 31^{s}\cdot38$ West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER W.

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
June d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
26. 19	1. 24. 17	19. 8. 15·6	−5. 45·75							
				−7·93						−7·33
27. 19										
									−8·69	
27. 22					23. 27. 54·2	−5. 55·25	5. 47. 16·0	24. 30·39		
									−8·69	
28. 7										
				−7·93					−8·40	−8·46
29. 10	17. 25. 17	10. 59. 10·6	−6. 7·27							
				−8·69						
30. 19	1. 41. 20	19. 10. 9·4	−6. 18·90						−8·40	−8·33
				−8·24						
July 1. 19									−7·47	
					2. 26. 57·8	−6. 29·40	9. 1. 56·0	24. 31·08		
2. 1									−7·47	
2. 7				−8·24					−8·03	−8·16
3. 10	17. 24. 51	10. 43. 38·2	−6. 40·28							
				−6·24						
3. 19	2. 16. 33	19. 33. 55·8	−6. 42·59						−8·03	−7·88
				−8·00						
4. 19									−6·80	
					2. 47. 25·0	−6. 52·77	9. 33. 50·0	24. 30·79		
5. 2									−6·80	
5. 7				−8·00					−8·01	−8·10
6. 10	17. 36. 6	10. 43. 29·8	−7. 3·04							
				−7·35						
7. 19	2. 43. 1	19. 45. 11·0	−7. 13·15						−8·01	−7·90
				−7·73						
8. 19									−7·41	
					4. 4. 13·0	−7. 23·55	11. 6. 1·0	24. 31·13		
9. 3									−7·41	
9. 7				−7·73					−7·70	−7·58
10. 10	17. 42. 11	10. 34. 25·0	−7. 33·23							
				−7·46						
10. 19	2. 51. 4	19. 41. 51·4	−7. 36·08						−7·70	−7·84
				−6·90						
11. 19									−7·99	
					4. 2. 49·4	−7. 45·68	11. 15. 59·5	24. 32·16		
12. 3									−7·99	
12. 7				−6·90					−6·83	−6·06
13. 10	17. 50. 56	10. 31. 46·0	−7. 54·68							
				−8·52						
14. 19	3. 9. 46	19. 45. 21·8	−8. 6·48						−6·83	−7·69
				−7·81						
15. 19									−7·74	
					4. 57. 39·4	−8. 17·31	12. 26. 9·5	24. 31·03		
16. 4									−7·74	
16. 7				−7·81					−7·21	−7·92
17. 10	18. 2. 22	10. 28. 3·4	−8. 26·86							
				−6·96						
18. 19	3. 25. 27	19. 45. 51·8	−8. 36·54						−7·21	−6·42
				−7·02						
19. 19									−9·44	

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER W.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 9					10. 55. 5·8	−8. 49·71	18. 39. 44·5	24. 30·41		
21. 7									−9·44	
22. 10	18. 52. 20	10. 58. 59·4	−9. 5·72	−7·02					−8·17	−7·56
				−8·00						
18. 19	3. 25. 27	19. 45. 51·8	−8. 36·54							
19. 19				−7·02					−7·21	−6·42
21. 5					5. 45. 57·4	−8. 55·94	13. 33. 33·5	24. 31·62	−9·44	
21. 7									−9·44	
22. 10	18. 52. 20	10. 58. 59·4	−9. 5·72	−7·02					−8·17	−7·56
22. 19	3. 42. 5	19. 47. 21·0	−9. 8·67	−8·00						
23. 19				−8·80					−8·17	−8·86
24. 3					3. 46. 59·8	−9. 20·12	11. 45. 39·0	24. 31·30	−8·00	
24. 7									−8·00	
25. 10				−8·80					−8·42	−8·75
25. 19	3. 44. 23	19. 38. 20·2	−9. 34·38	−8·00						
26. 19									−8·42	−8·05
27. 3					4. 21. 30·2	−9. 45·98	12. 31. 35·5	24. 30·56	−8·00	

Concluded Longitude of Kingstown from Greenwich = 24ᵐ. 30ˢ·97 West.

CHRONOMETER X.

June 26. 19	1. 27. 45	19. 5. 51·0	+0. 6·29							
27. 19				−0·63						−0·40
27. 22					23. 25. 53·4	+0. 5·39	5. 51. 16·0	24. 30·89	−1·32	
28. 7									−1·32	
29. 10	17. 27. 2	10. 54. 43·8	+0. 4·25	−0·63					−1·02	−0·83
30. 19	1. 42. 48	19. 5. 15·8	+0. 2·48	−1·32						
July 1. 19				−1·34					−1·02	−1·23
2. 1					2. 23. 55·0	+0. 0·80	9. 5. 24·0	24. 31·03	−1·06	
2. 7									−1·06	
				−1·34					−1·22	−1·44

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER X.—*continued.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
3. 10	17. 26. 21	10. 38. 28·6	−0. 0·92							
				−0·79						
3. 19	2. 17. 55	19. 28. 36·2	−0. 1·21							
				−1·06					−1·22	−0·97
4. 19									−1·03	
5. 2					2. 44. 11·0	−0. 2·58	9. 37. 26·5	24. 31·07		
									−1·03	
5. 7									−1·24	−1·14
				−1·06						
6. 10	17. 37. 8	10. 37. 32·6	−0. 4·00							
				−1·27						
7. 19	2. 44. 11	19. 39. 13·4	−0. 5·75						−1·24	−1·36
				−1·29						
8. 19									−1·15	
9. 3					3. 59. 20·6	−0. 7·47	11. 8. 25·0	24. 31·19		
									−1·15	
9. 7									−1·53	−1·23
				−1·29						
10. 10	17. 43. 41	10. 28. 30·6	−0. 9·08							
				−1·02						
10. 19	2. 52. 14	19. 35. 34·6	−0. 9·47						−1·53	−1·87
				−1·52						
11. 19									−1·19	
12. 3					3. 56. 48·2	−0. 11·45	11. 17. 33·5	24. 31·44		
									−1·19	
12. 7									−1·39	−1·21
				−1·52						
13. 10	17. 52. 21	10. 25. 29·4	−0. 13·31							
				−1·35						
14. 19	3. 11. 36	19. 39. 20·2	−0. 15·18						−1·39	−1·59
				−1·35						
15. 19									−1·09	
16. 4					4. 51. 14·6	−0. 16·98	12. 27. 45·0	24. 31·32		
									−1·09	
16. 7									−0·91	−1·14
				−1·35						
17. 10	18. 3. 6	10. 20. 39·0	−0. 18·58							
				−0·82						
18. 19	3. 26. 34	19. 38. 41·8	−0. 19·72						−0·91	−0·66
				−1·33						
19. 19									−1·45	
20. 9					10. 47. 47·4	−0. 21·97	18. 40. 54·0	24. 30·44		
									−1·45	
21. 7									−2·03	−1·93
				−1·33						
22. 10	18. 53. 26	10. 51. 24·2	−0. 24·71							
				−1·33						
18. 19	3. 26. 34	19. 38. 41·8	−0. 19·72							
				−1·33					−0·91	−0·66
19. 19									−1·45	
21. 5					5. 39. 10·6	−0. 23·06	13. 35. 21·0	24. 30·49		
									−1·45	
21. 7									−2·03	−1·93
				−1·33						
22. 10	18. 53. 26	10. 51. 24·2	−0. 24·71							

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER X.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
22. 19	3. 42. 55	19. 39. 27·4	−0. 25·20	−1·33						
23. 19				−1·72					−2·03	−2·14
24. 3					3. 39. 28·6	−0. 27·34	11. 47. 0·5	24. 31·60	−1·33	
24. 7									−1·33	
25. 10				−1·72					−0·99	−1·34
25. 19	3. 45. 44	19. 30. 36·6	−0. 30·01	−1·33						
26. 19									−0·99	−0·59
27. 3					4. 14. 4·6	−0. 32·18	12. 33. 24·5	24. 30·06	−1·33	

Concluded Longitude of Kingstown from Greenwich = $24^{m}.\ 31^{s}\cdot12$ West.

CHRONOMETER Y.

June 26. 19	1. 29. 19	19. 5. 8·0	+2. 23·04							
27. 19				+1·96						+0·61
27. 22									+0·95	
28. 7					23. 26. 37·0	+2. 25·12	5. 54. 18·5	24. 32·21	+0·95	
29. 10	17. 28. 59	10. 54. 17·0	+2. 27·72	+1·96					+2·52	+3·16
30. 19	1. 44. 34	19. 4. 35·0	+2. 28·99	+0·95						
July 1. 19				+2·09					+2·52	+1·80
2. 1									+1·74	
2. 7					2. 37. 32·2	+2. 31·65	9. 21. 34·5	24. 31·20	+1·74	
3. 10	17. 28. 15	10. 37. 47·0	+2. 34·36	+2·09					+1·74	+2·35
3. 19	2. 19. 45	19. 27. 49·4	+2. 35·29	+2·52						
4. 19				+1·73					+1·74	+1·06
5. 2									+1·84	
5. 7					2. 43. 37·0	+2. 37·58	9. 39. 32·5	24. 31·58	+1·84	
6. 10	17. 38. 51	10. 36. 31·4	+2. 39·91	+1·73					+2·75	+2·33
7. 19	2. 45. 10	19. 37. 25·0	+2. 41·49	+1·15						
8. 19				+2·59					+2·75	+3·22
9. 3									+0·62	
9. 7					3. 58. 51·0	+2. 44·49	11. 10. 48·5	24. 30·45	+0·62	
10. 10	17. 45. 2	10. 26. 55·0	+2. 47·30	+2·59					+2·64	+2·03

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER Y.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
10. 19	2. 53. 27	19. 33. 50·6	+2. 47·33	+0·08						
				+2·54					+2·64	+3·33
11. 19									+1·03	
12. 3					3. 57. 10·6	+2. 50·38	11. 20. 59·5	24. 30·23	+1·03	
12. 7				+2·54					+2·53	+1·84
13. 10	17. 53. 51	10. 23. 52·6	+2. 53·24	+1·98						
14. 19	3. 13. 1	19. 37. 33·8	+2. 55·99	+2·33					+2·53	+3·31
15. 19									+1·85	
16. 4					4. 50. 40·2	+2. 59·09	12. 30. 28·5	24. 29·94	+1·85	
16. 7				+2·33					+1·54	+1·46
17. 10	18. 4. 3	10. 18. 15·4	+3. 1·86	+1·72						
18. 19	3. 28. 1	19. 36. 44·6	+3. 4·24	+2·28					+1·54	+1·63
19. 19									+3·07	
20. 9					10. 47. 8·6	+3. 8·47	18. 43. 45·0	24. 31·54	+3·07	
21. 7				+2·28					+3·20	+2·86
22. 10	18. 54. 33	10. 48. 52·6	+3. 13·71	+3·65						
18. 19	3. 28. 1	19. 36. 44·6	+3. 4·24							
19. 19				+2·28					+1·54	+1·63
21. 5					5. 38. 3·8	+3. 10·54	13. 37. 47·5	24. 31·20	+3·07	
21. 7									+3·07	
22. 10	18. 54. 33	10. 48. 52·6	+3. 13·71	+2·28					+3·20	+2·86
22. 19	3. 43. 47	19. 36. 39·0	+3. 15·05	+3·65						
23. 19				+4·02					+3·20	+3·59
24. 3					3. 36. 47·0	+3. 20·25	11. 48. 7·0	24. 31·27	+3·65	
24. 7									+3·65	
25. 10				+4·02					+4·37	+4·41
25. 19	3. 47. 9	19. 28. 4·6	+3. 26·77	+3·65						
26. 19									+4·37	+4·33
27. 3					4. 11. 12·6	+3. 32·05	12. 34. 36·5	24. 30·48	+3·65	

Concluded Longitude of Kingstown from Greenwich = $24^{m}.30^{s}\cdot93$ West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER Z.

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
June d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
26. 19	1. 32. 10	19. 8. 58·6	+1. 22·97							+1·53
				+1·77						
27. 19									+0·86	
27. 22					23. 30. 45·0	+1. 24·85	5. 57. 28·0	24. 30·96	+0·86	
28. 7									+1·88	+1·98
				+1·77						
29. 10	17. 30. 58	10. 57. 16·2	+1. 27·20							
				+0·86						
30. 19	1. 46. 0	19. 7. 1·4	+1. 28·35						+1·88	+1·76
July				+1·80						
1. 19									+1·72	
2. 1					3. 13. 10·6	+1. 30·73	9. 56. 18·0	24. 30·80	+1·72	
2. 7									+1·69	+1·83
				+1·80						
3. 10	17. 30. 0	10. 40. 33·0	+1. 33·08							
				+2·57						
3. 19	2. 21. 22	19. 30. 27·4	+1. 34·03						+1·69	+1·53
				+2·48						
4. 19									+2·78	
5. 2					2. 46. 49·0	+1. 37·35	9. 41. 44·5	24. 31·71	+2·78	
5. 7									+2·65	+3·32
				+2·48						
6. 10	17. 40. 8	10. 38. 47·4	+1. 40·72							
				+2·98						
7. 19	2. 46. 46	19. 39. 57·4	+1. 44·83						+2·65	+1·89
				+2·13						
8. 19									+2·23	
9. 3					4. 2. 11·4	+1. 47·75	11. 13. 12·0	24. 31·00	+2·23	
9. 7									+2·67	+2·34
				+2·13						
10. 10	17. 46. 31	10. 29. 20·6	+1. 50·46							
				+1·47						
10. 19	2. 55. 25	19. 36. 44·6	+1. 51·02						+2·67	+3·04
				+2·67						
11. 19									+1·89	
12. 3					4. 1. 9·8	+1. 54·44	11. 24. 3·0	24. 30·48	+1·89	
12. 7									+2·22	+2·34
				+2·67						
13. 10	17. 55. 14	10. 26. 11·0	+1. 57·63							
				+2·30						
14. 19	3. 14. 10	19. 39. 37·8	+2. 0·81						+2·22	+2·08
				+2·16						
15. 19									+1·42	
16. 4					4. 54. 36·2	+2. 3·61	12. 33. 28·5	24. 30·95	+1·42	
16. 7									+2·85	+2·23
				+2·16						
17. 10	18. 5. 3	10. 20. 11·0	+2. 6·11							
				+0·54						
18. 19	3. 29. 9	19. 38. 49·8	+2. 6·86						+2·85	+3·55
				+3·09						
19. 19									−0·20	

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER Z.—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 9					10. 52. 1·4	+2. 9·67	18. 47. 41·0	24. 30·18		
21. 7									−0·20	
22. 10	18. 55. 51	10. 51. 11·0	+2. 13·10	+3·09					+4·44	+2·67
				+1·57						
18. 19	3. 29. 9	19. 38. 49·8	+2. 6·86							
19. 19				+3·09					+2·85	+3·55
21. 5					5. 41. 35·4	+2. 11·03	13. 40. 19·5	24. 31·70	−0·20	
21. 7									−0·20	
22. 10	18. 55. 51	10. 51. 11·0	+2. 13·10	+3·09					+4·44	+2·67
22. 19	3. 44. 53	19. 38. 46·2	+2. 13·68	+1·57						
23. 19				+6·00					+4·44	+6·42
24. 3					3. 41. 8·6	+2. 19·97	11. 51. 30·0	24. 30·13	+1·57	
24. 7									+1·57	
25. 10				+6·00					+4·22	+5·64
25. 19	3. 49. 20	19. 31. 14·2	+2. 27·81	+1·57						
26. 19									+4·22	+2·64
27. 3					4. 14. 10·6	+2. 34·23	12. 36. 33·5	24. 33·99	+1·57	

Concluded Longitude of Kingstown from Greenwich = 24m. 30s·80 West.

CHRONOMETER *a.*

June 26. 19	1. 35. 14	19. 14. 7·4	−0. 42·33							
27. 19				−1·72						−2·25
27. 22					23. 37. 49·8	−0. 44·88	6. 2. 24·0	24. 30·83	−3·90	
28. 7									−3·90	
29. 10	17. 32. 39	11. 1. 12·2	−0. 48·07	−1·72					−1·34	−1·25
30. 19	1. 47. 29	19. 10. 51·8	−0. 53·29	−3·90						
July 1. 19				−1·00					−1·34	−1·44
2. 1					3. 19. 12·2	−0. 55·21	9. 59. 54·0	24. 31·06	−3·33	
2. 7									−3·33	
				−1·00					−1·21	−0·61

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER *a.—continued.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
3. 10	17. 31. 28	10. 44. 31·0	−0. 57·16							
				−2·76						
3. 19	2. 22. 40	19. 34. 17·4	−0. 58·18							
				−1·15					−1·21	−1·89
4. 19									−2·13	
5. 2					2. 54. 17·0	−0. 59·93	9. 46. 36·5	24. 31·22	−2·13	
5. 7									+0·10	−0·49
				−1·15						
6. 10	17. 41. 35	10. 42. 56·6	−1. 1·72							
				−1·49						
7. 19	2. 48. 0	19. 43. 59·8	−1. 3·77							
				+0·45					+0·10	+0·77
8. 19									−1·57	
9. 3					4. 7. 28·2	−1. 3·68	11. 15. 38·5	24. 30·28	−1·57	
9. 7									+0·55	+0·17
				+0·45						
10. 10	17. 48. 6	10. 33. 49·4	−1. 3·59							
				−1·65						
10. 19	2. 56. 50	19. 41. 4·6	−1. 4·22							
				+0·66					+0·55	+0·98
11. 19									−1·87	
12. 3					4. 7. 0·6	−1. 3·96	11. 26. 56·0	24. 30·36	−1·87	
12. 7									+0·96	+0·38
				+0·66						
13. 10	17. 57. 27	10. 31. 25·0	−1. 3·73							
				−2·08						
14. 19	3. 15. 28	19. 44. 3·0	−1. 6·61							
				+0·66					+0·96	+1·62
15. 19									−1·50	
16. 4					5. 11. 6·2	−1. 6·25	12. 46. 52·0	24. 29·76	−1·50	
16. 7									+0·24	−0·19
				+0·66						
17. 10	18. 6. 28	10. 24. 47·8	−1. 5·93							
				−0·91						
18. 19	3. 30. 36	19. 43. 30·6	−1. 7·19							
				+1·13					+0·24	+0·73
19. 19									−0·17	
20. 9					10. 57. 4·6	−1. 6·23	18. 49. 28·0	24. 30·77	−0·17	
21. 7									+1·22	+1·49
				+1·13						
22. 10	18. 56. 47	10. 55. 25·0	−1. 5·05							
				−1·19						
18. 19	3. 30. 36	19. 43. 30·6	−1. 7·19							
				+1·13					+0·24	+0·73
19. 19									−0·17	
21. 5					5. 47. 3·0	−1. 5·75	13. 42. 31·0	24. 31·38	−0·17	
21. 7									+1·22	+1·49
				+1·13						
22. 10	18. 56. 47	10. 55. 25·0	−1. 5·05							

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER *a.*—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by ½ Σ.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
22. 19	3. 45. 52	19. 43. 4·2	−1. 5·49	−1·19						
23. 19				+1·35					+1·22	+0·92
24. 3					3. 45. 50·6	−1. 4·69	11. 52. 47·0	24. 30·69	−1·19	
24. 7									−1·19	
25. 10				+1·35					+1·48	+1·74
25. 19	3. 51. 0	19. 36. 25·4	−1. 3·66	−1·19						
26. 19									+1·48	+1·19
27. 3					4. 20. 28·2	−1. 2·82	12. 39. 18·0	24. 30·46	−1·19	

Concluded Longitude of Kingstown from Greenwich = 24ᵐ. 30ˢ·39 West.

