Survey of India.

PROFESSIONAL PAPER—No. 15.

THE PENDULUM OPERATIONS IN INDIA AND BURMA.

1908 to 1913

BY

CAPT. H. J. COUCHMAN, R.E.,

DEPUTY SUPERINTENDENT, SURVEY OF INDIA.

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INTRODUCTION.

Though Captain Couchman, who is the author of the greater part of this volume and the compiler of the remainder, has provided a short preface, it is necessary that a few words should be added to give an account of the circumstances of its production.

Captain Couchman had not quite finished his manuscript when he was transferred to the Head Quarters Office of the Survey of India in Calcutta. This was in the spring of 1914. The paper was being printed in Dehra Dūn, but it was still possible to send proofs for him to see before they were finally printed off, and he was able to see all the earlier chapters in type.

In August, however, the war broke out and two months later Captain Couchman, together with more than half the officers of the Survey Department, was recalled to military duty, and left India for England before the end of October.

Thus it has come about that the last two chapters, which contain the discussion of the methods of reduction and of the results, have not been seen by Captain Couchman since he first wrote them.

Those of us who have been left behind have read the proofs carefully and hope that there is nothing of importance in those chapters which their author would have wished to revise, but it is only fair to point out that he had to finish them in haste when preparing for his transfer to Calcutta and while taking up new and onerous duties there, and that he has not seen them since.

All the proofs have been read and corrected by Babu Rasik Chandra Ray of the Computing Office, who did his share of the work with care and discretion.

The observations of six successive seasons are described in this book, namely those from the autumn of 1907 to the spring of 1913.

The first season's observations were made by Mr. J. de Graaff Hunter and myself, those of the next three seasons by Major H. M. Cowie, and those of the last two seasons by Captain Couchman.

The equipment.

The clock that has been in use throughout is the one which was purchased with the rest of the equipment in 1902. It was made by Messrs. Strasser and Rohde of Glasshütte in Saxony and has a half-seconds invar pendulum.

There are signs that it has deteriorated since it was first taken into use. Considering how very carefully it has always been handled this should not have happened. The cause of the irregularities has not been definitely traced, but it is more likely to be connected with adhesion between the contact points than with defects of the wheel-work.

The arrangement for making electric contact is such that the moving contact point, carried by the pendulum, comes up against the other, which is carried by a light lever, just as the pendulum is finishing its upward swing, so that it has at that instant almost no momentum; the contact points are separated again by the return motion of the pendulum very soon after that motion has begun. It is clear, therefore, that any resistance offered either at the time of making or breaking contact would have an important effect.

In 1913 when Cavaliere F. de Filippi started on his great expedition to the Karakorum region, Commander Alessio, his second in command, visited Dehra Dūn before joining the main body in Kashmīr, and swung his pendulums alongside of ours in our pendulum room.

These operations are alluded to on p. 133 of this book, and I mention them in connection with the above remarks on the clock because Commander Alessio was equipped with a break-circuit chronometer of English make and Captain Couchman was much impressed by the accordance between the results he was able to obtain when using this chronometer. Its rate appeared to be much less subject to fluctuations than that of the clock. Enquiries as to the possibility of obtaining such a chronometer were at once instituted and we are now in possession of one which it is hoped will form a valuable addition to the equipment.

Pendulum work in India is much hampered by the difficulty of finding suitable observing rooms. In a tent the variations of temperature are so great as to make the determination of that of the pendulum difficult and uncertain. The remedy for this would be a pendulum of some material with a very small thermal expansion. With this in view the proposal was made to Professor Helmert, shortly after the Indian operations were begun, that invar should be used; he gave an adverse opinion, however, as to the likelihood of any advantage being gained, and expressed a fear that the fact that invar was magnetic would introduce complications and this had the effect of preventing the matter from going further. It was somewhat of a surprise, therefore, to see that invar pendulums had been adopted by the Prussian Geodetic Institute not very long afterwards with excellent results.

I have made several attempts to get a pendulum made of fused quartz and now have two which I have been hoping for some time to bring into use, but there have been delays about the determination of the constants. Of these pendulums, one has a quartz stem and knife edge and a brass bob, the other has a quartz bob and stem and a steel knife edge. These are the second and third pendulums that have been made; the first pendulum was entirely of quartz but the difficulties of construction were great, the result was fragile, and the stem was broken on its way to India.

The idea of making a pendulum of fused quartz arose out of a conversation with the late Sir David Gill who was at the time considering the design of a standard metre of that material. Since then the behaviour of quartz has not been found to be quite so satisfactory as had been hoped, a small increase of length having been detected in the metre kept under observation at the National Physical Laboratory. But this liability to slow molecular change would not be a serious drawback in the case of a pendulum; for the pendulum would be swung at the base-station at least twice a year, and the change in length in 6 months would be small and closely proportional to the time, so that its effect on observations made in the field between two visits to the base could easily be taken into account.