CHRONOMETER *b.*

June 26. 19	1. 37. 33	19. 15. 22·2	+0. 21·49							
27. 19				+3·82						+3·66
27. 22					23. 41. 4·6	+0. 25·10	6. 6. 49·5	24. 30·83	+0·03	
28. 7									+0·03	
29. 10	17. 34. 21	11. 1. 36·2	+0. 29·65	+3·82					+3·40	+3·96
30. 19	1. 48. 47	19. 10. 46·6	+0. 29·69	+0·03						
July 1. 19				+2·69					+3·40	+2·77
2. 1					3. 20. 0·6	+0. 32·49	10. 2. 10·5	24. 31·03	−0·30	
2. 7									−0·30	
3. 10	17. 32. 37	10. 44. 7·4	+0. 35·25	+2·69					+1·99	+2·62
3. 19	2. 23. 53	19. 33. 57·0	+0. 35·02	−0·62						
4. 19				+1·94					+1·99	+1·28
5. 2					2. 55. 29·8	+0. 37·60	9. 49. 27·0	24. 31·51	+2·14	
5. 7									+2·14	
6. 10	17. 43. 8	10. 42. 47·4	+0. 40·23	+1·94					+3·74	+2·53
7. 19	2. 49. 31	19. 43. 39·8	+0. 46·98	+4·90						
8. 19				+4·02					+3·74	+5·11
9. 3					4. 9. 15·8	+0. 52·23	11. 19. 23·0	24. 29·88	+3·25	
9. 7									+3·25	
10. 10	17. 49. 49	10. 33. 31·4	+0. 57·13	+4·02					+3·42	+3·06
				+1·60						

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER *b.—concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
10. 19	2. 58. 21	19. 40. 33·4	+0. 57·74							
				+3·29						
11. 19									+3·42	+3·83
									+1·97	
12. 3					4. 7. 15·0	+1. 1·89	11. 29. 16·5	24. 30·49		
12. 7									+1·97	
				+3·29					+2·69	+2·81
13. 10	17. 58. 27	10. 30. 15·4	+1. 5·71							
				+2·34						
14. 19	3. 16. 53	19. 43. 12·2	+1. 8·96							
				+2·24					+2·69	+2·55
15. 19									+1·96	
16. 4					5. 10. 25·0	+1. 11·99	12. 48. 28·5	24. 30·57		
16. 7									+1·96	
				+2·24					+1·88	+1·96
17. 10	18. 7. 38	10. 23. 37·0	+1. 14·68							
				+1·58						
18. 19	3. 31. 31	19. 42. 1·4	+1. 16·87							
				+3·18					+1·88	+1·79
19. 19									+1·96	
20. 9					10. 58. 35·4	+1. 21·25	18. 53. 25·5	24. 32·20		
21. 7									+1·96	
				+3·18					+4·02	+4·42
22. 10	18. 57. 40	10. 53. 46·2	+1. 26·61							
				+2·25						
18. 19	3. 31. 31	19. 42. 1·4	+1. 16·87							
				+3·18					+1·88	+1·79
19. 19									+1·96	
21. 5					5. 46. 55·4	+1. 23·37	13. 44. 51·5	24. 32·79		
21. 7									+1·96	
				+3·18					+4·02	+4·42
22. 10	18. 57. 40	10. 53. 46·2	+1. 26·61							
				+2·25						
22. 19	3. 47. 38	19. 42. 17·0	+1. 27·44							
				+2·99					+4·02	+3·57
23. 19									+2·25	
24. 3					3. 44. 40·6	+1. 31·16	11. 54. 13·5	24. 30·27		
24. 7									+2·25	
				+2·99					+2·33	+2·47
25. 10				+2·25						
25. 19	3. 51. 58	19. 34. 43·8	+1. 35·78						+2·33	+2·17
26. 19									+2·25	
27. 3					4. 19. 44·2	+1. 39·52	12. 41. 15·5	24. 31·64		

Concluded Longitude of Kingstown from Greenwich = $24^m. 30^s·92$ West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER *d.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
June d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
26. 19	1. 31. 8	19. 6.31·5	+2. 48·24	+2·65						+2·45
27. 19									+4·17	
27. 22					23. 44. 52·5	+2. 51·78	6. 13. 4·0	24. 31·93	+4·17	
28. 7				+2·65					+2·95	+2·83
29. 10	17. 36. 33	11. 1.21·37	+2. 56·11	+4·17						
30. 19	1. 50. 12	19. 9.39·37	+3. 1·70	+2·87					+2·95	+3·09
July 1. 19									+4·08	
2. 1					3. 19. 52·63	+3. 5·85	10. 4. 36·0	24. 31·30	+4·08	
2. 7				+2·87					+3·20	+2·68
3. 10	17. 33. 51	10. 42. 46·5	+3. 9·95	+3·99						
3. 19	2. 25. 9	19. 32. 36·37	+3. 11·43	+3·78					+3·20	+3·79
4. 19									+3·70	
5. 2					2. 56. 8·63	+3. 16·33	9. 52. 45·0	24. 31·61	+3·70	
5. 7				+3·78					+3·88	+3·77
6. 10	17. 44. 50	10. 41. 48·0	+3. 21·35	+3·40						
7. 19	2. 51. 2	19. 42. 31·5	+3. 26·03	+3·97					+3·88	+4·00
8. 19									+5·00	
9. 3					4. 9. 36·0	+3. 31·71	11. 22. 21·5	24. 31·56	+5·00	
9. 7				+3·97					+3·88	+3·94
10. 10	17. 50. 58	10. 32. 0·37	+3. 36·96	+6·60						
10. 19	3. 0. 6	19. 39. 36·37	+3. 39·48	+3·95					+3·88	+3·81
11. 19									+5·26	
12. 3					4. 6. 14·63	+3. 45·18	11. 30. 58·5	24. 31·68	+5·26	
12. 7				+3·95					+3·84	+4·07
13. 10	18. 0. 0	10. 29. 3·37	+3. 50·48	+3·91						
14. 19	3. 18. 31	19. 42. 3·0	+3. 55·89	+3·67					+3·84	+3·58
15. 19									+3·63	
16. 4					5. 9. 15·38	+4. 0·99	12. 50. 7·0	24. 31·72	+3·63	
16. 7				+3·67					+3·55	+3·75
17. 10	18. 9. 4	10. 22. 12·0	+4. 5·46	+3·34						
18. 19	3. 32. 35	19. 40. 12·0	+4. 10·09	+4·12					+3·55	+3·32
19. 19									+3·13	

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER *d.—concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
20. 9					11. 7.27·75	+4.16·18	19. 5.14·5	24.32·41		
21. 7									+3·13	
22. 10	18.59. 3	10.52.12·0	+4.23·58	+4·12					+5·22	+4·83
				+4·55						
18. 19	3.32.35	19.40.12·0	+4.10·09							
19. 19				+4·12					+3·55	+3·32
21. 5					5.46.24·38	+4.19·13	13.47.16·5	24.32·92	+3·13	
21. 7									+3·13	
22. 10	18.59. 3	10.52.12·0	+4.23·58	+4·12					+5·22	+4·83
22. 19	3.48.40	19.40.21·0	+4.25·26	+4·55						
23. 19				+5·50					+5·22	+5·66
24. 3					3.44.12·75	+4.32·23	11.56.46·0	24.31·41	+4·55	
24. 7									+4·55	
25. 10				+5·50					+5·41	+5·36
25. 19	3.53.47	19.33.27·37	+4.40·91	+4·55						
26. 19									+5·41	+5·47
27. 3					4.18. 6·38	+4.48·02	12.42.46·5	24.31·56	+4·55	

Concluded Longitude of Kingstown from Greenwich = $24^{m}.31^{s}\cdot74$ West.

CHRONOMETER *e.*

June 26. 19	1.34.10	19.11. 2·25	+1.18·99							
27. 19				−0·64						−0·81
27. 22					23.53.30·75	+1.18·40	6.20.10·5	24.31·45	+0·11	
28. 7									+0·11	
29. 10	17.39.16	11. 5.42·37	+1.17·68	−0·64					−0·59	−0·49
30. 19	1.51.46	19.12.57·0	+1.17·82	+0·11						
July 1. 19				−0·99					−0·59	−0·70
2. 1					3.24.54·0	+1.16·55	10. 7.49·0	24.30·89	−0·68	
2. 7									−0·68	
				−0·99					−2·90	−1·24

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER *e.—continued.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
3. 10	17. 35. 56	10. 46. 45·75	+1. 15·35							
				−1·46						
3. 19	2. 26. 40	19. 36. 3·75	+1. 14·81							
				−2·41					−2·90	−4·76
4. 19										
									−1·39	
5. 2					3. 4. 42·38	+1. 11·93	9. 59. 13·5	24. 33·53		
									−1·39	
5. 7										
				−2·41					−0·83	−0·32
6. 10	17. 46. 21	10. 45. 31·12	+1. 8·98							
				−1·31						
7. 19	2. 52. 34	19. 46. 22·12	+1. 7·17							
				−2·13					−0·83	−1·41
8. 19										
									−1·60	
9. 3					4. 15. 26·63	+1. 4·41	11. 25. 46·5	24. 30·43		
									−1·60	
9. 7										
				−2·13					−2·18	−2·77
10. 10	17. 53. 38	10. 37. 15·05	+1. 1·85							
				−1·89						
10. 19	3. 1. 32	19. 43. 40·5	+1. 1·12							
				−2·35					−2·18	−1·51
11. 19										
									−1·68	
12. 3					4. 12. 27·75	+0. 58·12	11. 34. 26·5	24. 30·31		
									−1·68	
12. 7										
				−2·35					−2·43	−3·10
13. 10	18. 1. 2	10. 33. 0·37	+0. 55·31							
				−1·47						
14. 19	3. 19. 56	19. 46. 30·37	+0. 53·28							
				−1·98					−2·43	−1·68
15. 19										
									−1·91	
16. 4					5. 16. 21·38	+0. 50·55	12. 54. 4·0	24. 30·92		
									−1·91	
16. 7										
				−1·98					−1·66	−2·25
17. 10	18. 10. 59	10. 27. 24·0	+0. 48·14							
				−2·34						
18. 19	3. 33. 49	19. 44. 51·0	+0. 44·89							
				−1·63					−1·66	−1·00
19. 19										
									−1·84	
20. 9					11. 20. 33·0	+0. 42·06	19. 14. 49·0	24. 30·60		
									−1·84	
21. 7										
				−1·63					−1·20	−2·19
22. 10	19. 0. 4	10. 56. 57·75	+0. 38·67							
				−1·49						
18. 19	3. 33. 49	19. 44. 51·0	+0. 44·89							
				−1·63					−1·66	−1·00
19. 19										
									−1·84	
21. 5					5. 52. 35·63	+0. 40·74	13. 49. 52·0	24. 30·70		
									−1·84	
21. 7										
				−1·63					−1·20	−2·19
22. 10	19. 0. 4	10. 56. 57·75	+0. 38·67							

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER *e.*—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
22. 19	3. 49. 32	19. 45. 0·0	+0. 38·12	−1·49						
				+0·43					−1·20	−0·09
23. 19									−1·49	
24. 3					3. 49. 13·13	+0. 37·96	11. 57. 52·0	24. 31·69		
24. 7									−1·49	
25. 10				+0·43					+0·49	+0·89
25. 19	3. 54. 47	19. 38. 30·37	+0. 37·75	−1·49						
26. 19									+0·49	+0·04
27. 3					4. 24. 30·0	+0. 37·59	12. 45. 0·0	24. 31·61	−1·49	

Concluded Longitude of Kingstown from Greenwich = 24m. 31s·19 West.

CHRONOMETER *f.*

June 26. 19	1. 35. 13	19. 15. 24·0	−1. 59·92							
				−1·34						−0·76
27. 19									−1·09	
27. 22					0. 1. 12·0	−2. 1·46	6. 24. 33·5	24. 30·55	−1·09	
28. 7									−1·79	−1·86
29. 10	17. 41. 49	11. 11. 36·0	−2. 3·37	−1·34						
30. 19	1. 53. 30	19. 18. 3·37	−2. 4·84	−1·09					−1·79	−1·72
July 1. 19				−2·10					−1·63	
2. 1					3. 32. 56·63	−2. 7·51	10. 12. 28·5	24. 30·71	−1·63	
2. 7									−1·90	−2·44
3. 10	17. 37. 30	10. 51. 45·0	−2. 10·15	−2·10						
3. 19	2. 27. 32	19. 40. 21·37	−2. 10·96	−2·17					−1·90	−1·29
4. 19				−1·42					−2·32	
5. 2					3. 11. 12·38	−2. 13·06	10. 2. 21·5	24. 31·04	−2·32	
5. 7									−1·43	−1·53
6. 10	17. 47. 59	10. 50. 33·0	−2. 15·16	−1·42						
7. 19	2. 54. 33	19. 51. 46·5	−2. 18·54	−2·46					−1·43	−1·31
8. 19				−1·16					−2·61	
9. 3					4. 28. 6·0	−2. 20·48	11. 35. 1·5	24. 31·43	−2·61	
9. 7									−1·02	−1·02
10. 10	17. 52. 29	10. 39. 30·37	−2. 22·29	−1·16						
				−2·76						

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF KINGSTOWN FROM GREENWICH.

CHRONOMETER *f.*—*concluded.*

Comparisons at Greenwich.					Comparisons at Kingstown.					Chronometer's Adopted Losing Rate.
Approximate Solar Time, 1844.	Time by Greenwich Transit Clock.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's Apparent Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by $\frac{1}{2}\Sigma$.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	
July d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
10. 19	3. 5. 4	19.50.36·37	−2. 23·34							
				−1·47					−1·02	−1·02
11. 19									−2·87	
12. 3					4.19.21·0	−2.25·68	11.37.56·0	24.30·82	−2·87	
12. 7									−2·07	−1·87
13. 10	18. 2. 6	10.37.27·37	−2.27·88	−1·47						
				−2·98					−2·07	−2·29
14. 19	3.21. 2	19.51. 1·5	−2.32·01	−1·19					−2·66	
15. 19									−2·66	
16. 4					5.21.59·63	−2.34·05	12.56.16·5	24.32·43	−1·30	−0·21
16. 7									−1·30	−2·52
17. 10	18.12.18	10.32. 6·75	−2.35·83	−1·19					−2·38	
				−2·33					−2·38	
18. 19	3.35. 8	19.49.33·75	−2.39·07	−2·60					−2·17	−2·67
19. 19										
20. 9					11.29.57·75	−2.43·22	19.20.49·0	24.31·05		
21. 7										
22. 10	19. 1.57	11. 2.17·25	−2.48·14	−2·60						
				−3·53						
18. 19	3.35. 8	19.49.33·75	−2.39·07							
				−2·60					−1·30	−2·52
19. 19									−2·38	
21. 5					5.59. 8·75	−2.45·12	13.52.59·5	24.30·98	−2·38	
21. 7									−2·17	−2·67
22. 10	19. 1.57	11. 2.17·25	−2.48·14	−2·60						
				−3·53						
22. 19	3.50.35	19.49.30·37	−2.49·44	−1·56					−2·17	−1·61
23. 19									−3·53	
24. 3					3.56.40·13	−2.52·29	12. 1.50·0	24.31·09	−3·53	
24. 7									−1·74	−1·52
25. 10				−1·56						
25. 19	3.56. 2	19.43.18·75	−2.55·83	−3·53					−1·74	−1·99
26. 19									−3·53	
27. 3					4.29.36·0	−2.58·70	12.46.30·0	24.31·56		

Concluded Longitude of Kingstown from Greenwich = 24m. 31s·05 West.

The following Table contains the Results from all the Chronometers.

Reference to Chronometer.	Longitude of Kingstown West of Greenwich.	Sum of Squares of Changes of Rate.	Weight of Result.
	m s		
A	24. 31 ·18	10 ·3739	96
B	24. 31 ·02	15 ·4183	65
C	24. 31 ·22	26 ·9721	37
D	24. 31 ·16	26 ·9183	37
E	24. 31 ·17	7 ·6459	131
F	24. 31 ·31	29 ·8487	33
G	24. 30 ·91	16 ·8947	59
H	24. 31 ·05	18 ·4051	54
I	24. 31 ·10	18 ·0763	55
J	24. 31 ·18	5 ·5568	180
K	24. 30 ·52	9 ·9624	100
L	24. 31 ·28	12 ·0563	66
M	24. 31 ·38	18 ·3417	54
N	24. 30 ·65	15 ·6931	64
O	24. 31 ·36	44 ·9166	22
P	24. 30 ·90	3 ·1271	320
Q	24. 30 ·68	49 ·3369	15
R	24. 30 ·45	14 ·0394	71
S	24. 30 ·67	161 ·9213	6
T	24. 31 ·07	11 ·5482	87
U	24. 31 ·38	18 ·2130	55
W	24. 30 ·97	13 ·2794	75
X	24. 31 ·12	4 ·9861	200
Y	24. 30 ·93	26 ·3868	38
Z	24. 30 ·80	33 ·0551	30
a	24. 30 ·39	15 ·8246	63
b	24. 30 ·92	26 ·7629	37
d	24. 31 ·74	5 ·2786	189
e	24. 31 ·19	51 ·1083	19
f	24. 31 ·05	15 ·1971	66

The sum of weights is 2324

The result for the Longitude of Kingstown temporary Observatory, West of Greenwich Observatory, is ..... $24^m. 31^s \cdot 062$

The probable error of this determination, as depending on the unsteadiness of rate of the travelling chronometers, is ..... $\pm 0^s \cdot 0138$

It must be borne in mind that this determination is based upon Kingstown transits as observed by Mr. Hind, and Greenwich transits as observed by Mr. Henry; and that no correction is yet applied for personal equation.

XII. — *Comparisons and Calculations for the Longitude of Valentia, as determined with reference to Kingstown.*

THE chronometers arrived at Dublin by the morning mail, and were brought to Kingstown shortly after eight o'clock. They were not compared immediately, but about two o'clock in the afternoon (sometimes earlier and sometimes later). They left Kingstown at five or six o'clock in the evening. They arrived at Valentia after midnight on the following day, and were then not immediately compared (with the exception of two instances only, of which however no notice is taken here), but were compared at one or two o'clock on the next day. Then they left Valentia late in the evening, and arrived at Kingstown on the next morning but one. The hour of comparison at Valentia was, on the average, a little later than that at Kingstown: the difference being an hour and forty or fifty minutes.

As the same journey was performed, in the same manner, in going backwards and forwards, it appears reasonable to suppose that the times corresponding to the stationary rates and those corresponding to the travelling rates were almost in the same proportion in the two journeys, and thus that the stationary and travelling rates may be fairly blended into one mixed rate. And, as the intervals between the Valentia and Kingstown comparisons are so nearly equal to those between the Kingstown and Valentia comparisons, they may be assumed as equal in the operations for application of the method of minimum squares.

The process then becomes exactly the same as that which is described in Section VIII. And as the time through which one rate is used is 48^h nearly, and the number of changes is 19, the probable error of the determination of longitude from the combination of the results of all the chronometers, A, B, &c., with the weights, W_A, W_B, &c.

$$\left(\text{where } W_A = \frac{1000}{\text{sum of minimum squares for } A}, \text{ \&c.}\right)$$

will be

$$\frac{\pm 0{\cdot}6745}{19} \times \sqrt{\frac{1000}{W_A + W_B + \text{\&c.}}}.$$

The chronometer S appears to have tripped between August 23 and 25; and the two series of comparisons, ending with August 23 and beginning with August 25, are treated without connexion, and the sum of the squares is multiplied by 1·6. The chronometer d ran down at an early stage of the operations, and the first rates being rejected, the sum of squares for the others is multiplied by 1·5.

The chronometer-time at comparison is occasionally altered in the second decimal for the same reason as in the last section.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

Chronometer A.

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
5. 4	12. 56. 48·0	4. 0. 44·8	−23. 31·03				(Chron. 2306.)			
				+0·10						+0·33
7. 4					1. 32. 20·0	−23. 30·85	9. 56. 17·0	16. 51·64		
				+0·10					−0·02	−0·13
9. 0	9. 15. 33·0	0. 4. 23·2	−23. 30·66				(Chron. 2306.)			
				+0·31					−0·02	+0·09
11. 3					1. 25. 50·0	−23. 30·03	10. 5. 23·0	16. 52·52		
				+0·31					+0·66	+0·53
13. 0	9. 43. 46·0	0. 16. 47·6	−23. 29·44				(TransitClock)			
				+0·68					+0·66	+0·79
15. 2					0. 2. 32·0	−23. 28·07	8. 57. 31·0	16. 51·86		
				+0·68					+0·55	+0·57
17. 1	10. 34. 58·0	0. 52. 6·4	−23. 26·69							
				+0·55					+0·55	+0·53
19. 3					2. 5. 14·8	−23. 25·55	11. 16. 14·0	16. 52·11		
				+0·55					+0·60	+0·57
21. 1	11. 37. 24·5	1. 38. 40·8	−23. 24·47							
				+0·78					+0·60	+0·63
23. 2					0. 50. 12·0	−23. 22·93	10. 16. 39·0	16. 52·34		
				+0·78					+0·74	+0·93
25. 2	12. 43. 57·5	2. 29. 19·2	−23. 21·34							
				+0·70					+0·74	+0·55
27. 3					2. 22. 10·0	−23. 19·93	12. 5. 33·0	16. 52·34		
				+0·70					+0·82	+0·85
29. 0	10. 39. 41·5	0. 9. 39·6	−23. 18·60							
				+1·05					+0·82	+0·79
31. 3					2. 11. 41·2	−23. 16·39	12. 10. 44·0	16. 52·61		
				+1·05					+1·17	+1·31
Sep. 2. 0	9. 57. 11·5	23. 11. 32·8	−23. 14·45							
				+0·89					+1·17	+1·03
4. 3					2. 39. 31·2	−23. 12·53	12. 54. 21·0	16. 51·76		
				+0·89					+0·88	+0·75
6. 0	11. 3. 9·0	0. 1. 36·0	−23. 10·86							
				+0·74					+0·88	+1·01
8. 3					0. 42. 17·18	−23. 9·34	11. 14. 30·0	16. 51·51		
				+0·74					+0·42	+0·47
10. 1	12. 25. 0·5	1. 7. 31·2	−23. 7·84							
				+0·36					+0·42	+0·37
12. 4					3. 8. 56·0	−23. 7·09	13. 56. 45·0	16. 52·03		
				+0·36						+0·35
14. 0	10. 49. 13·5	23. 16. 18·0	−23. 6·44							

Concluded Longitude of Valentia from Kingstown = 16m. 52s·06 West.

Chronometer B.

Aug.										
5. 4	12. 58. 0·0	3. 53. 46·4	−15. 20·82							
				+5·37			(Chron. 2306.)			
7. 4					4. 10. 54·4	−15. 9·93	12. 43. 39·0	16. 52·11		+5·28
				+5·37					+5·26	+5·46
9. 0	9. 18. 40·0	23. 58. 59·2	−15. 0·17				(Chron. 2306.)			
				+5·48					+5·26	+5·06
11. 3					1. 11. 32·0	−14. 48·85	9. 59. 45·0	16. 52·79		
				+5·48					+5·66	+5·90
13. 0	9. 46. 18·5	0. 10. 28·4	−14. 38·16				(TransitClock)			
				+5·50					+5·66	+5·42
15. 2					23. 55. 58·0	−14. 27·11	8. 59. 58·0	16. 52·22		
				+5·50					+5·89	+5·58
17. 1	10. 40. 58·5	0. 48. 55·2	−14. 15·97							
				+5·87					+5·89	+6·20
19. 3					2. 2. 20·38	−14. 3·85	11. 22. 43·0	16. 51·46		
				+5·87					+6·08	+5·54
21. 1	11. 38. 50·5	1. 30. 34·4	−13. 52·30							
				+6·47					+6·08	+6·62
23. 2					0. 44. 44·4	−13. 39·48	10. 20. 56·0	16. 51·89		
				+6·47					+5·92	+6·32
25. 2	12. 45. 16·5	2. 20. 42·8	−13. 26·16							
				+5·55					+5·92	+5·52

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

CHRONOMETER B.—*concluded.*

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3					2. 16. 18·4	—13. 15·03	12. 9. 47·0	16. 52·32		
				+5·55					+5·60	+5·58
29. 0	10. 41. 23·5	0. 1. 7·2	—13. 4·48							
				+5·64					+5·60	+5·62
31. 3					2. 4. 39·6	—12. 52·68	12. 14. 7·0	16. 52·27		
Sep.				+5·64					+5·74	+5·66
2. 0	9. 58. 28·0	23. 2. 16·8	—12. 42·16							
				+5·71					+5·74	+5·82
4. 3					2. 32. 23·2	—12. 29·86	12. 57. 56·0	16. 52·02		
				+5·71					+5·69	+5·60
6. 0	11. 4. 47·0	23. 52. 22·0	—12. 19·12							
				+5·63					+5·69	+5·78
8. 3					0. 37. 0·0	—12. 7·62	11. 20. 15·0	16. 51·98		
				+5·63					+5·40	+5·48
10. 1	12. 26. 43·5	0. 58. 2·4	—11. 56·32							
				+5·45					+5·40	+5·32
12. 4					2. 59. 36·0	—11. 44·92	13. 58. 47·0	16. 52·54		
				+5·45						+5·58
14. 0	10. 52. 15·5	23. 7. 48·0	—11. 34·94							

Concluded Longitude of Valentia from Kingstown = 16ᵐ. 52ˢ·13 West.

CHRONOMETER C.

Aug.										
5. 4	12. 59. 13·0	3. 58. 36·8	—18. 58·42							
				+2·12			(Chron. 2306.)			
7. 4					4. 16. 38·4	—18. 54·11	12. 45. 39·5	16. 51·75		+2·16
				+2·12					+2·22	+2·08
9. 0	9. 20. 21·0	0. 4. 30·0	—18. 50·25				(Chron. 2306.)			
				+2·89					+2·22	+2·36
11. 3					1. 25. 22·0	—18. 44·27	10. 9. 41·0	16. 52·98		
				+2·89					+3·53	+3·42
13. 0	9. 48. 42·0	0. 16. 52·0	—18. 38·65				(TransitClock)			
				+3·65					+3·53	+3·64
15. 2					0. 2. 37·57	—18. 31·30	9. 2. 34·0	16. 52·02		
				+3·65					+3·41	+3·66
17. 1	10. 46. 43·5	0. 58. 47·2	—18. 23·91							
				+3·22					+3·41	+3·16
19. 3					2. 10. 34·8	—18. 17·26	11. 26. 44·0	16. 52·10		
				+3·22					+3·35	+3·28
21. 1	11. 40. 55·0	1. 36. 57·2	—18. 10·94							
				+3·51					+3·35	+3·42
23. 2					0. 55. 54·0	—18. 3·97	10. 27. 42·0	16. 52·11		
				+3·51					+3·20	+3·60
25. 2	12. 47. 5·0	2. 27. 1·6	—17. 56·75							
				+3·08					+3·20	+2·80
27. 3					2. 26. 49·2	—17. 50·55	12. 15. 43·0	16. 52·55		
				+3·08					+3·50	+3·36
29. 0	10. 43. 54·5	0. 8. 18·0	—17. 44·68							
				+3·85					+3·50	+3·64
31. 3					2. 14. 8·0	—17. 36·60	12. 18. 52·0	16. 52·53		
Sep.				+3·85					+3·80	+4·06
2. 0	10. 0. 51·5	23. 9. 27·2	—17. 29·45							
				+3·28					+3·80	+3·54
4. 3					2. 42. 10·38	—17. 22·33	13. 2. 52·0	16. 51·53		
				+3·28					+3·37	+3·02
6. 0	11. 6. 45·5	23. 59. 17·2	—17. 16·15							
				+3·33					+3·37	+3·72
8. 3					0. 43. 42·8	—17. 9·34	11. 21. 57·0	16. 51·33		
				+3·33					+3·17	+2·94
10. 1	12. 28. 37·5	1. 5. 2·4	—17. 2·63							
				+3·05					+3·17	+3·40
12. 4					3. 6. 18·0	—16. 56·26	14. 0. 19·0	16. 51·45		
				+3·05						+2·70
14. 0	10. 53. 21·5	23. 14. 9·6	—16. 50·72							

Concluded Longitude of Valentia from Kingstown = 16ᵐ. 52ˢ·00 West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

Chronometer D.

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by $\frac{1}{2}\Sigma$.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
5. 4	13. 0.23·0	4. 2.12·8	−21.24·62				(Chron. 2306.)			+4·24
				+4·05	4.21.42·0	−21.16·37	12.48.21·0	16.52·03		
7. 4				+4·05					+3·77	+3·86
9. 0	9.21.22·0	0. 7.49·6	−21. 9·02				(Chron. 2306.)		+3·77	+3·68
				+4·03	1.36.52·0	−21. 0·64	10.18.56·0	16.53·10		
11. 3				+4·03					+4·53	+4·38
13. 0	9.49.46·0	0.20.10·0	−20.52·82				(TransitClock)		+4·53	+4·68
				+4·56	0. 9.44·34	−20.43·62	9. 7.29·0	16.52·26		
15. 2				+4·56					+4·60	+4·44
17. 1	10.49. 3·0	1. 3.16·8	−20.34·39							
				+4·75	2.21.38·0	−20.24·59	11.35.41·0	16.52·43	+4·60	+4·76
19. 3				+4·75					+4·66	+4·74
21. 1	11.43.19·0	1.41.25·2	−20.15·33						+4·66	+4·58
				+4·37	1. 0. 3·2	−20. 6·63	10.29.49·0	16.51·98		
23. 2				+4·37					+4·48	+4·16
25. 2	12.49.36·5	2.31.33·6	−19.57·67						+4·48	+4·80
				+5·06	2.31.48·0	−19.47·49	12.18.45·0	16.52·92		
27. 3				+5·06					+5·10	+5·32
29. 0	10.45.11·5	0.11.28·0	−19.37·89						+5·10	+4·88
				+5·17	2.20.13·2	−19.26·99	12.23. 7·0	16.53·02		
31. 3				+5·17					+5·40	+5·46
Sep.										
2. 0	10. 2.11·0	23.12.34·4	−19.17·36						+5·40	+5·34
				+5·21	2.48.58·0	−19. 6·10	13. 7.56·0	16.52·21		
4. 3				+5·21					+4·99	+5·08
6. 0	11. 8.36·0	0. 2.47·6	−18.56·35						+4·99	+4·90
				+4·86	0.55.21·2	−18.46·39	11.31.59·0	16.52·32		
8. 3				+4·86					+4·85	+4·82
10. 1	12.31.23·5	1. 9.22·0	−18.36·68						+4·85	+4·88
				+4·82	3.20.51·98	−18.26·56	14.13.24·0	16.52·26		
12. 4				+4·82						+4·76
14. 0	10.56. 2·5	23.18.17·2	−18.17·76							

Concluded Longitude of Valentia from Kingstown = 16m. 52s·42 West.

Chronometer E.

Aug.										
5. 4	13. 2.43·5	4. 7.58·4	−24.50·10				(Chron. 2306.)			
				+0·52	4.26.10·0	−24.49·04	12.49.16·0	16.52·51		+0·33
7. 4				+0·52					+0·64	+0·71
9. 0	9.23. 6·0	0.13.12·4	−24.48·10				(Chron. 2306.)		+0·64	+0·57
				+0·65	1.45.26·0	−24.46·74	10.23.45·5	16.52·29		
11. 3				+0·65					+1·04	+0·73
13. 0	9.51.56·5	0.26.12·8	−24.45·48				(TransitClock)		+1·04	+1·35
				+1·09	0.18.25·62	−24.43·28	9.12.12·0	16.51·66		
15. 2				+1·09					+1·45	+0·83
17. 1	10.50.12·5	1. 8.32·8	−24.41·08						+1·45	+2·07
				+1·83	2.28. 9·6	−24.37·29	11.38. 1·0	16.51·71		
19. 3				+1·83					+1·74	+1·59
21. 1	11.44.28·0	1.46.52·4	−24.33·72						+1·74	+1·89
				+1·88	1.14.52·0	−24.29·97	10.40.16·0	16.52·14		
23. 2				+1·88					+1·21	+1·87
25. 2	12.51.11·5	2.37.36·8	−24.26·13						+1·21	+0·55
				+0·60						

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

CHRONOMETER E.—*concluded.*

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3				+0·60	2.40. 1·2	−24.24·92	12.22.22·0	16.52·28	+0·41	+0·65
29. 0	10.47. 3·5	0.18. 5·6	−24.23·80	−0·03					+0·41	+0·17
31. 3				−0·03	2.27.20·38	−24.23·85	12.25.19·0	16.51·71	−0·18	−0·23
Sep. 2. 0	10. 4.50·5	23.20.20·0	−24.23·90	−0·06					−0·18	−0·13
4. 3				−0·06	2.57.50·4	−24.24·04	13.11.31·0	16.52·25	−0·14	+0·01
6. 0	11.10.30·5	0.10. 9·6	−24.24·16	−0·05					−0·14	−0·29
8. 3				−0·05	1. 2.52·0	−24.24·27	11.33.52·0	16.52·55	+0·14	+0·19
10. 1	12.33.10·5	1.16.56·4	−24.24·37	+0·05					+0·14	+0·09
12. 4				+0·05	3.34.29·18	−24.24·26	14.21. 5·0	16.52·00		+0·01
14. 0	10.57.56·0	23.26.16·8	−24.24·17							

Concluded Longitude of Valentia from Kingstown = 16ᵐ. 52ˢ·12 West.

CHRONOMETER F.

Aug. 5. 4	13. 4.30·5	4. 7.21·6	−22.26·59							
7. 4				+1·56	4.25. 4·8	−22.23·41	(Chron. 2306.) 12.50.37·5	16.51·66		+1·93
9. 0	9.24.45·0	0.12.23·6	−22.20·58	+1·56					+0·82	+1·19
11. 3				+0·87	1.48.24·0	−22.18·76	(Chron. 2306.) 10.29.11·5	16.53·13	+0·82	+0·45
13. 0	9.54.20·5	0.26. 8·0	−22.17·07	+0·87					+1·10	+1·29
15. 2				+0·72	0.27.38·36	−22.15·61	(TransitClock) 9.23.54·0	16.51·95	+1·10	+0·91
17. 1	10.52.29·0	1. 8.22·0	−22.14·15	+0·72					+0·97	+0·53
19. 3				+1·17	2.33.10·0	−22.11·73	11.45.28·0	16.51·87	+0·97	+1·41
21. 1	11.46.33·0	1.46.32·8	−22. 9·45	+1·17					+1·03	+0·93
23. 2				+0·99	1.15. 2·0	−22. 7·47	10.42.49·0	16.52·06	+1·03	+1·13
25. 2	12.53. 8·5	2.37.12·8	−22. 5·45	+0·99					+0·93	+0·85
27. 3				+1·12	2.41.11·2	−22. 3·19	12.25.54·0	16.52·56	+0·93	+1·01
29. 0	10.48.50·5	0.17.29·6	−22. 1·09	+1·12					+1·15	+1·23
31. 3				+1·29	2.29.45·2	−21.58·39	12.30. 9·0	16.52·76	+1·15	+1·07
Sep. 2. 0	10. 6. 5·0	23.19. 6·4	−21.56·00	+1·29					+1·17	+1·51
4. 3				+0·98	2.58.46·0	−21.53·87	13.14.57·0	16.52·57	+1·17	+0·83
6. 0	11.12.12·5	0. 9.19·2	−21.52·04	+0·98					+1·15	+1·13
8. 3				+1·26	1. 1. 4·0	−21.49·46	11.34.39·0	16.52·49	+1·15	+1·17
10. 1	12.34.45·0	1.15.53·2	−21.46·94	+1·26					+1·40	+1·35
12. 4				+1·19	3.44.48·0	−21.44·42	14.34. 6·0	16.51·78	+1·40	+1·45
14. 0	10.59.53·0	23.25.31·6	−21.42·28	+1·19						+0·93

Concluded Longitude of Valentia from Kingstown = 16ᵐ. 52ˢ·32 West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

Chronometer G.

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
5. 4	13. 6.19·0	4. 8.26·8	−21.43·59							+1·81
				+1·86			(Chron. 2306)			
7. 4					4.26.36·8	−21.39·81	12.52.53·0	16.52·13		
				+1·86					+1·80	+1·91
9. 0	9.26.23·0	0.13.17·2	−21.36·44				(Chron. 2306.)		+1·80	+1·69
				+2·24						
11. 3					2. 2.58·0	−21.31·75	10.44.35·0	16.53·16	+2·84	+2·79
				+2·24						
13. 0	9.55.25·5	0.26.23·2	−21.27·45				(TransitClock)		+2·84	+2·89
				+2·95						
15. 2					0.30. 0·0	−21.21·51	9.27.10·0	16.52·21	+3·10	+3·01
				+2·95						
17. 1	10.54.25·5	1. 9.19·6	−21.15·57						+3·10	+3·19
				+3·04						
19. 3					2.33.33·2	−21. 9·25	11.46.54·0	16.51·80	+2·76	+2·89
				+3·04						
21. 1	11.48.53·5	1.47.46·8	−21. 3·34						+2·76	+2·63
				+2·79						
23. 2					1.17.47·98	−20.57·76	10.46.45·0	16.52.39	+2·65	+2·95
				+2·79						
25. 2	12.55.35·5	2.38.26·0	−20.52·05						+2·65	+2·35
				+2·61						
27. 3					2.45. 2·0	−20.46·78	12.31. 2·0	16.52·62	+3·20	+2·87
				+2·61						
29. 0	10.51. 2·5	0.18.22·0	−20.41·85						+3·20	+3·53
				+3·81						
31. 3					2.31.21·2	−20.33·82	12.33.10·0	16.52·82	+4·05	+4·09
				+3·81						
Sep. 2. 0	10. 8.11·0	23.19.42·8	−20.26·75						+4·05	+4·01
				+3·93						
4. 3					3. 0.26·4	−20.18·21	13.18.14·0	16.52·17	+4·10	+3·85
				+3·93						
6. 0	11.14.10·0	0. 9.35·2	−20.10·86						+4·10	+4·35
				+3·92						
8. 3					1. 1.10·0	−20. 2·79	11.36.33·0	16.51·47	+3·72	+3·49
				+3·92						
10. 1	12.36.40·5	1.15.56·4	−19.54·94						+3·72	+3·95
				+3·60						
12. 4					3.43.51·6	−19.47·31	14.35. 7·0	16.51·65		+3·25
				+3·60						
14. 0	11. 1.40·0	23.25.16·8	−19.40·77							

Concluded Longitude of Valentia from Kingstown = 16m. 52s·16 West.

Chronometer H.

Aug. 5. 4	13. 9.42·5	4. 1.36·4	−11.30·25							
				+6·84			(Chron. 2306.)			+6·86
7. 4					4.17.44·4	−11.16·43	12.54.24·5	16.51·86		
				+6·84					+6·78	+6·82
9. 0	9.36.21·5	0.12.41·6	−11. 3·98				(Chron. 2306.)		+6·78	+6·74
				+6·42						
11. 3					1.58.45·92	−10.50·55	10.51. 7·0	16.51·33	+6·10	+6·10
				+6·42						
13. 0	9.57.31·5	0.17.39·6	−10.38·19				(TransitClock)		+6·10	+6·10
				+6·35						
15. 2					0.22.21·6	−10.25·39	9.30.28·0	16.52·47	+6·75	+6·60
				+6·35						
17. 1	10.56.26·0	1. 0.16·8	−10.12·60						+6·75	+6·90
				+6·38						
19. 3					2.29.23·2	− 9.59·37	11.53.56·0	16.50·80	+5·95	+5·86
				+6·38						
21. 1	11.50.23·0	1.37.59·6	− 9.46·88						+5·95	+6·04
				+6·36						
23. 2					1. 9. 8·0	− 9.34·25	10.49.29·0	16.52·35	+6·80	+6·68
				+6·36						
25. 2	12.57.23·0	2.28.42·4	− 9.21·23							
				+7·09					+6·80	+6·92

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

CHRONOMETER H.—*concluded.*

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s		h m s	m s	h m s	m s	s	s
27. 3				+7·09	2. 36. 3·2	— 9. 6·97	12. 33. 44·0	16. 52·07	+7·00	+7·26
29. 0	10. 52. 33·0	0. 8. 4·0	— 8. 53·60	+6·47					+7·00	+6·74
31. 3				+6·47	2. 23. 18·0	— 8. 39·98	12. 37. 3·0	16. 51·09	+6·21	+6·20
Sep. 2. 0	10. 11. 15·5	23. 10. 48·0	— 8. 27·96	+6·51					+6·21	+6·22
4. 3				+6·51	2. 52. 46·4	— 8. 13·90	13. 22. 39·0	16. 52·19	+6·90	+6·80
6. 0	11. 16. 13·5	23. 59. 29·2	— 8. 1·70	+6·93					+6·90	+7·00
8. 3				+6·93	0. 54. 42·8	— 7. 47·48	11. 42. 22·0	16. 51·52	+6·74	+6·86
10. 1	12. 39. 1·5	1. 5. 55·6	— 7. 33·53	+6·80					+6·74	+6·62
12. 4				+6·80	3. 39. 13·6	— 7. 19·20	14. 42. 58·0	16. 52·05		+6·98
14. 0	11. 4. 54·0	23. 15. 56·4	— 7. 6·90							

Concluded Longitude of Valentia from Kingstown = $16^{m}.51^{s}\cdot76$ West.

CHRONOMETER I.

Aug. 5. 4	13. 10. 17·5	4. 13. 36·8	—22. 55·74							
7. 4				+1·74	4. 30. 24·0	—22. 52·21	(Chron. 2306.) 12. 55. 28·5	16. 51·85		+1·91
9. 0	9. 38. 42·0	0. 26. 46·8	—22. 49·06	+1·74					+1·62	+1·57
11. 3				+1·84	2. 24. 44·0	—22. 45·20	(Chron. 2306.) 11. 5. 11·5	16. 52·52	+1·62	+1·67
13. 0	9. 59. 13·5	0. 31. 24·8	—22. 41·67	+1·84					+1·84	+2·01
15. 2				+1·47	0. 42. 20·0	—22. 38·69	(TransitClock) 9. 38. 15·0	16. 51·84	+1·84	+1·67
17. 1	10. 58. 32·0	1. 14. 45·6	—22. 35·75	+1·47					+1·38	+1·27
19. 3				+1·57	2. 46. 15·2	—22. 32·48	11. 58. 14·0	16. 52·41	+1·38	+1·49
21. 1	11. 53. 37·0	1. 53. 55·6	—22. 29·41	+1·57					+1·54	+1·65
23. 2				+1·40	1. 25. 45·6	—22. 26·61	10. 53. 15·0	16. 52·20	+1·54	+1·43
25. 2	12. 59. 14·0	2. 43. 35·6	—22. 23·74	+1·40					+1·37	+1·37
27. 3				+1·42	2. 57. 50·0	—22. 20·86	12. 42. 18·0	16. 52·37	+1·37	+1·37
29. 0	10. 54. 52·0	0. 23. 47·2	—22. 18·18	+1·42					+1·40	+1·47
31. 3				+1·49	2. 40. 20·0	—22. 15·04	12. 40. 29·0	16. 52·60	+1·40	+1·33
Sep. 2. 0	10. 12. 33·0	23. 25. 49·6	—22. 12·26	+1·49					+1·71	+1·65
4. 3				+1·70	3. 12. 9·2	—22. 8·57	13. 28. 8·0	16. 52·21	+1·71	+1·77
6. 0	11. 18. 6·5	0. 15. 25·6	—22. 5·39	+1·70					+1·60	+1·63
8. 3				+1·53	1. 10. 44·0	—22. 2·25	11. 44. 8·0	16. 52·25	+1·60	+1·57
10. 1	12. 40. 10·0	1. 21. 29·6	—21. 59·21	+1·53					+1·46	+1·49
12. 4				+1·23	3. 57. 45·2	—21. 56·60	14. 46. 53·0	16. 51·89	+1·46	+1·43
14. 0	11. 7. 8·5	23. 32. 58·0	—21. 54·37	+1·23						+1·03

Concluded Longitude of Valentia from Kingstown = $16^{m}.52^{s}\cdot26$ West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

Chronometer J.