With a set of quartz pendulums and a good break-circuit chronometer, which it would be easy to protect from changes of temperature, the restrictions on the number and positions of pendulum stations in India would be withdrawn, and we should be free to make observations under camp conditions wherever we liked.

Observations at the Edgar Shaft, Kolār Gold Field.

This volume contains in Chapter II the details of the observations made on the Kolār Gold Field by Mr. Hunter and myself, and I am very glad to have this opportunity of putting on record, in a more permanent place than the pages of the Annual Report in which an account of the work was first given, our great appreciation of the assistance that we received both from the Committee of Management of the Gold Field and from many individuals, particularly from Mr. H. M. A. Cooke of the Champion Reef Mine.

One point of some interest may be mentioned here. The mine field suffers very much from the shocks that are commonly called "air-blasts"; this is an old term first used, I believe, in some of the Cornish mines, at a time when the nature of the phenomenon was misunderstood.

These shocks are in effect earthquakes on a small scale caused by the disturbance of the equilibrium of pressure which is brought about by the excavation of the shafts and galleries of the mines. They produce appreciable and sometimes violent oscillations, and when the pendulum observations were about to be undertaken it was feared that if an air-blast happened to take place during the observation of a pendulum its time of vibration would be affected and,—a much greater danger,—that the rate of the clock would suffer if an air-blast took place at any time during the progress of the observations.

The idea occurred to Mr. Hunter that if the oscillations caused by air-blasts were capable of affecting the time of vibration of a swinging pendulum they would be equally capable of starting a vibration in a pendulum at rest. A stand was, therefore, devised and made up in the workshops of the Champion Reef Mine, and on it the auxiliary pendulum, which is used for the flexure observation, was hung; a lamp was so placed that its light reflected from the pendulum mirror fell on a screen some distance away, so that any vibration of the pendulum would be revealed by a movement of the spot of light. The auxiliary pendulum has very nearly the same period as the invariable pendulums and the clock pendulum, so that it was fair to assume that if it was set in motion the time of vibration of any other pendulum that was in motion would be affected. However, throughout the whole time covered by the observations, though some air-blasts took place, not the slightest motion of the spot of light was ever detected, and the conclusion was that, ordinarily at any rate, the oscillations set up are of too short period to affect a pendulum with so long a period as half a second.

This agrees with what I had noticed in 1904 at Colāba where the pendulum room was very near a fort in which heavy artillery was practising. The concussion produced by the firing, though it shook the whole house, did not seem to have any effect on the time of vibration of the pendulums.

The observations at the Kolār Gold Field, at the top and bottom of the Edgar Shaft, were undertaken with a view to obtaining a new value of the mean density of the earth, by repeating, under more favourable conditions, Sir George Airy's celebrated Harton Pit experiment*. One of the most serious difficulties that Sir George Airy met with was that of arriving at a satisfactory value of the average density of the geological formations through which the Harton Pit descends. The Edgar Shaft throughout its length pierces a homogeneous mass of hornblendic schist the density of which could be measured with considerable certainty. A difficulty in the application of Sir George Airy's method, which had not at first been thought of, was that the bottom of the Edgar Shaft, though the shaft is 2700 feet deep, is still some 300 feet above the level of the sea. So that the idea that the bottom of the shaft could be considered to be a point on the inner surface of a spheroidal shell enveloping the earth was untenable.

The results of the observations are given in Chapter II. They have not so far been put to any special use. The principal reason why no discussion of them has taken place is that not long after the observations had been reduced Mr. Hayford produced the results of his

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* *Phil. Trans. CXLVI.* 342.

investigation of the isostatic hypothesis, which turned our thoughts into new channels, and at the same time greatly complicated the process by which the normal value of gravity at any place is computed. At present the Kolār result, as well as many others, must be regarded in the same way as a botanist regards the specimens that he collects in a new region, namely, as the material from which ultimately a system may be evolved.

On the theory of Isostasy.

Perhaps the most interesting part of Captain Couchman's paper is the last chapter in which he applies Mr. Hayford's hypothesis of isostatic compensation to the Indian results.