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
5. 4	13. 11. 37·5	4. 14. 49·6	−22. 48·76							
				+3·63						+3·76
7. 4					4. 32. 6·8	−22. 41·38	(Chron. 2306.) 12. 57. 22·5	16. 51·79		
				+3·63					+3·20	+3·50
9. 0	9. 39. 56·5	0. 27. 46·8	−22. 34·76						+3·20	
				+3·09			(Chron. 2306.)			+2·90
11. 3					2. 57. 20·0	−22. 28·20	11. 38. 10·0	16. 52·40		
				+3·09					+3·17	+3·28
13. 0	10. 1. 38·0	0. 33. 29·6	−22. 22·36				(TransitClock)			
				+2·98					+3·17	+3·06
15. 2					0. 43. 30·4	−22. 16·31	9. 39. 48·0	16. 51·88		
				+2·98					+3·15	+2·90
17. 1	11. 0. 16·5	1. 16. 4·4	−22. 10·33							
				+3·40					+3·15	+3·40
19. 3					2. 49. 46·0	−22. 3·26	12. 2. 15·0	16. 52·08		
				+3·40					+3·33	+3·40
21. 1	11. 54. 50·0	1. 54. 35·6	−21. 56·61							
				+3·23					+3·33	+3·26
23. 2					1. 34. 50·4	−21. 50·12	11. 2. 58·0	16. 52·08		
				+3·23					+3·24	+3·20
25. 2	13. 2. 46·0	2. 46. 26·8	−21. 43·51							
				+3·10					+3·24	+3·28
27. 3					3. 0. 45·2	−21. 37·23	12. 45. 58·0	16. 51·79		
				+3·10					+2·79	+2·92
29. 0	10. 57. 18·0	0. 25. 26·0	−21. 31·38							
				+2·75					+2·79	+2·66
31. 3					2. 40. 50·0	−21. 25·58	12. 41. 49·0	16. 52·28		
Sep.				+2·75					+3·01	+2·84
2. 0	10. 14. 23·5	23. 26. 48·0	−21. 20·47							
				+3·27					+3·01	+3·18
4. 3					3. 16. 56·0	−21. 13·33	13. 33. 51·0	16. 52·45		
				+3·27					+3·25	+3·36
6. 0	11. 20. 41·5	0. 17. 2·0	−21. 7·22							
				+3·30					+3·25	+3·14
8. 3					1. 13. 22·0	−21. 0·44	11. 47. 48·0	16. 52·64		
				+3·30					+3·43	+3·46
10. 1	12. 43. 31·5	1. 23. 45·2	−20. 53·86							
				+3·06					+3·43	+3·40
12. 4					3. 59. 33·2	−20. 47·39	14. 49. 51·0	16. 51·57		
				+3·06						+2·72
14. 0	11. 8. 48·5	23. 33. 25·2	−20. 41·85							

Concluded Longitude of Valentia from Kingstown = 16m. 52s·14 West.

Chronometer K.

Aug.										
5. 4	13. 12. 46·5	4. 18. 41·6	−25. 31·95							
				+2·21						+2·57
7. 4					4. 37. 10·8	−25. 27·47	(Chron. 2306.) 12. 59. 41·5	16. 51·07		
				+2·21					+2·41	+1·85
9. 0	9. 41. 45·5	0. 32. 24·2	−25. 23·46							
				+3·30			(Chron. 2306.)		+2·41	+2·97
11. 3					3. 9. 8·03	−25. 16·44	11. 47. 11·0	16. 52·63		
				+3·30					+3·82	+3·63
13. 0	10. 3. 58·5	0. 38. 37·6	−25. 10·24							
				+3·95			(TransitClock)		+3·82	+4·01
15. 2					0. 53. 31·2	−25. 2·22	9. 47. 4·0	16. 51·95		
				+3·95					+3·87	+3·89
17. 1	11. 2. 4·0	1. 20. 35·6	−24. 54·32							
				+3·73					+3·87	+3·85
19. 3					2. 56. 26·4	−24. 46·53	12. 6. 13·0	16. 51·84		
				+3·73					+3·42	+3·61
21. 1	11. 56. 42·0	1. 59. 10·0	−24. 39·31							
				+3·35					+3·42	+3·23
23. 2					1. 45. 20·8	−24. 32·57	11. 10. 47·0	16. 52·29		
				+3·35					+2·94	+3·47
25. 2	13. 5. 27·0	2. 51. 49·6	−24. 25·74							
				+2·65					+2·94	+2·41

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

CHRONOMETER K.—*concluded.*

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3				+2·65	3. 7.50·4	−24.20·36	12.50.20·0	16.52·57	+2·78	+2·89
29. 0	10.59.11·5	0.30. 3·2	−24.15·39	+2·22					+2·78	+2·67
31. 3				+2·22	2.49.44·0	−24.10·71	12.48. 0·0	16.51·15	+1·71	+1·77
Sep. 2. 0	10.16.28·5	23.31.38·8	−24. 6·61	+1·87					+1·71	+1·65
4. 3				+1·87	3.22.40·0	−24. 2·54	13.36.46·0	16.52·46	+2·13	+2·09
6. 0	11.22.46·0	0.21.58·0	−23.59·06	+2·36					+2·13	+2·17
8. 3				+2·36	1.25.56·0	−23.54·20	11.57.30·0	16.52·47	+2·72	+2·55
10. 1	12.45. 2·5	1.28.11·6	−23.49·51	+2·92					+2·72	+2·89
12. 4				+2·92	4. 5.55·2	−23.43·31	14.53.17·0	16.52·20		+2·95
14. 0	11.10. 2·5	23.37.35·2	−23.38·03							

Concluded Longitude of Valentia from Kingstown = 16m. 52s·03 West.

CHRONOMETER K*.

Aug. 5. 4	13.14.24·0	4.16.41·8	−21.54·91	+7·50						+7·74
7. 4				+7·50	4.34.49·0	−21.39·68	(Chron. 2306.) 13. 1. 7·0	16.51·79	+6·60	+7·26
9. 0	9.43.32·0	0.30.13·0	−21.26·05	+5·49			(Chron. 2306.)		+6·60	+5·94
11. 3				+5·49	3.19.14·97	−21.14·33	12. 1.24·0	16.51·09	+5·40	+5·04
13. 0	10. 5.13·5	0.35.46·2	−21. 4·04	+5·26			(TransitClock)		+5·40	+5·76
15. 2				+5·26	1.11.56·63	−20.53·28	10. 9.43·0	16.50·99	+4·72	+4·76
17. 1	11. 5. 1·0	1.19.20·6	−20.42·79	+4·50					+4·72	+4·68
19. 3				+4·50	2.57.20·2	−20.33·39	12.11.21·0	16.51·61	+4·06	+4·32
21. 1	12. 0.33·5	1.58.46·2	−20.24·65	+3·95					+4·06	+3·80
23. 2				+3·95	1.46.37·0	−20.16·75	11.16.20·0	16.52·20	+3·83	+4·10
25. 2	13. 8.17·5	2.50.22·6	−20. 8·73	+3·99					+3·83	+3·56
27. 3				+3·99	3. 8.39·0	−20. 0·62	12.55.29·0	16.52·76	+4·40	+4·42
29. 0	11. 1.15·5	0.27.44·6	−19.53·12	+3·87					+4·40	+4·38
31. 3				+3·87	3.39.11·0	−19.44·90	13.42. 2·0	16.50·74	+3·57	+3·36
Sep. 2. 0	10.19. 1·5	23.29.42·6	−19.37·82	+4·03					+3·57	+3·78
4. 3				+4·03	3.23. 0·6	−19.29·03	13.41.41·0	16.52·37	+3·80	+4·28
6. 0	11.23.53·5	0.18.27·8	−19.21·54	+3·13					+3·80	+3·32
8. 3				+3·13	1.26.29·0	−19.15·04	12. 2.44·0	16.51·48	+2·90	+2·94
10. 1	12.46.54·5	1.25.22·6	−19. 8·81	+2·90					+2·90	+2·86
12. 4				+2·90	4. 7.52·2	−19. 2·66	14.59.56·0	16.51·94		+2·94
14. 0	11.11.58·0	23.34.49·8	−18.57·45							

Concluded Longitude of Valentia from Kingstown = 16m. 51s·94 West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

Chronometer M.

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by $\frac{1}{2}\Sigma$.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
5. 4	13. 15. 41·0	4. 20. 11·2	−24. 7·51				(Chron. 2306.)			−0·31
				−0·06	4. 39. 24·0	−24. 7·64	13. 3. 14·0	16. 52·18		
7. 4				−0·06					+0·01	+0·19
9. 0	9. 45. 24·0	0. 34. 46·4	−24. 7·75				(Chron. 2306.)		+0·01	−0·17
				+0·32	3. 30. 50·0	−24. 7·07	12. 10. 6·0	16. 52·71		
11. 3				+0·32					+0·71	+0·81
13. 0	10. 7. 16·0	0. 40. 50·8	−24. 6·48				(TransitClock)		+0·71	+0·61
				+0·63	1. 26. 1·6	−24. 5·19	10. 20. 37·0	16. 51·80		
15. 2				+0·63					+0·76	+0·65
17. 1	11. 6. 29·5	1. 24. 10·0	−24. 3·94						+0·76	+0·87
				+0·69	3. 6. 1·22	−24. 2·50	12. 16. 34·0	16. 51·38		
19. 3				+0·69					+0·54	+0·51
21. 1	12. 1. 55·0	2. 3. 44·0	−24. 1·17						+0·54	+0·57
				+0·73	1. 55. 6·0	−23. 59·71	11. 21. 7·0	16. 52·03		
23. 2				+0·73					+0·29	+0·89
25. 2	13. 10. 10·5	2. 56. 4·8	−23. 58·23						+0·29	−0·31
				−0·26	3. 13. 50·0	−23. 58·76	12. 56. 43·0	16. 51·82		
27. 3				−0·26					−0·05	−0·21
29. 0	11. 3. 17·5	0. 33. 52·4	−23. 59·25						−0·05	+0·11
				+0·02	3. 44. 14·0	−23. 59·22	13. 42. 50·0	16. 51·56		
31. 3				+0·02					+0·21	−0·07
Sep. 2. 0	10. 20. 37·0	23. 35. 39·2	−23. 59·19						+0·21	+0·49
				+0·47	3. 28. 22·0	−23. 58·16	13. 42. 34·0	16. 51·79		
4. 3				+0·47					+0·65	+0·45
6. 0	11. 26. 30·0	0. 25. 39·6	−23. 57·28						+0·65	+0·85
				+0·35	1. 47. 45·2	−23. 56·55	12. 19. 22·0	16. 50·85		
8. 3				+0·35					+0·15	−0·15
10. 1	12. 50. 7·0	1. 33. 21·6	−23. 55·85						+0·15	+0·45
				+0·54	4. 21. 16·0	−23. 54·71	15. 8. 29·0	16. 52·08		
12. 4				+0·54						+0·63
14. 0	11. 14. 58·0	23. 42. 45·6	−23. 53·74							

Concluded Longitude of Valentia from Kingstown = $16^{m}.51^{s}\cdot77$ West.

Chronometer N.

Aug.										
5. 4	13. 16. 57·5	4. 20. 42·4	−23. 22·43							
				+1·66			(Chron. 2306.)			+1·47
7. 4				+1·66	4. 41. 26·4	−23. 19·05	13. 6. 5·5	16. 52·13		
9. 0	9. 47. 6·0	0. 35. 36·4	−23. 16·03						+1·72	+1·85
				+1·76			(Chron. 2306.)		+1·72	+1·59
11. 3				+1·76	3. 33. 59·98	−23. 12·26	12. 14. 12·0	16. 52·15		
13. 0	10. 9. 1·0	0. 41. 38·0	−23. 8·97						+1·95	+1·93
				+2·02			(TransitClock)		+1·95	+1·97
15. 2				+2·02	1. 33. 40·0	−23. 4·84	10. 29. 17·0	16. 51·98		
17. 1	11. 8. 22·5	1. 24. 59·6	−23. 0·84						+2·38	+2·07
				+2·28					+2·38	+2·69
19. 3				+2·28	3. 7. 50·0	−22. 56·09	12. 19. 30·0	16. 51·04		
21. 1	12. 4. 59·0	2. 5. 38·0	−22. 51·66						+1·70	+1·87
				+2·03					+1·70	+1·53
23. 2				+2·03	2. 4. 20·0	−22. 47·56	11. 31. 34·0	16. 52·88		
25. 2	13. 11. 58·0	2. 56. 37·2	−22. 43·42						+2·50	+2·53
				+2·68					+2·50	+2·47

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

CHRONOMETER N.—*concluded.*

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3					3. 15. 45·2	—22. 37·95	12. 59. 59·0	16. 52·35		
				+2·68					+2·80	+2·89
29. 0	11. 5. 29·0	0. 34. 37·2	—22. 32·91							
				+2·13					+2·80	+2·71
31. 3					3. 44. 34·0	—22. 28·33	13. 44. 42·0	16. 50·75		
Sep.				+2·13					+1·79	+1·55
2. 0	10. 23. 33·0	23. 37. 0·0	—22. 24·46							
				+2·06					+1·79	+2·03
4. 3					3. 32. 52·0	—22. 19·98	13. 48. 43·0	16. 51·96		
				+2·06					+1·97	+2·09
6. 0	11. 28. 15·0	0. 25. 43·2	—22. 16·16							
				+2·17					+1·97	+1·85
8. 3					1. 49. 32·4	—22. 11·65	12. 22. 53·0	16. 52·55		
				+2·17					+2·78	+2·49
10. 1	12. 51. 26·5	1. 32. 52·4	—22. 7·36							
				+2·95					+2·78	+3·07
12. 4					4. 27. 51·6	—22. 1·08	15. 17. 0·0	16. 51·70		
				+2·95						+2·83
14. 0	11. 17. 5·5	23. 42. 54·8	—21. 55·79							

Concluded Longitude of Valentia from Kingstown = 16m. 51s·89 West.

CHRONOMETER O.

Aug.										
5. 4	13. 18. 15·5	4. 9. 38·8	—11. 1·03							
				+2·75			(Chron. 2306.)			+3·00
7. 4					4. 29. 48·8	—10. 55·44	13. 6. 52·5	16. 51·27		
				+2·75					+2·77	+2·50
9. 0	9. 49. 28·0	0. 25. 32·4	—10. 50·42				(Chron. 2306.)			
				+3·26					+2·77	+3·04
11. 3					3. 29. 36·0	—10. 43·46	12. 22. 18·0	16. 52·29		
				+3·26					+3·22	+3·48
13. 0	10. 10. 44·5	0. 30. 49·6	—10. 37·35				(TransitClock)			
				+2·75					+3·22	+2·96
15. 2					1. 23. 10·0	—10. 31·69	10. 31. 21·0	16. 51·46		
				+2·75					+2·80	+2·54
17. 1	11. 10. 45·5	1. 14. 47·6	—10. 26·23							
				+3·06					+2·80	+3·06
19. 3					2. 57. 47·2	—10. 19·84	12. 22. 3·0	16. 51·90		
				+3·06					+3·32	+3·06
21. 1	12. 6. 19·0	1. 54. 20·0	—10. 13·88							
				+3·59					+3·32	+3·58
23. 2					1. 55. 11·6	—10. 6·67	11. 35. 8·0	16. 51·93		
				+3·59					+3·32	+3·60
25. 2	13. 14. 16·0	2. 46. 10·8	— 9. 59·40							
				+3·27					+3·32	+3·04
27. 3					3. 9. 14·0	— 9. 52·78	13. 6. 14·0	16. 52·34		
				+3·27					+3·22	+3·50
29. 0	11. 7. 24·0	0. 23. 45·6	— 9. 46·62							
				+2·99					+3·22	+2·94
31. 3					3. 32. 43·96	— 9. 40·22	13. 45. 39·0	16. 51·98		
				+2·99					+3·03	+3·04
Sep.										
2. 0	10. 25. 21·0	23. 25. 58·0	— 9. 34·76							
				+2·94					+3·03	+3·02
4. 3					3. 24. 26·4	— 9. 28·36	13. 53. 10·0	16. 51·70		
				+2·94					+3·04	+2·86
6. 0	11. 30. 53·5	0. 15. 28·0	— 9. 22·89							
				+3·28					+3·04	+3·22
8. 3					1. 42. 0·4	— 9. 16·09	12. 28. 18·0	16. 51·98		
				+3·28					+2·96	+3·34
10. 1	12. 53. 21·0	1. 21. 48·8	— 9. 9·57							
				+2·22					+2·96	+2·58
12. 4					4. 18. 15·2	— 9. 4·86	15. 20. 21·0	16. 51·06		
				+2·22						+1·86
14. 0	11. 18. 21·0	23. 31. 15·2	— 9. 0·89							

Concluded Longitude of Valentia from Kingstown = 16m. 51s·85 West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

Chronometer P.

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
5. 4	13. 20. 14·5	4. 34. 35·2	−33. 58·76							−5·88
				−6·10			(Chron. 2306.)			
7. 4					4. 56. 35·6	−34. 11·24	13. 10. 24·5	16. 50·84		
				−6·10					−6·01	−6·32
9. 0	9. 54. 22·5	0. 53. 58·0	−34. 22·33				(Chron. 2306.)		−6·01	−5·70
				−5·76	4. 10. 16·02	−34. 34·82	12. 39. 10·5	16. 51·17		
11. 3									−5·85	−5·82
				−5·76			(TransitClock)			
13. 0	10. 13. 52·5	0. 58. 5·2	−34. 45·47						−5·85	−5·88
				−5·60	1. 51. 24·08	−34. 57·07	10. 35. 10·0	16. 51·78		
15. 2									−5·15	−5·32
				−5·60						
17. 1	11. 14. 27·0	1. 43. 10·4	−35. 8·14						−5·15	−4·98
				−5·01	3. 26. 59·6	−35. 18·67	12. 26. 18·0	16. 51·16		
19. 3									−4·92	−5·04
				−5·01						
21. 1	12. 10. 28·0	2. 23. 42·8	−35. 28·36						−4·92	−4·80
				−5·08	2. 27. 39·18	−35. 38·64	11. 42. 6·0	16. 50·68		
23. 2									−5·45	−5·36
				−5·08						
25. 2	13. 21. 26·5	3. 19. 9·6	−35. 48·87						−5·45	−5·54
				−5·49	3. 42. 45·18	−36. 0·09	13. 13. 40·0	16. 51·42		
27. 3									−5·60	−5·44
				−5·49						
29. 0	11. 11. 12·5	0. 53. 57·2	−36. 10·34						−5·60	−5·76
				−5·40	4. 10. 40·0	−36. 22·04	13. 56. 55·0	16. 52·04		
31. 3									−5·24	−5·04
				−5·40						
Sep. 2. 0	10. 27. 27·5	23. 55. 1·2	−36. 31·81						−5·24	−5·44
				−5·35	3. 58. 49·2	−36. 43·61	14. 0. 19·0	16. 51·41		
4. 3									−5·18	−5·26
				−5·35						
6. 0	11. 35. 12·0	0. 47. 16·4	−36. 53·50						−5·18	−5·10
				−5·23	2. 20. 30·0	−37. 4·42	12. 39. 2·0	16. 50·99		
8. 3									−5·32	−5·36
				−5·23						
10. 1	12. 58. 21·5	1. 54. 53·6	−37. 14·68						−5·32	−5·28
				−5·12	5. 0. 29·2	−37. 25·71	15. 34. 16·0	16. 51·47		
12. 4										−4·96
				−5·12						
14. 0	11. 23. 42·0	0. 5. 9·2	−37. 34·76							

Concluded Longitude of Valentia from Kingstown = 16m. 51s·27 West.

Chronometer Q.

Aug. 5. 4	13. 21. 26·5	4. 23. 52·0	−22. 3·76							
				−1·15			(Chron. 2306.)			−0·42
7. 4					4. 46. 10·8	−22. 6·11	13. 12. 5·5	16. 50·43		
				−1·15					−1·37	−1·88
9. 0	9. 56. 43·0	0. 44. 4·0	−22. 8·21				(Chron. 2306.)		−1·37	−0·86
				−0·01	4. 2. 2·8	−22. 8·23	12. 43. 22·0	16. 53·73		
11. 3									+1·34	+0·84
				−0·01			(TransitClock)			
13. 0	10. 16. 12·5	0. 47. 47·6	−22. 8·24						+1·34	+1·84
				+1·82	1. 43. 15·18	−22. 4·50	10. 39. 54·0	16. 52·23		
15. 2									+0·98	+1·80
				+1·82						
17. 1	11. 16. 45·0	1. 32. 20·8	−22. 0·92						+0·98	+0·16
				−0·16	3. 23. 4·0	−22. 1·25	12. 35. 41·0	16. 51·50		
19. 3									−0·63	−0·48
				−0·16						
21. 1	12. 13. 28·5	2. 13. 16·0	−22. 1·56						−0·63	−0·78
				−0·38	2. 23. 31·6	−22. 2·33	11. 51. 34·0	16. 52·94		
23. 2									+0·07	+0·02
				−0·38						
25. 2	13. 23. 29·0	3. 7. 26·0	−22. 3·10						+0·07	+0·12
				+0·48						

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

Chronometer Q.—*concluded.*

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3				+0·48	3. 31. 33·2	−22. 2·13	13. 16. 25·0	16. 52·85		
29. 0	11. 13. 1·5	0. 41. 36·8	−22. 1·24	+1·63					+0·83	+0·84
31. 3				+1·63	3. 59. 42·0	−21. 57·75	14. 0. 20·0	16. 53·88	+0·83	+0·82
Sep. 2. 0	10. 29. 12·0	23. 42. 8·4	−21. 54·80	+1·51					+2·17	+2·44
4. 3				+1·51	3. 48. 30·4	−21. 51·51	14. 4. 53·0	16. 51·45	+2·17	+1·90
6. 0	11. 36. 33·0	0. 33. 32·4	−21. 48·71	+0·92					+1·58	+1·12
8. 3				+0·92	2. 13. 28·0	−21. 46·80	12. 47. 20·0	16. 49·96	+1·58	+2·04
10. 1	13. 1. 28·5	1. 42. 30·4	−21. 44·99	+0·19					−0·23	−0·20
12. 4				+0·19	4. 50. 34·8	−21. 44·57	15. 40. 2·0	16. 53·15	−0·23	−0·26
14. 0	11. 25. 56·5	23. 51. 32·8	−21. 44·23							+0·64

Concluded Longitude of Valentia from Kingstown = 16ᵐ. 52ˢ·15 West.

Chronometer R.

Aug. 5. 4	13. 22. 41·5	4. 31. 11·6	−28. 8·56	+3·24			(Chron. 2306.)			+2·71
7. 4				+3·24	4. 53. 47·6	−28. 1·96	13. 13. 44·0	16. 53·17	+3·65	+3·77
9. 0	9. 58. 27·0	0. 51. 35·6	−27. 56·10	+4·37			(Chron. 2306.)		+3·65	+3·53
11. 3				+4·37	4. 13. 8·0	−27. 46·62	12. 48. 49·5	16. 53·94	+5·15	+5·21
13. 0	10. 18. 2·5	0. 55. 7·6	−27. 38·54	+5·24			(TransitClock)		+5·15	+5·09
15. 2				+5·24	2. 7. 48·8	−27. 27·66	10. 59. 7·0	16. 52·82	+5·65	+5·39
17. 1	11. 18. 58·5	1. 39. 50·4	−27. 17·38	+5·65					+5·65	+5·91
19. 3				+5·65	3. 34. 55·6	−27. 5·48	12. 42. 29·0	16. 51·99	+5·45	+5·39
21. 1	12. 15. 59·5	2. 20. 39·6	−26. 54·56	+5·66					+5·45	+5·51
23. 2				+5·66	2. 34. 13·2	−26. 43·08	11. 57. 36·0	16. 52·76	+5·75	+5·81
25. 2	13. 27. 7·0	3. 15. 32·0	−26. 31·70	+5·80					+5·75	+5·69
27. 3				+5·80	3. 39. 15·2	−26. 19·84	13. 19. 50·0	16. 52·68	+6·10	+5·91
29. 0	11. 15. 16·5	0. 47. 59·2	−26. 9·01	+6·20					+6·10	+6·29
31. 3				+6·20	4. 5. 40·0	−25. 55·61	14. 2. 22·0	16. 52·35	+6·38	+6·11
Sep. 2. 0	10. 31. 11·5	23. 47. 57·2	−25. 44·42	+6·50					+6·38	+6·65
4. 3				+6·50	3. 57. 1·2	−25. 30·15	14. 9. 45·0	16. 52·39	+6·75	+6·35
6. 0	11. 39. 8·0	0. 39. 36·4	−25. 18·13	+6·46					+6·75	+7·15
8. 3				+6·46	2. 23. 32·0	−25. 4·59	12. 54. 6·0	16. 51·27	+5·62	+5·77
10. 1	13. 3. 17·5	1. 47. 26·0	−24. 51·89	+5·63					+5·62	+5·47
12. 4				+5·63	5. 4. 30·0	−24. 39·73	15. 51. 4·0	16. 52·99		+5·79
14. 0	11. 27. 48·5	23. 56. 10·0	−24. 29·74							

Concluded Longitude of Valentia from Kingstown = 16ᵐ. 52ˢ·41 West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

Chronometer S.

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by $\frac{1}{2}\Sigma$.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
5. 4	13.24. 5·5	4.22.52·8	−18.25·99							
				+7·25			(Chron. 2306.)			+6·65
7. 4					4.45.40·8	−18.11·24	13.15.27·0	16.54·37		
				+7·25					+7·67	+7·85
9. 0	10. 3.19·5	0.46.29·2	−17.57·99				(Chron. 2306.)			
				+8·08					+7·67	+7·49
11. 3					4. 9.53·96	−17.40·59	12.55.42·0	16.54·54		
				+8·08					+8·10	+8·67
13. 0	10.19.18·0	0.46.10·0	−17.25·65				(TransitClock)			
				+8·00					+8·10	+7·53
15. 2					2. 5. 1·58	−17. 9·11	11. 6.38·0	16.54·35		
				+8·00					+8·10	+8·47
17. 1	11.21.28·5	1.31.56·0	−16.53·40							
				+6·20					+8·10	+7·73
19. 3					3.43.28·4	−16.40·34	13. 1.32·0	16.50·03		
				+6·20					+5·93	+4·67
21. 1	12.18.26·5	2.12.40·0	−16.28·36							
									+5·93	+7·19
23. 2					2.30.27·2	−16.15·79	12. 4.20·0	16.51·16		
25. 2	13.28.42·5	3. 6.13·6	−15.38·06							
				+5·94						+5·70
27. 3					3.30.28·0	−15.26·03	13.21.56·0	16.53·65		
				+5·94					+6·10	+6·18
29. 0	11.17.41·0	0.39.29·2	−15.14·90							
				+5·30					+6·10	+6·02
31. 3					3.56. 4·0	−15. 3·50	14. 3.39·0	16.51·67		
				+5·30					+4·72	+4·58
Sep. 2. 0	10.33.52·5	23.39.47·2	−14.53·86							
				+5·94					+4·72	+4·86
4. 3					3.52.16·0	−14.40·85	14.15.47·0	16.55·50		
				+5·94					+6·27	+7·02
6. 0	11.40.55·0	0.30.34·8	−14.29·82							
				+5·07					+6·27	+5·52
8. 3					2.16.33·2	−14.19·22	12.57.52·0	16.52·44		
				+5·07					+5·44	+4·62
10. 1	13. 5.12·5	1.38.38·0	−14. 9·20							
				+6·20					+5·44	+6·26
12. 4					4.54.34·4	−13.55·90	15.51.52·0	16.53·35		
				+6·20						+6·14
14. 0	11.29.40·5	23.47.16·8	−13.44·84							

Concluded Longitude of Valentia from Kingstown = $16^{m}.53^{s}\cdot24$ West.

Chronometer T.

Aug.										
5. 4	13.25.44·5	4.29.32·8	−23.27·26							
				−2·20			(Chron. 2306.)			−1·86
7. 4					4.54.24·8	−23.31·72	13.18.54·0	16.51·44		
				−2·20					−2·57	−2·54
9. 0	10. 5.14·5	0.54. 1·6	−23.35·71				(Chron. 2306.)			
				−2·58					−2·57	−2·60
11. 3					4.20.30·0	−23.41·30	13. 0.20·5	16.52·10		
				−2·58					−2·70	−2·56
13. 0	10.21.11·5	0.54.23·6	−23.46·06				(TransitClock)			
				−2·91					−2·70	−2·84
15. 2					2.18.30·0	−23.52·09	11.13.27·0	16.51·90		
				−2·91					−2·92	−2·98
17. 1	11.22.37·5	1.40. 9·2	−23.57·78							
				−3·24					−2·92	−2·86
19. 3					4.26.23·2	−24. 4·70	13.37. 7·0	16.51·24		
				−3·24					−3·94	−3·62
21. 1	12.20. 7·5	2.22. 3·2	−24.10·84							
				−4·13					−3·94	−4·26
23. 2					2.41.27·2	−24.19·22	12. 7.16·0	16.52·19		
				−4·13					−4·25	−4·00
25. 2	13.30.55·0	3.17.15·2	−24.27·51							
				−4·84					−4·25	−4·50

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

CHRONOMETER T.—*concluded.*

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by $\frac{1}{2}\Sigma$.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3					3.42.58·4	−24.37·35	13.25.18·0	16.51·27		
				−4·84					−4·77	−5·18
29. 0	11.18.48·5	0.50. 8·0	−24.46·38							
				−4·46					−4·77	−4·36
31. 3					4.10. 8·0	−24.56·01	14. 7.51·0	16.51·83		
				−4·46					−4·98	−4·56
Sep.										
2. 0	10.39.30·0	23.55.34·0	−25. 4·08							
				−5·38					−4·98	−5·40
4. 3					4. 5.36·0	−25.15·88	14.18.36·0	16.51·91		
				−5·38					−5·47	−5·36
6. 0	11.43.21·0	0.43.56·4	−25.25·82							
				−5·95					−5·47	−5·58
8. 3					2.33.16·0	−25.38·32	13. 3.18·0	16.51·03		
				−5·95					−6·52	−6·32
10. 1	13. 7.34·5	1.52.40·4	−25.49·99							
				−6·32					−6·52	−6·72
12. 4					5.12. 2·42	−26. 3·65	15.57.14·0	16.52·49		
				−6·32						−5·92
14. 0	11.31.44·0	0. 1.50·0	−26.14·87							

Concluded Longitude of Valentia from Kingstown = 16m. 51s·96 West.

CHRONOMETER U.

Aug.										
5. 4	13.26.53·5	4.26.57·2	−19.42·86							
				+4·23			(Chron. 2306.)			+4·05
7. 4					4.51.13·6	−19.34·25	13.19.40·0	16.51·83		
				+4·23					+4·45	+4·41
9. 0	10. 7. 8·0	0.51.45·6	−19.26·52							
				+4·53			(Chron. 2306.)		+4·45	+4·49
11. 3					4.25.10·0	−19.16·73	13. 9.27·0	16.51·65		
				+4·53					+4·70	+4·57
13. 0	10.23.42·0	0.52.16·0	−19. 8·37							
				+4·48			(TransitClock)		+4·70	+4·83
15. 2					2.20. 4·0	−18.59·02	11.19.56·0	16.51·00		
				+4·48					+4·52	+4·13
17. 1	11.24.22·5	1.36.46·4	−18.50·26							
				+4·70					+4·52	+4·91
19. 3					4.24.31·22	−18.40·26	13.40.40·0	16.51·28		
				+4·70					+4·35	+4·49
21. 1	12.21.20·0	2.17.36·0	−18.31·34							
				+4·72					+4·35	+4·21
23. 2					2.40.30·4	−18.21·74	12.12.17·0	16.52·70		
				+4·72					+4·84	+5·23
25. 2	13.33.25·5	3.13.30·0	−18.12·23							
				+4·70					+4·84	+4·45
27. 3					3.43.58·4	−18. 2·65	13.32.53·0	16.52·20		
				+4·70					+4·92	+4·95
29. 0	11.20.36·5	0.45. 3·2	−17.53·87							
				+4·48					+4·92	+4·89
31. 3					4. 4.32·0	−17.44·23	14. 9.28·0	16.50·88		
				+4·48					+4·13	+4·07
Sep.										
2. 0	10.40.51·0	23.49.26·8	−17.36·10							
				+4·50					+4·13	+4·19
4. 3					4. 0.34·4	−17.26·28	14.21.24·0	16.52·37		
				+4·50					+4·97	+4·81
6. 0	11.44.37·5	0.37. 4·8	−17.17·93							
				+4·88					+4·97	+5·13
8. 3					2.29.20·0	−17. 7·73	13. 7.53·0	16.51·36		
				+4·88					+4·52	+4·63
10. 1	13. 9.45·5	1.45.59·2	−16.58·15							
				+4·38					+4·52	+4·41
12. 4					5. 7.34·0	−16.48·74	16. 2. 2·0	16.51·75		
				+4·38						+4·35
14. 0	11.34.40·0	23.55.11·6	−16.40·95							

Concluded Longitude of Valentia from Kingstown = 16m. 51s·69 West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

CHRONOMETER W.

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by $\frac{1}{2}\Sigma$.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
5. 4	13.28.16·0	4.44. 2·2	−35.25·57	−7·73			(Chron. 2306.)			−7·82
7. 4				−7·73	5. 8.58·6	−35.41·35	13.21.18·0	16.52·00	−7·90	−7·64
9. 0	10. 9.29·0	1.10.35·0	−35.55·30	−8·03			(Chron. 2306.)		−7·90	−8·16
11. 3				−8·03	4.44.59·0	−36.12·80	13.12.20·0	16.52·07	−7·75	−7·90
13. 0	10.26.46·0	1.12.38·6	−36.27·48	−7·76			(TransitClock)		−7·75	−7·60
15. 2				−7·76	2.42.23·4	−36.43·74	11.24.31·0	16.51·43	−7·58	−7·92
17. 1	11.26.30·5	1.57. 2·6	−36.58·82	−7·42					−7·58	−7·24
19. 3				−7·42	4.46.58·2	−37.14·70	13.44.33·0	16.51·45	−7·58	−7·60
21. 1	12.23. 9·5	2.38.22·6	−37.28·72	−7·49					−7·58	−7·56
23. 2				−7·49	3. 4.57·0	−37.44·01	12.17.23·0	16.51·86	−7·28	−7·42
25. 2	13.35.18·5	3.35. 9·4	−37.58·94	−7·10					−7·28	−7·14
27. 3				−7·10	4. 9.43·0	−38.13·47	13.38.28·0	16.51·88	−7·25	−7·06
29. 0	11.23. 0·0	1. 7.59·0	−38.26·57	−7·52					−7·25	−7·44
31. 3				−7·52	4.26.36·2	−38.42·89	14.10.33·0	16.51·59	−7·70	−7·60
Sep. 2. 0	10.43.30·5	0.13.26·2	−38.56·44	−7·70					−7·70	−7·80
4. 3				−7·70	4.34. 2·2	−39.13·44	14.33. 7·0	16.51·91	−7·50	−7·60
6. 0	11.46.46·5	1. 1.23·0	−39.27·48	−7·19					−7·50	−7·40
8. 3				−7·19	2.55.52·2	−39.42·65	13.11.50·0	16.52·29	−7·17	−6·98
10. 1	13.13.23·0	2.12.34·6	−39.56·64	−7·65					−7·17	−7·36
12. 4				−7·65	5.37. 5·0	−40.13·24	16. 8.10·0	16.51·25		−7·94
14. 0	11.36.24·0	0.20.41·0	−40.26·63							

Concluded Longitude of Valentia from Kingstown = 16m. 51s·79 West.

CHRONOMETER X.

Aug.										
5. 4	13.30.22·0	4.35.46·6	−25. 4·32	−0·97			(Chron. 2306.)			−0·92
7. 4				−0·97	4.59.54·2	−25. 6·31	13.22.49·0	16.51·88	−1·06	−1·02
9. 0	10.10.32·0	1. 0.50·6	−25. 8·07	−1·13			(Chron. 2306.)		−1·06	−1·10
11. 3				−1·13	4.39. 3·19	−25.10·52	13.17.27·5	16.51·86	−1·26	−1·16
13. 0	10.28.42·0	1. 3.19·4	−25.12·59	−1·34			(TransitClock)		−1·26	−1·36
15. 2				−1·34	2.40.21·0	−25.15·41	11.33.58·0	16.51·90	−1·03	−1·32
17. 1	11.29.29·0	1.48.19·8	−25.18·01	−0·92					−1·03	−0·74
19. 3				−0·92	4.38.23·0	−25.19·97	13.47.53·0	16.51·53	−0·93	−1·10
21. 1	12.26.39·5	2.29.45·0	−25.21·70	−0·65					−0·93	−0·76
23. 2				−0·65	2.54.13·0	−25.23·03	12.19. 0·0	16.52·10	−0·55	−0·54
25. 2	13.37. 9·0	3.24.25·0	−25.24·33	−0·60					−0·55	−0·56

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

CHRONOMETER X.—*concluded.*

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by $\frac{1}{2}\Sigma$.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3				−0·60	3.59.14·63	−25.25·56	13.40.48·0	16.51·80	−0·81	−0·64
29. 0	11.24.51·0	0.56.49·8	−25.26·67	−1·34					−0·81	−0·98
31. 3				−1·34	4.15.23·0	−25.29·55	14.12.34·0	16.51·07	−1·57	−1·70
Sep. 2. 0	10.46. 5·0	0. 2.35·8	−25.31·96	−1·31					−1·57	−1·44
4. 3				−1·31	4.23.54·2	−25.34·84	14.36.38·0	16.52·07	−1·25	−1·18
6. 0	11.49. 5·5	0.49.51·4	−25.37·26	−0·89					−1·25	−1·32
8. 3				−0·89	2.50.46·6	−25.39·12	13.20.49·0	16.52·69	−0·72	−0·46
10. 1	13.14.43·0	1.59.38·6	−25.40·85	−1·01					−0·72	−0·98
12. 4				−1·01	5.24.23·0	−25.43·03	16. 9.58·0	16.51·76		−1·04
14. 0	11.38. 4·5	0. 7.39·4	−25.44·81							

Concluded Longitude of Valentia from Kingstown = 16ᵐ. 51ˢ·87 West.

CHRONOMETER Y.

Aug. 5. 4	13.31.36·0	4.32.21·4	−20.25·32	+2·72						+2·90
7. 4				+2·72	4.57.28·2	−20.19·79	(Chron. 2306.) 13.25.10·5	16.51·28	+2·79	+2·54
9. 0	10.12.15·5	0.57.40·6	−20.14·86	+3·43					+2·79	+3·04
11. 3				+3·43	4.40. 9·77	−20. 7·38	(Chron. 2306.) 13.23.37·5	16.52·59	+3·75	+3·82
13. 0	10.31.42·0	1. 1. 7·4	−20. 1·08	+3·73					+3·75	+3·68
15. 2				+3·73	2.38.55·4	−19.53·33	(TransitClock) 11.37.55·0	16.52·02	+4·10	+3·78
17. 1	11.32.21·0	1.45.39·4	−19.46·07	+4·45					+4·10	+4·42
19. 3				+4·45	4.39.35·0	−19.36·59	13.54.49·0	16.52·03	+4·22	+4·48
21. 1	12.27.21·5	2.24.33·4	−19.28·21	+3·95					+4·22	+3·96
23. 2				+3·95	2.53.43·0	−19.20·18	12.24.34·0	16.51·86	+3·43	+3·94
25. 2	13.39.37·5	3.20.41·0	−19.12·23	+3·54					+3·43	+2·92
27. 3				+3·54	4. 1.33·0	−19. 4·96	13.49.27·0	16.53·19	+4·08	+4·16
29. 0	11.26.13·5	0.51.43·8	−18.58·40	+4·52					+4·08	+4·00
31. 3				+4·52	4.20.50·2	−18.48·64	14.24.42·0	16.53·15	+4·86	+5·04
Sep. 2. 0	10.47.52·0	23.57.31·0	−18.40·45	+4·68					+4·86	+4·68
4. 3				+4·68	4.20.41·0	−18.30·15	14.40.30·0	16.52·21	+5·24	+4·68
6. 0	11.50.45·5	0.44.15·4	−18.21·54	+5·58					+5·24	+5·80
8. 3				+5·58	2.47. 7·0	−18. 9·79	13.24.40·0	16.52·03	+5·66	+5·36
10. 1	13.17.13·0	1.54.26·2	−17.58·86	+5·13					+5·66	+5·96
12. 4				+5·13	5.26.18·2	−17.47·75	16.19.51·0	16.50·83		+4·30
14. 0	11.43.58·0	0. 5.25·8	−17.38·66							

Concluded Longitude of Valentia from Kingstown = 16ᵐ. 52ˢ·03 West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

Chronometer Z.

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
5. 4	13. 32. 57·0	4. 34. 56·6	−21. 39·75							
				+1·33			(Chron. 2306.)			+1·40
7. 4					5. 0. 15·8	−21. 37·05	13. 26. 41·0	16. 51·36		
				+1·33					+1·29	+1·26
9. 0	10. 13. 58·0	1. 0. 42·6	−21. 34·64				(Chron. 2306.)		+1·29	+1·32
				+2·33	4. 51. 19·0	−21. 29·56	13. 33. 25·0	16. 53·71		
11. 3									+3·70	+3·34
				+2·33			(TransitClock)			
13. 0	10. 33. 30·5	1. 4. 19·8	−21. 25·28						+3·70	+4·06
				+2·58	2. 44. 26·2	−21. 19·86	11. 42. 3·0	16. 48·96		
15. 2									+0·95	+1·10
				+2·58						
17. 1	11. 35. 7·5	1. 49. 54·2	−21. 14·83						+0·95	+0·80
				+1·35	4. 43. 11·0	−21. 11·95	13. 56. 49·0	16. 52·99		
19. 3									+1·65	+1·90
				+1·35						
21. 1	12. 29. 9·0	2. 28. 1·8	−21. 9·40						+1·65	+1·40
				+1·79	2. 58. 11·0	−21. 5·75	12. 27. 16·0	16. 52·70		
23. 2									+2·14	+2·18
				+1·79						
25. 2	13. 41. 41·5	3. 24. 34·6	−21. 2·17						+2·14	+2·10
				+2·19	4. 7. 25·0	−20. 57·69	13. 53. 28·0	16. 52·10		
27. 3									+2·17	+2·28
				+2·19						
29. 0	11. 28. 13·0	0. 55. 38·2	−20. 53·62						+2·17	+2·06
				+2·45	4. 25. 53·0	−20. 48·32	14. 27. 46·0	16. 52·77		
31. 3									+3·18	+2·84
				+2·45						
Sep. 2. 0	10. 50. 0·5	0. 1. 42·6	−20. 43·90						+3·18	+3·52
				+2·37	4. 28. 45·0	−20. 38·70	14. 46. 29·0	16. 49·62		
4. 3									+1·16	+1·22
				+2·37						
6. 0	11. 52. 45·0	0. 48. 27·4	−20. 34·36						+1·16	+1·10
				+1·61	2. 54. 10·2	−20. 30·97	13. 29. 22·0	16. 52·82		
8. 3									+2·05	+2·12
				+1·61						
10. 1	13. 19. 58·5	1. 59. 40·2	−20. 27·81						+2·05	+1·98
				+1·77	5. 33. 48·2	−20. 23·99	16. 24. 45·0	16. 51·40		
12. 4										
				+1·77						+1·56
14. 0	11. 46. 27·0	0. 10. 36·6	−20. 20·87							

Concluded Longitude of Valentia from Kingstown = 16ᵐ. 51ˢ·83 West.

Chronometer *a*.

Aug.										
5. 4	13. 35. 16·0	4. 41. 8·6	−25. 33·13							
				+3·48			(Chron. 2306.)			+3·76
7. 4					5. 7. 35·0	−25. 26·01	13. 30. 12·0	16. 51·17		
				+3·48					+3·39	+3·20
9. 0	10. 16. 8·5	1. 6. 37·8	−25. 19·69				(Chron. 2306.)		+3·39	+3·58
				+3·67	4. 57. 7·02	−25. 11·71	13. 35. 33·0	16. 51·93		
11. 3									+3·50	+3·76
				+3·67			(TransitClock)			
13. 0	10. 35. 13·5	1. 9. 42·2	−25. 4·96						+3·50	+3·24
				+3·08	2. 55. 2·2	−24. 58·49	11. 48. 59·0	16. 51·45		
15. 2									+2·98	+2·92
				+3·08						
17. 1	11. 36. 18·0	1. 54. 42·2	−24. 52·52						+2·98	+3·04
				+3·90	4. 50. 34·2	−24. 44·19	14. 0. 40·0	16. 53·59		
19. 3									+4·67	+4·76
				+3·90						
21. 1	12. 31. 11·5	2. 33. 31·4	−24. 36·84						+4·67	+4·58
				+3·87	3. 5. 11·37	−24. 28·94	12. 30. 56·0	16. 50·49		
23. 2									+3·28	+3·16
				+3·87						
25. 2	13. 43. 5·5	3. 29. 17·4	−24. 21·21						+3·28	+3·40
				+3·22						

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

CHRONOMETER *a.*—*concluded.*

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3				+3·22	4.12.39·0	−24.14·61	13.55.26·0	16.51·51	+3·24	+3·04
29. 0	11.30.11·5	1. 0.51·4	−24. 8·65	+3·93					+3·24	+3·44
31. 3				+3·93	4.33. 1·4	−24. 0·13	14.31.43·0	16.53·00	+4·07	+4·42
Sep. 2. 0	10.52.10·5	0. 7. 1·4	−23.53·05	+4·15					+4·07	+3·72
4. 3				+4·15	4.34.47·0	−23.43·92	14.49.23·0	16.52·89	+4·16	+4·58
6. 0	11.55.23·5	0.54. 7·4	−23.36·29	+3·66					+4·16	+3·74
8. 3				+3·66	3. 2. 3·0	−23.28·60	13.34.19·0	16.51·79	+3.87	+3·58
10. 1	13.21.23·5	2. 3.58·6	−23.21·45	+3·47					+3·87	+4·16
12. 4				+3·47	5.44.17·0	−23.13·91	16.32.26·0	16.50·52		+2·78
14. 0	11.49. 2·5	0.15.58·6	−23. 7·79							

Concluded Longitude of Valentia from Kingstown = $16^{m}.51^{s}.86$ West.

CHRONOMETER *b.*

Aug. 5. 4	13.36.18·0	4.39. 9·4	−22.32·09	+3·00						+3·19
7. 4				+3·00	5. 6.19·4	−22.25·95	(Chron. 2306.) 13.31.56·0	16.51·92	+3·22	+2·81
9. 0	10.19.11·0	1. 6.40·6	−22.20·49	+3·52			(Chron. 2306.)		+3·22	+3·63
11. 3				+3·52	5. 0.10·87	−22.12·83	13.41.36·5	16.52·15	+3·69	+3·41
13. 0	10.37.42·5	1. 9.12·2	−22. 6·37	+4·00			(TransitClock)		+3·69	+3·97
15. 2				+4·00	2.59.12·6	−21.57·99	11.56.10·0	16.52·53	+4·02	+4·03
17. 1	11.38.15·0	1.53.36·6	−21.50·24	+3·88					+4·02	+4·01
19. 3				+3·88	4.50.25·0	−21.41·94	14. 3.35·0	16.52·10	+3·68	+3·75
21. 1	12.33.32·5	2.32.49·8	−21.34·62	+3·75					+3·68	+3·61
23. 2				+3·75	3.12.47·75	−21.26·96	12.41.34·0	16.52·58	+3·84	+3·89
25. 2	13.45. 3·5	3.28.13·4	−21.19·52	+3·85					+3·84	+3·79
27. 3				+3·85	4.51.29·0	−21.11·56	14.37.25·0	16.52·36	+4·07	+3·91
29. 0	11.32.30·0	1. 0. 5·4	−21. 4·53	+4·15					+4·07	+4·23
31. 3				+4·15	4.35.43·0	−20.55·55	14.37.31·0	16.52·13	+3·93	+4·07
Sep. 2. 0	10.54.37·5	0. 6.23·0	−20.48·06	+3·78					+3·93	+3·79
4. 3				+3·78	4.32.41·0	−20.39·74	14.50.22·0	16.52·22	+3·71	+3·77
6. 0	11.56.46·0	0.52.26·2	−20.32·81	+3·33					+3·71	+3·65
8. 3				+3·33	3. 4.35·0	−20.25·82	13.39.55·0	16.51·48	+2·37	+3·01
10. 1	13.24.20·5	2. 3.53·0	−20.19·33	+2·26					+2·37	+1·73
12. 4				+2·26	5.42.25·0	−20.14·44	16.33.31·0	16.53·17		+2·79
14. 0	11.50.50·5	0.14.49·0	−20.10·48							

Concluded Longitude of Valentia from Kingstown = $16^{m}.52^{s}.27$ West.

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

Chronometer *d.*

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by $\frac{1}{2}\Sigma$.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
5. 4	13. 39. 1·5	4. 38. 28·13	−19. 7·77				(Chron. 2306.)			
				+4·20	5. 6. 9·0	−18. 59·23	13. 35. 12·0	16. 52·77		
7. 4				+4·20						
9. 0	10. 21. 12·0	1. 5. 12·37	−18. 51·59				(Chron. 2306.)			
11. 3					5. 19. 51·0	−24. 41·16	13. 58. 51·5	16. 51·75		
									+5·35	+5·06
13. 0	10. 41. 5·0	1. 14. 58·87	−24. 31·08				(TransitClock)			
				+5·55	3. 11. 7·46	−24. 19·40	12. 5. 45·0	16. 52·53	+5·35	+5·64
15. 2				+5·55					+5·15	+5·46
17. 1	11. 40. 51·5	1. 58. 31·12	−24. 8·69							
				+4·80	4. 54. 55·5	−23. 58·44	14. 5. 49·0	16. 52·47	+5·15	+4·84
19. 3				+4·80					+4·81	+4·76
21. 1	12. 35. 59·5	2. 37. 31·13	−23. 49·35							
				+5·39	3. 22. 45·0	−23. 38·27	12. 49. 20·0	16. 53·77	+4·81	+4·86
23. 2				+5·39					+5·45	+5·92
25. 2	13. 48. 37·0	3. 33. 54·38	−23. 27·59							
				+5·30	4. 56. 1·5	−23. 16·61	14. 39. 52·0	16. 53·23	+5·45	+4·98
27. 3				+5·30					+6·29	+5·62
29. 0	11. 35. 44·5	1. 5. 21·75	−23. 6·90							
				+6·52	4. 40. 46·5	−22. 52·75	14. 40. 38·0	16. 51·93	+6·29	+6·96
31. 3				+6·52					+5·98	+6·08
Sep. 2. 0	10. 57. 13·0	0. 10. 51·0	−22. 40·99							
				+5·85	4. 36. 46·5	−22. 28·12	14. 52. 39·0	16. 52·71	+5·98	+5·88
4. 3				+5·85					+6·05	+5·82
6. 0	12. 0. 3·5	0. 57. 27·75	−22. 17·40							
				+5·70	3. 10. 6·0	−22. 5·32	13. 43. 47·0	16. 51·62	+6·05	+6·28
8. 3				+5·70					+4·87	+5·12
10. 1	13. 26. 35·0	2. 7. 42·0	−21. 54·20							
				+5·08	5. 48. 49·5	−21. 43·20	16. 38. 27·0	16. 53·73	+4·87	+4·62
12. 4				+5·08						+5·54
14. 0	11. 54. 48·5	0. 20. 10·13	−21. 34·26							

Concluded Longitude of Valentia from Kingstown = $16^{m}.52^{s}\cdot71$ West.

Chronometer *e.*

Aug.										
5. 4	13. 40. 24·5	4. 44. 45·37	−24. 2·23				(Chron. 2306.)			
				−2·77	5. 13. 39·0	−24. 7·90	13. 37. 36·0	16. 50·48		−2·27
7. 4				−2·77					−3·58	−3·27
9. 0	10. 24. 3·5	1. 13. 24·75	−24. 12·94				(Chron. 2306.)			
				−3·78	5. 21. 39·0	−24. 21·23	14. 1. 0·0	16. 51·53	−3·58	−3·89
11. 3				−3·78					−3·31	−3·67
13. 0	10. 44. 7·0	1. 17. 57·37	−24. 28·08				(TransitClock)			
				−3·35	3. 18. 57·0	−24. 35·15	12. 13. 22·0	16. 50·56	−3·31	−2·95
15. 2				−3·35					−3·72	−3·75
17. 1	11. 42. 51·5	2. 1. 3·75	−24. 41·64							
				−3·87	5. 4. 57·0	−24. 49·91	14. 15. 2·0	16. 50·99	−3·72	−3·69
19. 3				−3·87					−4·55	−4·05
21. 1	12. 38. 16·0	2. 40. 55·12	−24. 57·22							
				−4·70	3. 28. 50·98	−25. 6·86	12. 54. 0·0	16. 51·92	−4·55	−5·05
23. 2				−4·70					−4·89	−4·35
25. 2	13. 50. 4·0	3. 37. 9·75	−25. 16·19							
				−5·52					−4·89	−5·43

COMPARISON OF TRAVELLING CHRONOMETERS FOR THE LONGITUDE OF VALENTIA FROM KINGSTOWN.

CHRONOMETER *e.—concluded.*

Comparisons at Kingstown.					Comparisons at Valentia.					
Approximate Solar Time, 1844.	Time by ½ Σ.	Corresponding Time by Chronometer.	Chronometer Slow.	Chronometer's App. Losing Rate.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Chronometer's Apparent Losing Rate.	Chronometer's Adopted Losing Rate.
Aug. d h	h m s	h m s	m s	s	h m s	m s	h m s	m s	s	s
27. 3					5. 0. 18·0	−25. 27·62	14. 42. 0·0	16. 51·06		
				−5·52					−4·37	−5·61
29. 0	11. 37. 38·0	1. 9. 45·75	−25. 37·70						−4·37	−3·13
				−2·15	4. 46. 16·5	−25. 42·39	14. 43. 17·0	16. 53·73		
31. 3									−1·67	−1·17
Sep.				−2·15						
2. 0	10. 59. 41·5	0. 16. 24·37	−25. 46·26						−1·67	−2·17
				−1·83	4. 42. 57·0	−25. 50·29	14. 55. 28·0	16. 52·50		
4. 3									−1·52	−1·49
				−1·83						
6. 0	12. 1. 33·5	1. 2. 33·75	−25. 53·64						−1·52	−1·55
				−2·53	3. 16. 4·5	−25. 58·98	13. 45. 54·0	16. 49·79		
8. 3									−3·48	−3·51
				−2·53						
10. 1	13. 29. 32·5	2. 14. 48·75	−26. 3·92						−3·48	−3·45
				−3·36	5. 57. 39·0	−26. 11·22	16. 42. 51·0	16. 51·91		
12. 4										−3·27
				−3·36						
14. 0	11. 56. 57·0	0. 27. 1·12	−26. 17·10							

Concluded Longitude of Valentia from Kingstown = 16ᵐ. 51ˢ·50 West.

CHRONOMETER *f.*

Aug.										
5. 4	13. 42. 43·5	4. 50. 55·12	−27. 53·37							
				−2·22			(Chron. 2306.)			−2·02
7. 4					5. 20. 51·0	−27. 57·89	13. 40. 57·0	16. 52·04		
				−2·22					−2·52	−2·42
9. 0	10. 25. 29·0	1. 18. 39·0	−28. 1·92							
				−2·27			(Chron. 2306.)		−2·52	−2·62
11. 3					5. 32. 12·20	−28. 6·90	14. 7. 47·0	16. 53·14		
				−2·27					−2·26	−1·92
13. 0	10. 50. 37·5	1. 28. 9·75	−28. 11·03							
				−2·83			(TransitClock)		−2·26	−2·60
15. 2					3. 26. 40·5	−28. 16·99	12. 17. 23·0	16. 51·88		
				−2·83					−2·83	−3·06
17. 1	11. 50. 52·5	2. 12. 44·25	−28. 22·47							
				−2·98					−2·83	−2·60
19. 3					5. 11. 36·0	−28. 28·85	14. 18. 2·0	16. 51·53		
				−2·98					−3·12	−3·36
21. 1	12. 42. 6·0	2. 48. 21·75	−28. 34·47							
				−3·03					−3·12	−2·88
23. 2					3. 43. 42·0	−28. 40·65	13. 5. 19·0	16. 51·98		
				−3·03					−3·18	−3·18
25. 2	13. 56. 7·5	3. 46. 42·73	−28. 46·67							
				−3·23					−3·18	−3·18
27. 3					5. 6. 16·5	−28. 53·39	14. 44. 32·0	16. 52·20		
				−3·23					−3·45	−3·28
29. 0	11. 39. 41·5	1. 15. 10·5	−28. 59·29							
				−3·60					−3·45	−3·62
31. 3					4. 51. 7·5	−29. 7·13	14. 44. 45·0	16. 52·22		
				−3·60					−3·53	−3·58
Sep.										
2. 0	11. 2. 25·5	0. 22. 35·25	−29. 13·59							
				−3·36					−3·53	−3·48
4. 3					4. 50. 33·0	−29. 21·02	14. 59. 34·0	16. 52·44		
				−3·36					−3·26	−3·24
6. 0	12. 4. 39·5	1. 9. 12·75	−29. 27·16							
				−3·40					−3·26	−3·28
8. 3					3. 23. 1·5	−29. 34·36	13. 49. 14·0	16. 51·96		
				−3·40					−3·82	−3·52
10. 1	13. 32. 59·0	2. 21. 51·75	−29. 40·99							
				−3·92					−3·82	−4·12
12. 4					6. 4. 7·5	−29. 49·50	16. 45. 41·0	16. 52·59		
				−3·92						−3·72
14. 0	11. 58. 31·5	0. 32. 14·63	−29. 56·36							

Concluded Longitude of Valentia from Kingstown = 16ᵐ. 52ˢ·29 West.

The following Table contains the Results from all the Chronometers.

Reference to Chronometer.	Longitude of Valentia West of Kingstown.	Sum of Squares of Changes of Rate.	Weight of Result.
	m s		
A	16. 52·06	1·7012	588
B	52·13	4·1668	240
C	52·00	5·1228	195
D	52·42	2·4680	405
E	52·12	5·2120	192
F	52·32	4·3728	229
G	52·16	4·6880	213
H	51·76	3·6000	278
I	52·26	0·9824	1018
J	52·14	1·9200	521
K	52·03	5·3201	188
*K**	51·94	8·3760	119
M	51·77	5·1180	195
N	51·89	5·1648	194
O	51·85	3·8380	261
P	51·27	2·4576	407
Q	52·15	21·6236	46
R	52·41	8·1112	123
S	53·24	34·2444	18
T	51·96	5·1628	194
U	51·69	4·9412	202
W	51·79	2·2080	453
X	51·87	2·5008	400
Y	52·03	10·0800	99
Z	51·83	23·2408	43
a	51·86	11·3940	88
b	52·27	4·7656	210
d	52·71	8·4576	79
e	51·50	20·7488	48
f	52·29	3·2476	308

The sum of weights is 7554

The result for the Longitude of the Valentia temporary Observatory, West of the Kingstown temporary Observatory, is ..... } $16^m.52^s\cdot034$

The probable error of this determination, as depending on the unsteadiness of rate of the travelling chronometers, is ..... } $\pm 0^s\cdot0129$

This determination is based upon Kingstown transits as observed by Mr. Hind, and Valentia transits as observed by Lieutenant Gosset; and no correction is yet applied for personal equation.

The following Comparisons, made at Valentia, were not used for the Determination of Longitude; but they are used in the next Section, for the Determination of the Stationary Rates of the Travelling Chronometers at Valentia.

Reference to Chronometer.	Comparisons near August 26, 14h.				Comparisons near September 3, 13h.			
	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.	Time by Chronometer.	Chronometer Error employed.	Corresponding Time by Valentia Transit Clock.	Resulting Difference of Longitude.
	h m s	m s	h m s	m s	h m s	m s	h m s	m s
A	14.26. 0·0	−23.20·27	0. 7.26	16.52·41	13.41.48·0	−23.13·01	23.54.31	16.51·34
B	14.20. 0·0	−13.17·79	0.11.30	16.51·57	13.34.22·4	−12.32·95	23.57.46	16.51·32
C	14.25.42·0	−17.52·07	0.12.37	16.52·46	13.42.42·03	−17.24·09	0. 1.15	16.51·39
D	14.31.28·4	−19.49·99	0.16.26	16.52·55	13.50.14·4	−19. 8·89	0. 7. 3	16.51·90
E	14.41.11·2	−24.25·22	0.21.35	16.51·95	13.59.19·2	−24.24·00	0.10.54	16.51·20
F	14.46. 2·0	−22. 3·75	0.28.49	16.51·40	13.59.54·0	−21.54·40	0.13.59	16.51·11
G	14.46.30·0	−20.48·08	0.30.32	16.52·36	14. 0.26·4	−20.20·32	0.16. 5	16.51·94
H	14.37.35·2	− 9.10·50	0.33.15	16.52·57	13.51.58·0	− 8.17·44	0.19.40	16.51·99
I	14.56.45·2	−22.21·57	0.39.16	16.51·49	14. 6.46·0	−22. 9·48	0.20.37	16.51·11
J	14.59. 4·0	−21.38·77	0.42.18	16.51·58	14. 7.57·2	−21.15·13	0.22.42	16.52·00
K	15. 5. 8·0	−24.21·70	0.45.39	16.52·19	14.14.50·0	−24. 3·57	0.26.47	16.52·02
*K**	15. 6.21·0	−20. 2·63	0.51.11	16.53·16	14.15.24·2	−19.31·26	0.31.54	16.52·36
M	15.12.57·18	−23.58·63	0.53.53	16.51·78	14.24.30·0	−23.58·42	0.36.34	16.51·77
N	15.14.10·0	−22.39·31	0.56.25	16.52·33	14.26. 0·0	−22.21·10	0.39.42	16.51·59
O	15. 8.51·6	− 9.54·42	1. 3.53	16.52·03	14.17.20·4	− 9.29·98	0.43.54	16.51·80
P	15.38.34·0	−35.57·35	1. 7.33	16.52·10	14.54.21·2	−36.40·67	0.53.46	16.51·51
Q	15.29.20·4	−22. 2·37	1.12.14	16.53·24	14.42.17·2	−21.52·32	0.56.32	16.50·31
R	15.38.15·2	−26.22·76	1.16.50	16.52·39	14.54.30·8	−25.33·70	1. 5. 4	16.51·92
S	15.35. 8·0	−15.28·96	1.24.38	16.52·27	14.45.14·0	−14.44·10	1. 6.34	16.54·97
T	15.51.45·2	−24.34·99	1.32.11	16.51·66	14.56.45·98	−25.12·96	1. 7.41	16.51·26
U	15.48.32·0	−18. 4·97	1.35.28	16.52·01	14.55.20·4	−17.28·69	1.13.59	16.52·98
W	16.12.48·2	−38. 9·94	1.39.40	16.51·92	15.20.55·0	−39. 9·19	1.17.55	16.51·72
X	16. 3.11·0	−25.25·26	1.42.48	16.51·92	15.12.26·6	−25.34·13	1.23. 2	16.52·21
Y	16. 0.30·2	−19. 6·75	1.46.26	16.52·21	15. 9.15·38	−18.32·74	1.26.53	16.52·00
Z	16. 5.29·0	−20.58·79	1.49.34	16.51·48	15.16.42·18	−20.40·00	1.32.16	16.49·42
a	16.13.16·2	−24.16·23	1.54. 5	16.50·96	15.21.49·0	−23.46·19	1.34.15	16.51·36
b	16.13.28·0	−21.13·56	1.57.20	16.50·97	15.22.49·4	−20.41·82	1.38.20	16.51·81
d	16.20.24·0	−23.19·39	2. 2.10	16.51·92	15.30.27·0	−22.31·31	1.44.10	16.50·86
e	16.24.45·0	−25.24·74	2. 4.26	16.51·94	15.35.16·5	−25.49·28	1.45.41	16.51·64
f	16.31.40·5	−28.51·71	2. 7.56	16.51·04	15.43. 6·0	−29.19·18	1.50. 2	16.50·95

XIII. — *Difference between Travelling Rates and Stationary Rates of Travelling Chronometers; Correction of the determination of Longitude for this difference; Combination of the various Differences of Longitude; Corrections for Personal Equation of Transit-Observers; and final result for Astronomical Difference of Longitude.*

In the comparisons for determining the longitude of Liverpool as referred to Greenwich, there are six independent determinations of stationary rates of travelling chronometers. The mean of these has been compared with the mean of all the travelling rates during the same operation.

In the comparisons for determining the longitude of Kingstown, as referred immediately to Greenwich, there are seven independent determinations (of which one is used twice) of stationary rates. The mean of these has been compared with the mean of all the travelling rates during that operation.

Between the operation for connecting Kingstown with Liverpool, and that for connecting Kingstown with Valentia, one stationary rate is obtained (August 4, 3^h to 5, 4^h). This is compared with the mean of the last of the Kingstown-Liverpool mixed rates and the first of the Kingstown-Valentia mixed rates.

At Valentia, stationary rates were obtained between August 26, 14^h and 27, 3^h, and between Sep. 3, 13^h and Sep. 4, 3^h. These are compared with the mean of the mixed rates immediately preceding and following them.

The subjoined table contains the results:—

Excess of Chronometer's Stationary Rate above its Travelling Rate, the Rates being estimated positive when losing.

Reference to Chronometer.	In Comparisons between Greenwich and Liverpool.	In Comparisons between Greenwich and Kingstown.	At Kingstown.	At Valentia.
	s	s	s	s
A	+0·32	+0·05	−0·42	−0·33
B	−1·13	−2·41	+3·18	−1·40
C	+1·31	+0·33	−0·40	−0·14
D	−1·50	−0·45	−1·60	−0·72
E	−0·16	−1·66	+0·34	−1·31
F	−1·55	−1·15	−1·10	−2·52
G	+0·41	−0·37	+0·20	−0·49
H	−0·13	−1·15	−1·03	+0·32
I	−1·74	−0·77	−0·15	−1·91
J	−1·00	−0·95	−0·20	−0·62
K	−0·96	−0·46	−1·70	−0·76
*K**	+0·60		−1·71	+0·45
L		+0·12		
M	+0·31	+0·15	−0·63	−0·18
N	−0·47	−0·43	−1·27	−0·35
O	+0·47	−1·69	+0·76	−0·20
P	−0·89	−0·73	−0·21	+0·75
Q	+1·31	−1·34	−0·60	−0·67
R	+0·49	−3·74	−1·88	−0·69
S	−0·63	−1·83	−2·97	−1·89
T	+0·32	−0·07	+0·29	−0·15
U	+0·47	+0·11	−1·27	+0·55
W	+0·43	−0·01	−0·57	−0·16
X	+0·40	+0·07	−0·12	+0·26
Y	−0·38	−0·66	−1·54	−1·12
Z	−0·24	−1·24	+0·98	−0·80
a	−2·85	−1·88	−2·71	−1·94
b	−1·15	−1·21	−0·60	−1·72
d	+0·75	+0·23		−1·95
e	+0·66	−0·08	+0·24	+0·06
f	−1·85	−0·83	−0·65	−2·46
Mean..	−0·28	−0·80	−0·58	−0·73
Weights	6	8	1	2
General Mean	.....	.....	−0s·60	

As, in most of these instances, the stationary rate is compared not with a pure travelling rate but with a mixed rate, the result ought to be somewhat increased. Thus we may state, as a result of these comparisons, that the effect of travelling is to make pocket chronometers lose about $0^s{\cdot}7$ per day. In the following applications of corrections to the longitude, I have used the quantity $0^s{\cdot}6$ without increase, as the rates which are supposed unaltered are partially mixed rates.

1. No correction is to be made in the longitude of Liverpool as referred to Greenwich; the stationary rates being fully taken into account.

2. In computing the longitude of Liverpool as referred to Kingstown, the mean interval from Kingstown comparison to Liverpool comparison was $19\frac{1}{2}$ hours, and that from Liverpool comparison to Kingstown comparison was $28\frac{1}{2}$ hours. Let r be the mixed rate for $19\frac{1}{2}$ hours, $r - 0^s{\cdot}60$ the stationary rate for 9 hours, and r the mixed rate for the remaining $19\frac{1}{2}$ hours. Then the whole loss is $2r - 0^s{\cdot}60 \times \frac{9}{24}$; and the proportional part of this for $19\frac{1}{2}$ hours is

$$\frac{19\frac{1}{2}}{24} r - \frac{19\frac{1}{2}}{48} \times 0^s{\cdot}225;$$

which is the quantity that we may conceive to have been used in the previous operations. But the quantity which ought to have been used is $\frac{19\frac{1}{2}}{24} r$. Therefore the correction, which ought to be applied to the chronometer's loss is,

$$\frac{19\frac{1}{2}}{48} \times 0^s{\cdot}225, \text{ or } 0^s{\cdot}091.$$

By this quantity, the Kingstown sidereal time at Liverpool comparison will be increased; and therefore the difference of longitude will be diminished.

3. In computing the longitude of Kingstown as referred to Greenwich, it was assumed that the journey from Greenwich to Kingstown occupied 24 hours, and that from Kingstown to Greenwich 27 hours. Yet it is probable that the actual agitation by the journey occupied no longer time in the latter passage than in the former. Thus estimated, the whole loss in the two journeys was

$$2r + \frac{1}{8}(r - 0^s{\cdot}60) = \frac{51}{24} r - 0^s{\cdot}075;$$

the proportional part of which for 24 hours is $r - 0^s{\cdot}035$; and this has been

used. But the quantity which ought to have been used is r. Therefore, the correction to be applied to the Greenwich sidereal times at the Kingstown comparisons is $+0^s{\cdot}035$; and by this quantity the difference of longitude will be increased.

4. In computing the longitude of Valentia, as referred to Kingstown, the interval from Kingstown comparison to Valentia comparison was supposed 49¾ hours, and that from Valentia comparison to Kingstown comparison was 46¼ hours. The correction, computed in the same way, is $0^s{\cdot}042$, by which the difference of longitude is to be diminished.

Applying these corrections to the results formerly obtained, we have the following (still requiring correction for personal equation of transit-observers):—

	m	s
Longitude West from Greenwich to Liverpool	11.	59·886
,, ,, Liverpool to Kingstown	12.	31·322
Hence from Greenwich to Kingstown, by indirect or composite determination, is	24.	31·208
From Greenwich to Kingstown, by direct determination, is	24.	31·097
From Kingstown to Valentia	16.	51·992

The difference between the two determinations of the longitude of Kingstown, although very small, namely, $0^s{\cdot}111$, is greater than the preceding numbers would abstractedly have led us to expect. The probable error in the Greenwich-Liverpool determination being $0^s{\cdot}010$, and that in the Liverpool-Kingstown determination being $0^s{\cdot}016$, the probable error of the composite Greenwich-Kingstown will be $0^s{\cdot}019$. And as the probable error of the direct determination is $0^s{\cdot}014$, the probable discordance of the two is $0^s{\cdot}024$. This, it is to be remarked, is the probable discordance depending only upon the unsteadiness of the travelling or mixed rates of the chronometers as used in the four last sections, and does not include any uncertainty depending on the uncertainty of the chronometers' stationary rates, or on the errors in the astronomical determinations, or on the possible change in the habits of the transit-observer. It seems not unreasonable to attribute the principal part of the difference of determinations to these latter causes.

In a case like this, where the only calculation of probable errors that we can make evidently does not apply to the principal causes of error, the

adoption of final results must be somewhat arbitrary. Remarking, however, the favourable circumstances of comparison in the Greenwich-Liverpool determination, the duration and generally favourable circumstances of the Greenwich-Kingstown determination, and the smaller duration and less favourable circumstances of comparison in the Kingstown-Liverpool determination, I think that the two former may be altered by equal quantities, $0^s{\cdot}028$, and the third by double that quantity, or $0^s{\cdot}055$. Thus we have,

	m	s
Liverpool, West of Greenwich	11.	59·858
Kingstown, West of Liverpool	12.	31·267
Kingstown, West of Greenwich	24.	31·125
The probable error of which does not perhaps exceed		0·03

Combining with this the result,

Valentia, West of Kingstown	16.	51·992

We have

Valentia, West of Greenwich	41.	23·117
With a probable error perhaps of		$0^s{\cdot}04$, or 0·05

These results are founded upon transit-observations as made by Mr. Henry, at Greenwich; by Mr. Hartnup, at Liverpool; by Mr. Hind, at Kingstown; and by Lieutenant Gosset, at Valentia. They are yet subject to the correction for the personal equation or difference in the mode of observing transits among these observers; and I now proceed to give the elements of that correction.

On 1844, December 5, fourteen stars were observed by Mr. Sheepshanks, with the transit instrument of the Royal Observatory, Greenwich; and their places were corrected by the clock-errors determined from Mr. Henry's observations of ten clock stars, compared with the places in the Greenwich Catalogue of 1439 Stars (slightly altered from some observations in 1843). Mr. Sheepshanks' places of the fourteen stars thus obtained were compared with the places of the same stars in the Greenwich Catalogue.

The following table contains the whole operation:—

DETERMINATION OF PERSONAL EQUATION BETWEEN MR. SHEEPSHANKS AND MR. HENRY.

Month and Day, 1844.	Star's Name.	Observer.	Number of Wires.	Transit over Mean of the Seven Wires.	Seconds corrected for instrumental Errors.	Tabular R.A. of Clock-Stars.	Clock apparently Slow.	Deduced Apparent Right Ascension.	Deduced Mean Right Asc.	Mean R.A. of Greenwich Cat.	Excess of the former.
				h m s	s	s	s	h m s	s	s	s
Dec. 4	Arcturus....	H	4	14. 8.20.32	20·34	35·01	14·67				
	ϵ Bootis	H	7	14.37.57·42	57·43	12·23	14·80				
	α Coronæ...	H	7	15.27.51·93	51·94	6·56	14·62				
	α Serpentis..	H	7	15.36.22·84	22·84	37·46	14·62				
Dec. 5	α Lyræ.....	H	7	18.31.25·56	25·57	40·24	14·67				
	β Lyræ.....	H	7	18.44. 5·72	5·74	20·47	14·73				
	θ Pegasi....	S	1	22. 2. 7·93	7·93			22. 2.22·73	19·36	19·66	—0·30
	θ Aquarii ...	S	6	22. 8.24·09	24·08			22. 8.38·88	35·34	35·73	—0·39
	γ Aquarii ...	S	6	22.13.24·07	24·06			22.13.38·86	35·35	35·69	—0·34
	ζ Aquarii....	S	7	22.20.36·13	36·12			22.20.50·93	47·39	47·62	—0·23
	σ Aquarii....	S	6	22.22.11·47	11·45			22.22.26·26	22·63	23·10	—0·47
	η Aquarii....	S	7	22.27. 8·60	8·59			22.27.23·40	19·83	20·19	—0·36
	κ Aquarii ...	S	7	22.29.28·84	28·83			22.29.43·64	40·02	40·40	—0·38
	ζ Pegasi....	S	7	22.33.29·19	29·19			22.33.44·00	40·45	40·96	—0·51
	τ^2 Aquarii...	S	7	22.41. 8·07	8·05			22.41.22·86	19·01	19·56	—0·55
	λ Aquarii ...	S	7	22.44.16·88	16·87			22.44.31·69	27·98	28·28	—0·30
	δ Aquarii ...	S	7	22.46.10·30	10·28			22.46.25·10	21·34	21·77	—0·43
	Fomalhaut..	S	7	22.48.49·40	49·36			22.49. 4·18	0·35	0·93	—0·58
	3 Piscium...	S	4	22.52.26·32	26·31			22.52.41·13	37·40	37·78	—0·38
	α Pegasi....	S	7	22.56.48·07	48·08			22.56.62·90	59·20	59·64	—0·44
	α Andromedæ	H	7	0. 0. 9·50	9·51	24·30	14·79				
	γ Pegasi....	H	7	0. 5. 1·84	1·85	16·66	14·81				
	β Ceti.....	H	7	0.35.34·67	34·66	49·41	14·75				
	θ Ceti.....	H	7	1.16. 3·00	2·99	17·99	15·00				
Mean.....											— 0s·404

It appears from this that Mr. Sheepshanks writes down a smaller number for the star's time of transit, and therefore makes the "clock slow" greater than Mr. Henry does, by $0^s{\cdot}404$. Expressing this, therefore, by our usual equation, in which the initial of the observer's name is used to denote the "clock slow" resulting from his observation,

$$S - He = + 0^s{\cdot}404.$$

For the personal equation between Mr. Sheepshanks and Mr. Hartnup, fifteen stars were observed by Mr. Sheepshanks, and ten stars by Mr. Hartnup, at the Liverpool Observatory, on 1844, Dec. 6. I am not possessed of the whole of the details of these observations, and therefore state only the following abstract of results:—Six of the stars observed by Mr. Sheepshanks preceded those observed by Mr. Hartnup, and gave for clock slow at the mean epoch of Mr. Hartnup's observations, $22^s{\cdot}23$. The remaining nine stars followed those observed by Mr. Hartnup, and gave for clock slow at the same epoch $22^s{\cdot}35$. The latter stars being the better observed, $22^s{\cdot}31$ is adopted. The mean clock slow determined by Mr. Hartnup for the same time is $22^s{\cdot}10$ (the extreme determinations being $21^s{\cdot}95$ and $22^s{\cdot}18$). Hence we have

$$S - Ha = + 0^s{\cdot}21.$$

Combining this with the preceding determination,

$$Ha - He = + 0^s{\cdot}19.$$

The "clock slow" used at Liverpool has therefore been too great by $0^s{\cdot}19$. Diminishing it by this quantity, and therefore diminishing the nominal sidereal time at chronometer-comparisons by this quantity, we evidently increase the difference of Greenwich and Liverpool sidereal times, or increase the west longitude of Liverpool. Thus the west longitude of Liverpool already found is to be increased by $0^s{\cdot}19$.

The personal equation between Mr. Sheepshanks and Mr. Hind, as has been explained in Section VI., is given by the equation $S - J.\,H = + 0^s{\cdot}33$. Combining this with the first equation, we find,

$$J.\,H - He = + 0^s{\cdot}07;$$

by which quantity the west longitude of Kingstown is to be increased.

The personal equation between Mr. Sheepshanks and Lieutenant Gosset,

as inferred from the combination of the two equations in Section VI., is S − G = + 0ˢ·29. Combining this with the first equation, we find,

$$G - He = + 0^s \cdot 11;$$

by which quantity the west longitude of Valentia is to be increased.

Applying these corrections we obtain the following final results:—

			m	s
Longitude of Liverpool	West from	Greenwich	12.	0·05
,, Kingstown	,,		24.	31·20
,, Valentia	,,		41.	23·23

and the probable error of the last determination can scarcely amount to 0ˢ·05 or 0ˢ·06.

It is proper to mention here that, in the adoption of the personal equations above, I have taken the observations bearing on this element which were made at times approaching most nearly to the times of the observations relating to the longitude-determination, and under circumstances most nearly resembling those circumstances. Other observations have been made at different times presenting a somewhat different result. Of these I give the following abstract: the details will be found in the Greenwich Observations.

In the years 1843 and 1844 the clock errors at 0ʰ sidereal as determined from different groups of clock stars observed by Mr. Main and Mr. Hind at the Royal Observatory, Greenwich, were as follows:—

		M.	J. H.	J. H.—M.
		s	s	s
1843, August	11	43·65	43·54	− 0·11
,, August	18-19	49·51	49·38	− 0·13
1844, September	24	57·55	57·74	+ 0·19

The mean gives J. H − M. = − 0ˢ·02. As we have reason to believe that the difference between Mr. Main's and Mr. Henry's modes of observation is very small, these observations give J. H. − He = −0ˢ·02.

On 1845, Feb. 6, observations were made by Mr. Henry and Mr. Hind at the Royal Observatory, Greenwich, partly by the observation of broken transits (one observer taking the transit over four wires, and the other over the remaining three wires, and the means being reduced to the mean of the seven wires by the known interval of the wires, the order of observations being also changed,) and partly by observations of groups of different clock stars, the group observed by Mr. Hind being included between two groups observed by Mr. Henry. The results are—

By broken transits of four stars	J. H − He = + 0·13
By clock errors of five stars observed by Mr. Hind compared with fourteen stars observed by Mr. Henry	J. H − He = − 0·15

I can give no explanation of the discordance between the two last results, or of that between the last result and the result of comparisons through Mr. Sheepshanks.

For the personal equation of Lieutenant Gosset, observations were made on 1844, April 1, 2, 3, 4, 6. On April 1 and 3 they were compared with Mr. Ellis's observations, which were reduced to Mr. Henry's by the application of the well-established difference − 0ˢ·30 to the clock-errors determined by Mr. Ellis. The results of the five days for the quantity of G − He are,

$$+ 0^s\cdot31,\ + 0^s\cdot22,\ + 0^s\cdot31,\ + 0^s\cdot28,\ + 0^s\cdot34;$$

the mean gives,

$$G - He = + 0^s\cdot30$$

It will be remarked that Lieutenant Gosset was at this time unaccustomed to observation with a transit instrument, and that a change in his method of observation is sufficiently probable.

I do not think that these discordances offer any reason for changing the values already adopted, or that they leave any material doubt on the correctness of the results concluded from those adopted values. But they tend to shew that the proportion of uncertainty as depending on personal equation to uncertainty as depending on transmission of chronometers is greater than is generally supposed.

It is also proper to state that, in the reduction of the Greenwich Observations for 1844, an error was committed, arising from this circumstance: that in preparing the places of several clock stars, the results of the year 1842 (which were referred to the old equinox) were combined unaltered with the results of the year 1843 (which were referred to the same equinox as the Greenwich Catalogue of 1439 Stars). I have satisfied myself by examination of the instances affected by this error, that the error of results must be much below $\frac{1}{100}$ of a second of time. The only star which could produce sensible error is θ Ceti in the determination of Mr. Sheepshanks' personal equation; but in this instance I have corrected the place of the star, and the error is entirely removed.

XIV.—*Computation of the Geodetic Values of the Differences of Longitude upon Assumed Elements for the Figure of the Earth; Comparison of the Geodetic Value with the Chronometrical Value; and Final Result for the Value of an Arc of Parallel.*

In comparing a difference of longitude determined by transmission of chronometers, by observations of reciprocal azimuths, or by any other means, with the results of a geodetic survey connecting the two extreme points: if the extent of the arc be small, the easiest method of instituting the comparison in such a form as to give information upon the dimensions of the earth is—to convert the geodetic measure into chord-distance or arc-distance between the extreme points; from this to find the chord-distance or arc-distance between two points in the same parallel; and, by a small correction, to obtain the distance between these two points as measured along the parallel. But this method cannot be applied where the difference of longitude is so great as in the instance before us (in which it exceeds ten degrees). The only method that here appears practicable is analogous to that which is adopted in regard to widely-separated observations of planets, comets, &c. The elements being very approximately known, the place or measure is to be computed from these approximate elements, and this computed number is to be compared with that found from observation. If it agrees exactly, the elements (in so far as they can be tested by this measure) are correct. If there is discordance, the amount of discordance enables us to compute the amount of error of the elements. The value of this method consists in this, that it is always possible to compute a place from assumed elements with the utmost geometrical accuracy, and thus the comparison between the place obtained from assumed elements, and the place found from observations, may be rigorously exact.

Having satisfied myself that this course of proceeding would be the proper one in reference to the case before me, I requested the assistance of Colonel (now Major-General) Colby for communication of the necessary elements for computing the chain of geodetic lines, connecting the Royal Observatory of Greenwich with the Liverpool Observatory, the temporary Kingstown Observatory, and the station of Feagh Main. Colonel Colby complied with my request with a zeal and liberality which I had no title to expect. He not

only took immediate steps for connecting, by a secondary triangulation, the Liverpool and Kingstown Observatories with the great triangulation, but he also made many experimental calculations for determining the process which would be best employed in the computation, prepared the materials of every kind, effected the calculations throughout, and, finally, placed the whole at my service. In every part which required more detailed explanation, I received most powerful assistance from Captain Yolland, R.E., who, under Colonel Colby's instructions, superintended the principal part of these computations. The whole of this Section may therefore be considered as the work of Colonel Colby, attached to the chronometrical work for the convenience of comparison of the two sets of results.

The first matter to be determined was, the nature of the formulæ to be used for computing this case: Given the bearing and distance in feet of the second station as viewed from the first, and given also the astronomical latitude of the first station; to compute the astronomical latitude and the difference of longitude of the second station, and the bearing of the first station as viewed from the second. Theorems have been laid down for the computation of similar cases, on the supposition that each of these distances, or geodetic lines, is the shortest line connecting two points on the surface of the spheroid. On this I have only to remark that the supposition is unfounded; the geodetic lines of observation are really straight lines; and we are therefore compelled to resort to other methods, which may appear better adapted to the true circumstances of geodetic observation.

The following are the rigorous theorems upon which a complete system of geodetic trigonometry may be founded:—

If h and k are the major and minor semi-axes of the spheroid, a and b the astronomical colatitudes of two stations, C the difference of longitude, then:—

Cotan. angle of azimuth opposite a =

$$\frac{k^2 . \sin. a . \cos. b - h^2 . \cos. a . \sin. b . \cos. C}{h^2 . \sin. b . \sin. C} + \frac{(h^2 - k^2) . \sin. a . \cos. a}{h^2 . \sin. b . \sin. C} \sqrt{\frac{k^2 . \cos.^2 b + h^2 . \sin.^2 b}{k^2 . \cos.^2 a + h^2 . \sin.^2 a}}$$

Square of the chord-distance between the two stations =

$$\frac{h^4 . \sin.^2 a + k^4 . \cos.^2 a}{k^2 . \cos.^2 a + h^2 . \sin.^2 a} + \frac{h^4 . \sin.^2 b + k^4 . \cos.^2 b}{k^2 . \cos.^2 b + h^2 . \sin.^2 b} - 2 \frac{h^4 . \sin. a . \sin. b . \cos. C + k^4 . \cos. a . \cos. b}{\sqrt{\{k^2 . \cos.^2 a + h^2 . \sin.^2 a\}} \sqrt{\{k^2 . \cos.^2 b + h^2 . \sin.^2 b\}}}$$

These theorems, however, and those which may be derived from them, are too complicated for extensive use.

Under the direction of Captain Yolland, trials were made of several formulæ for the computation of large geodetic triangles. The triangles selected for this purpose were Precelly, Snowdon, Kippure; and Kippure, Kulteagh, Keeper. In each of these the spherical excess is greater than 49″, and one side at least exceeds 100 miles in length. The test of success was assumed to be that, on starting with an assumed latitude and longitude of one station, and with an assumed azimuth of the second station from the meridian as seen from the first, and using the angles of the triangle which correspond rigorously to the sides of the triangle; and computing, from the the first station, the latitude, longitude, and reciprocal azimuth at the second station, and (by application of the angle of the triangle) obtaining the azimuth of the third station as seen from the second; then computing in like manner from the second to the third; and then from the third to the first; the assumed latitude and longitude of the first station, and the azimuth of the second station at the first, should be rigorously reproduced.

It was found that on using the method introduced by Delambre (of referring all the calculations for any one station to the surface of a sphere whose centre is the point at which the normal to that station meets the axis of revolution), all desirable accuracy was obtained. The latitude and longitude were reproduced without sensible error; the azimuth was reproduced with an error of one or two tenths of a second.

The form in which this method was used was the following. A table was prepared of the length in feet of 1″ for an arc perpendicular to the meridian. Then, the distance of the second station from the first being expressed in feet: this number of feet was converted into seconds of arc by means of the "length of 1″ for an arc perpendicular to the meridian," for the latitude of the first station, whatever the bearing of the second station from the first might be. Then the computation for the latitude, longitude, and reciprocal azimuth at the second station, were computed by the rules of spherical trigonometry; and then, a table of the "length of 1″ for an arc in the meridian" having been prepared, the apparent difference of latitude of the first station and the second was converted into true difference of latitude by multiplying it by the fraction

$$\frac{\text{length of 1″ for an arc perpendicular to meridian at 1st station}}{\text{length of 1″ for an arc in the meridian at latitude intermediate to those of 1st and 2nd stations}},$$

and, applying this true difference of latitude to the latitude of the first station, the latitude of the second station was found. No alteration was made in the longitude or reciprocal azimuth.

The next point was to determine on the spheroidal elements which should be used. It has been the practice for some years to employ, in the geodetic calculations made in the Ordnance Map-Office under Colonel Colby's direction, the elements which I obtained by an investigation published in the article "Figure of the Earth" in the Encyclopædia Metropolitana. These elements are,

Polar semi-axis	20,853,810 feet
Equatoreal	20,923,713 ,,

and the tables computed from them and employed in the geodetic calculations of this Section, are the following :—

Complement of the Logarithm of the Number of Feet in 1".

Latitude.	For Arc perpendicular to the Meridian.	For Arc in the Meridian.
° ′		
50. 30	7·9929221	7·9941006
40	29180	40882
50	29137	40754
51. 0	29096	40631
10	29055	40508
20	29014	40384
30	28973	40262
40	28932	40138
50	28890	40013
52. 0	28849	39889
10	28808	39767
20	28767	39644
30	28727	39523
40	28686	39400
50	28645	39277
53. 0	28604	39154
10	28564	39034
20	28523	38911
30	28482	38788
40	28441	38666

The map attached to this paper will shew the lines of triangulation connecting the Royal Observatory of Greenwich with the Observatories of Liverpool, Kingstown, and Feagh Main. And the subjoined table will shew all the principal steps of the calculation. The following explanations, it is hoped, will be sufficient to render the table intelligible :—

The angles of azimuth are in all cases reckoned in the direction N, E, S, W, N, E.

The zero of absolute azimuth is in all cases the north meridian of the place.

The angle of azimuth in the second column is the horizontal angle between the first and third station as observed with the theodolite planted on the second station.

The log. distance in the third column is computed from the triangulation, of which the details are suppressed here.

The calculations have been made on two suppositions:—In the first, which is distinguished as the *first method*, the absolute azimuth observed at Greenwich is used as far as Wrotham, and then the absolute azimuth observed at Wrotham (by reference to the astronomical meridian as determined by observation of circumpolar stars) is used for the remainder of the chain of geodetic sides. In the *second method*, the absolute azimuths observed at Greenwich, Wrotham, Leith Tower, Butser, and Dunkerry, are successively used.

Absolute azimuths were also observed (for comparison with the computed azimuths) at Dunnose, Wingreen, Mendip, Precelly, Dunstable, White Horse, Arbury, Bardon, Axe Edge, Whittle Hill, Delamere, and Dublin Observatory. And absolute latitudes were observed with the zenith sector at Dunnose, Precelly, Hungry Hill, Forth, Feagh Main, Arbury Hill, Delamere; and with the Ramsden's Circle at Dublin Observatory.

CHAIN OF GEODETIC LINES

Names of Three Successive Stations.	Angle of Azimuth from the First Station to the Third, as seen at the Second.	Log. Distance in Feet from Second Station to Third.
	° ′ ″	
Assumed for Greenwich	.....	.....
North Meridian, Greenwich, Chingford	359. 59. 53·83	4·7622738
Greenwich, Chingford, Severndroog	347. 13. 46·82	4·8026910
Chingford, Severndroog, Wrotham	149. 26. 14·71	4·8751369
North Meridian, Greenwich, Norwood	218. 7. 16·00	4·4952140
Greenwich, Norwood, Severndroog	20. 15. 2·77	4·5928122
Norwood, Severndroog, Wrotham	258. 17. 37·82	4·8751369
North Meridian, Greenwich, Severndroog	106. 10. 35·12	4·1647154
Greenwich, Severndroog, Wrotham	210. 29. 19·47	4·8751369
Greenwich, Chingford, Wrotham	330. 38. 44·45	5·1259313
Adopted for Wrotham		
Greenwich, Norwood, Hanger Hill	272. 21. 21·00	4·8039848
Norwood, Hanger Hill, Leith Tower	57. 12. 26·34	5·1062144
Chingford, Wrotham, Leith Tower	280. 32. 54·75	5·2008803
Chingford, Severndroog, Leith Tower	235. 50. 21·64	5·1606647
Adopted for Leith Tower [NOTE. From Wrotham and Leith Tower commences the branch chain to Liverpool Observatory.]		
Wrotham, Leith Tower, Butser	171. 58. 31·81	5·1977346
Leith Tower, Butser, Dunnose [For verification of latitude]	138. 44. 0·87	5·1480450
Leith Tower, Butser, Wingreen	208. 37. 25·78	5·4148029
Butser, Wingreen, Mendip	220. 20. 40·65	5·1192792
Wingreen, Mendip, Dunkerry	135. 22. 46·90	5·3799736
Mendip, Dunkerry, Precelly	232. 21. 9·78	5·5949357
Dunkerry, Precelly, Kippure [NOTE. From Kippure commences the branch chain to Kingstown Observatory.]	186. 51. 24·22	5·7542078
Precelly, Kippure, Keeper	108. 53. 6·18	5·6560502
Kippure, Keeper, Bartregaun	171. 53. 15·37	5·6043242
Keeper, Bartregaun, Hungry Hill [For verification of latitude.]	117. 42. 19·83	5·2788759
Keeper, Bartregaun, Feagh Main	168. 41. 25·32	5·1927594
Dunkerry, Precelly, Forth	153. 8. 26·30	5·6271469
Precelly, Forth, Knockanafrion	160. 2. 22·35	5·3587705
Forth, Knockanafrion, Bartregaun	180. 22. 42·78	5·7028291
Knockanafrion, Bartregaun, Hungry Hill [For verification of latitude.]	91. 45. 2·87	5·2788759
Knockanafrion, Bartregaun, Feagh Main	142. 44. 8·36	5·1927594
Adopted for Feagh Main		

FROM GREENWICH TO FEAGH MAIN.

Computed Azimuth of Second Station from North Meridian, as seen at the Third Station. 1st Method.	2nd Method.	Azimuth Observed.	Computed Latitude of Third Station. 1st Method.	2nd Method.	Latitude Observed.	Computed West Longitude from Greenwich of Third Station. 1st Method.	2nd Method.
° ′ ″	″	″	° ′ ″	″	″	° ′ ″	″
.....			51.28.38·30			.....	
179.59.53·81			51.38. 8·85			0. 0. 0·03	
347.16.34·21			51.27.58·09			−0. 3.41·62	
316.53.21·52		21·83	51.18.58·71			−0.17.11·17	
38. 3.17·86			51.24.35·50			0. 5. 4·52	
238.25.12·04			51.27.58·09			−0. 3.41·61	
316.53.22·46		21·83	51.18.58·71			−0.17.11·16	
286.13.28·49			51.27.58·09			−0. 3.41·61	
316.53.20·57		21·83	51.18.58·71			−0.17.11·17	
330.52. 5·02		6·06	51.18.58·72			−0.17.11·17	
			51.18.58·71			−0.17.11·17	
130.14.39·19			51.31.21·96			0.17.51·13	
7.23.42·56		50·65	51.10.32·86			0.22.11·02	
70.54.18·67		23·32	51.10.32·88			0.22.11·02	
42.46.43·76		49·42	51.10.32·87			0.22.11·02	
			51.10.32·88			0.22.11·02	
62.24.24·56	29·19	29·85	50.58.38·21	38·24		0.58.43·74	43·77
20.58.16·06	21·30	21·25	50.37. 3·66	3·71	7·10	1.11.50·12	50·19
90. 9.15·08	20·37	18·91	50.59. 4·73	4·78		2. 6.24·85	24·85
130. 9.32·42	37·74	33·82	51.13. 4·88	4·96		2.32.36·71	36·68
84.43.35·86	41·17	41·91	51. 9.44·12	44·27		3.35. 8·40	8·38
136. 8.56·11	62·26	56·41	51.56.44·84	45·07	44·13	4.46.24·99	24·84
141.46. 7·20	13·51		53.10.40·94	41·27		6.19.52·94	52·58
69. 6.47·97	54·20		52.45. 4·58	5·01		8.15.39·49	39·21
59.45.25·32	31·44		52.12.24·52	25·05		9.49.45·31	45·14
357.29.30·29	36·33		51.41.11·91	12·44	10·06	9.47.31·79	31·71
48. 2.23·13	29·21		51.55.20·76	21·32		10.20.45·93	45·82
107.52.40·43	46·62		52.18.56·95	57·30	57·25	6.33.42·42	42·22
87. 6.38·11	44·28		52.17.19·22	19·65		7.34.53·97	53·77
85.42.42·87	48·99		52.12.24·17	24·74		9.49.45·53	45·37
357.29.30·87	36·92		51.41.11·55	12·13	10·06	9.47.32·02	31·96
48. 2.23·72	29·80		51.55.20·41	21·02		10.20.46·15	46·05
			51.55.20·58	21·17	23·24	10.20.46·01	45·93

BRANCH CHAIN OF GEODETIC LINES

Names of Three Successive Stations.	Angle of Azimuth from the First Station to the Third, as seen at the Second.	Log. Distance in Feet from Second Station to Third.
	° ′ ″	
Chingford, Wrotham, Dunstable	346. 23. 42·23	5·4369102
Wrotham, Leith Tower, White Horse Hill	227. 37. 39·89	5·4908363
Leith Tower, White Horse Hill, Dunstable	307. 43. 19·22	5·4089331
Wrotham, Leith Tower, Dunstable	280. 38. 41·86	5·4046570
Adopted for Dunstable		
Leith Tower, White Horse Hill, Arbury Hill	261. 0. 5·73	5·3984029
Leith Tower, Dunstable, Arbury Hill	139. 44. 30·86	5·3031466
Adopted for Arbury Hill		
Dunstable, Arbury Hill, Bardon Hill	221. 38. 52·41	5·2564050
Arbury Hill, Bardon Hill, Axe Edge	151. 50. 53·31	5·3700341
Bardon Hill, Axe Edge, Whittle Hill	193. 0. 47·20	5·2379457
Axe Edge, Whittle Hill, Rivington	99. 50. 39·46	4·7465243
Bardon Hill, Axe Edge, Rivington	176. 15. 5·60	5·2801115
Adopted for Rivington		
Axe Edge, Rivington, Delamere	54. 41. 28·85	5·1862213
Axe Edge, Whittle Hill, Delamere	53. 14. 20·28	5·2704922
Adopted for Delamere		
Rivington, Delamere, Everton	306. 8. 25·10	4·9871901
Axe Edge, Whittle Hill, Everton	84. 5. 42·53	5·2478109
Whittle Hill, Rivington, Everton	157. 14. 48·89	5·0940068
Adopted for Everton		
Rivington, Delamere, Heswell	280. 19. 54·73	4·9981098
Delamere, Everton, Heswell	80. 14. 18·25	4·6433041
Adopted for Heswell		
Rivington, Delamere, Edge Hill	304. 57. 24·84	4·9531907
Axe Edge, Rivington, Edge Hill	90. 28. 21·25	5·0998580
Adopted for Edge Hill		
Delamere, Edge Hill, Little Britain	158. 35. 45·75	4·3560974
Delamere, Heswell, Little Britain	263. 2. 39·61	4·5907585

FROM WROTHAM AND LEITH TOWER TO LIVERPOOL OBSERVATORY.

Computed Azimuth of Second Station from North Meridian, as seen at the Third Station. 1st Method.	2nd Method.	Azimuth Observed.	Computed Latitude of Third Station. 1st Method.	2nd Method.	Latitude Observed.	Computed West Longitude from Greenwich of Third Station. 1st Method.	2nd Method.
° ′ ″	″	″	° ′ ″	″	″	° ′ ″	″
136. 37. 11·60	11·60	11·29	51. 51. 49·57	49·57		0. 32. 5·30	5·30
117. 35. 54·41	59·10	56·69	51. 34. 29·81	29·88		1. 33. 57·04	56·99
246. 7. 47·30	52·03	48·55	51. 51. 49·54	49·57		0. 32. 5·33	5·25
171. 25. 15·27	19·99	18·42	51. 51. 49·54	49·56		0. 32. 5·35	5·26
			51. 51. 49·55	49·56		0. 32. 5·33	5·26
198. 52. 48·93	53·69		52. 13. 27·27	27·32		1. 12. 35·14	35·01
130. 37. 52·04	54·99	51·57	52. 13. 27·28	27·31		1. 12. 35·14	35·04
			52. 13. 27·27	27·32	26·81	1. 12. 35·14	35·02
172. 11. 32·22	35·21	36·36	52. 42. 50·71	50·74		1. 19. 8·85	8·71
143. 32. 19·32	22·34	23·18	53. 13. 56·01	56·08		1. 56. 51·25	51·06
156. 17. 48·61	51·66	58·66	53. 39. 59·08	59·16		2. 15. 53·87	53·65
75. 56. 24·48	27·53		53. 37. 46·39	46·48		2. 30. 52·31	52·08
139. 20. 5·65	8·70		53. 37. 46·39	46·47		2. 30. 52·31	52·09
			53. 37. 46·39	46·47		2. 30. 52·31	52·08
13. 53. 24·23	27·24	35·21	53. 13. 17·16	17·25		2. 41. 3·71	3·52
29. 11. 56·05	59·06	66·35	53. 13. 17·15	17·25		2. 41. 3·73	3·55
			53. 13. 17·16	17·25	18·77	2. 41. 3·72	3·54
139. 48. 3·89	6·92		53. 25. 29·65	29·75		2. 58. 13·34	13·14
59. 49. 28·56	31·58		53. 25. 29·64	29·75		2. 58. 13·34	13·14
52. 49. 13·02	16·05		53. 25. 29·64	29·75		2. 58. 13·33	13·13
			53. 25. 29·64	29·75		2. 58. 13·34	13·14
113. 53. 20·44	23·46		53. 19. 57·35	57·42		3. 5. 59·42	59·23
39. 56. 6·50	9·51		53. 19. 57·35	57·46		3. 5. 59·44	59·25
			53. 19. 57·35	57·42		3. 5. 59·42	59·23
138. 37. 47·61	50·62		53. 24. 22·63	22·75		2. 57. 18·64	18·44
49. 27. 12·16	15·19		53. 24. 22·64	22·74		2. 57. 18·63	18·44
			53. 24. 22·63	22·75		2. 57. 18·64	18·44
117. 9. 5·68	8·69		53. 26. 4·91	5·05		3. 2. 51·99	51·78
196. 58. 30·49	33·51		53. 26. 4·93	5·00		3. 2. 51·99	51·81

BRANCH CHAIN OF GEODETIC LINES

Names of Three Successive Stations.	Angle of Azimuth from the First Station to the Third, as seen at the Second.	Log. Distance in Feet from Second Station to Third.
	° ′ ″	
Delamere, Everton, Little Britain	142. 12. 0·14	4·2369016
Adopted for Little Britain		
Edge Hill, Little Britain, Liverpool Observatory (Transit)	11. 6. 33·95	4·1093730

BRANCH CHAIN OF GEODETIC LINES

Precelly, Kippure, Howth	257. 1. 57·96	4·9617237
Kippure, Howth, Dublin Observatory	56. 4. 4·66	4·7709985
Precelly, Kippure, Dublin Observatory	217. 9. 28·86	4·8829868
Adopted for Dublin Observatory		
Kippure, Howth, Poolbeg Lighthouse	18. 33. 19·96	4·3270654
Kippure, Dublin Observatory, Poolbeg Lighthouse	292. 59. 21·11	4·6445682
Adopted for Poolbeg Lighthouse		
Kippure, Howth, Kingstown Observatory	345. 55. 38·63	4·5117780
Howth, Poolbeg, Kingstown Observatory	109. 16. 40·45	4·2685985
Adopted for Kingstown Observatory		

FROM WROTHAM AND LEITH TOWER TO LIVERPOOL OBSERVATORY.

Computed Azimuth of Second Station from North Meridian, as seen at the Third Station. 1st Method.	2nd Method.	Azimuth Observed.	Computed Latitude of Third Station. 1st Method.	2nd Method.	Latitude Observed.	Computed West Longitude from Greenwich of Third Station. 1st Method.	2nd Method.
° ′ ″	″	″	° ′ ″	″	″	° ′ ″	″
101. 56. 18·66	21·68		53. 26. 4·92	5·03		3. 2. 52·02	51·82
			53. 26. 4·92	5·03		3. 2. 52·00	51·80
308. 17. 53·69	56·70		53. 24. 46·34	46·45		3. 0. 5·30	5·11

FROM KIPPURE TO KINGSTOWN OBSERVATORY.

219. 0. 43·43	49·74		53. 22. 23·51	23·85		6. 4. 6·92	6·52
94. 51. 49·86		53·57	53. 23. 13·95			6. 20. 16·54	
178. 55. 17·21		17·05	53. 23. 13·96			6. 20. 16·54	
			53. 23. 13·96		12·83	6. 20. 16·54	
57. 30. 6·44	12·75		53. 20. 31·10	31·45		6. 9. 2·23	1·83
292. 3. 39·42			53. 20. 31·11			6. 9. 2·23	
			53. 20. 31·10	31·45		6. 9. 2·23	1·83
24. 53. 21·21	27·50		53. 17. 32·95	33·28		6. 7. 52·39	52·01
346. 47. 42·89	49·21		53. 17. 32·92	33·28		6. 7. 52·37	51·98
			53. 17. 32·94	33·28		6. 7. 52·38	52·00

ADDENDUM.

In computing the geodetic differences of longitude, it might have been more accurate to employ the mean of the latitudes of the two stations on any line as argument to be used in the table of page (ccxxviii), for converting the measure in feet into seconds of arc, instead of the latitude of the first station. The correction is thus investigated. If the second latitude is greater than the first by m minutes of arc, the logarithm of the number of seconds is to be diminished by $\frac{m}{2} \times 0{\cdot}00000042$ nearly; and if n minutes of arc, be the increase of longitude, the correction to that longitude in minutes of arc, is $-mn \times \frac{0'{\cdot}00000021}{\text{modulus of logarithms}}$; or, in seconds of time, it is $-mn \times \frac{0^s{\cdot}00000084}{\text{modulus of logarithms}} = -mn \times 0^s{\cdot}0000019$. This applies to a single arc: for the whole series, the correction is $-0^s{\cdot}0000019 \times \Sigma(mn)$. The values of $\Sigma(mn)$ are: from Greenwich to Liverpool, $+4017$; from Greenwich to Kingstown, $+9795$; from Greenwich to Valentia, $+3429$; and the corresponding corrections are nearly $-0^s{\cdot}01$, $-0^s{\cdot}02$, $-0^s{\cdot}01$.

1846, *July* 4.