The hypothesis is thus defined by its author "Let the depth within which the isostatic compensation is complete be called the depth of compensation ....the condition above the depth of compensation may be expressed as follows:—The mass is any prismatic column which has for its base a unit area of the horizontal surface which lies at the depth of compensation, for its edges vertical lines (lines of gravity) and for its upper surface the actual irregular surface of the earth (or the sea surface if the area in question is beneath the ocean) is the same as the mass in any other similar prismatic column having any other unit area of the same surface for its base."*

When Mr. Hayford made his monumental calculations of the effects of topography and isostatic compensation on the direction and the intensity of gravity, his first object was to find out by a discussion of the American observations whether the theory was borne out and could be said to be an approximation to the real state of density-distribution in the earth's crust. The smallness of the outstanding differences between the results of observation and those of calculation showed that the hypothesis was on the whole sound, and that complete compensation of mountain protuberances and ocean hollows may be looked upon as the normal condition, every departure from which is to be regarded as an anomaly.

The reduction of pendulum observations has thus reached a second stage. Originally, as was natural, when endeavouring to arrive by calculation at the value of gravity at any given station, the attractive force of the terrestrial masses lying between sea-level and the station was computed on the assumption that these masses constituted local excesses of matter, that they were in fact standing on and supported by an unyielding globe.

The calculations of the Ven. J. H. Pratt, Archdeacon of Calcutta, in connection with the latitude observations at the northern end of Everest's Great Arc of Meridian, were the first to show that mountain masses do not in fact exert an attractive force proportional to their bulk; that there is some counteracting or compensatory influence at work. This idea of compensation has gradually developed, and we have now advanced from the conception of a globe with heights and hollows on its surface, to that of an internal core, within which and on the surface of which there is a condition of hydrostatic equilibrium; and of an outer shell or crust of varying thickness, in which the matter is so arranged that where the shell is thin it is proportionately dense and where thick deficient in density, with the result that all prisms of the same cross section, extending from the surface of the land or sea to the surface of the inner core, contain equal quantities of matter This condition is known as one of Isostatic Equilibrium, and the theory demands that whenever this equilibrium is disturbed, as by the denudation of mountains and the deposit of eroded matter, it tends to be restored by a subterranean flow, or "undertow", by which the excess of matter over areas of deposition is relieved and the defect in areas of erosion is made good†.

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* "*The figure of the earth and Isostasy from measurements in the United States*" by John F. Hayford, p. 67.

† For a description of this action *vide* an address by Mr. Hayford to the American Association for the Advancement of Science, given on 29th Dec. 1910, which may be found in "*Science*". N.S. Vol. XXXIII No. 841, 10th Feb. 1911, pp. 199-208.

When an endeavour is made to calculate what the intensity of gravity at any place should be it is now assumed that there is isostatic equilibrium.

If observation shows that there is a departure from equilibrium it is evidence that a disturbing force is at work, with which the forces which make for the restoration of the isostatic state are unable to keep pace. An anomaly, *i.e.* a difference between the observed value of gravity commonly denoted by g and the computed value, called γ_C, is therefore a sign of a non-quiescent condition; and where such anomalies occur it will be natural to see whether any cause of disturbance is visible, such for instance as excessive erosion or deposit; or whether there is any other sign of unusual forces being at work, such as a change in the height above sea-level, either in the form of subsidence or of mountain-building.

If $g-\gamma_C$ be positive it would indicate an excess of matter over that which was allowed for in making the calculation of γ_C, and if negative a defect. Thus in a region subject to rapid erosion one would expect $g-\gamma_C$ to be negative, matter being carried off more rapidly than the restorative forces can replace it.

The outer slopes of the Himālaya are probably subject to more violent erosion than any other place in the world, so that it would be reasonable to expect to find that the subaerial processes were ahead of the subterranean ones, and that the lightening of the mountain masses had not been made good by the undertow from the areas of deposition.

We should thus have in the crust underlying a Himālayan station a degree of isostatic compensation corresponding to a greater superficial mass than actually exists, then g, the observed value of gravity, would be less than γ_C, the value obtained by computation on the assumption of perfect isostatic compensation; that is to say $g-\gamma_C$ would be negative.

Since the undertow which restores the equilibrium is set in motion by the overloading of areas of deposition and the lightening of those of erosion, it is not conceivable that it should ever be in advance of the erosion, and therefore the theory of isostasy is not competent to explain a positive value of $g-\gamma_C$, except in areas of deposition.

A positive value means that the compensation underlying a mountain mass is incomplete; that it is appropriate to a smaller mass than that actually in existence. This points to the mass having been piled up at a greater rate than the forces tending to restore equilibrium could keep pace with, and leads to the conclusion that in areas of erosion if $g-\gamma_C$ is positive a mountain building force must be at work.

In areas of deposition the argument is similar. If isostatic equilibrium is perfect g will be found equal to the computed value γ_C.

If originally, when there was isostatic equilibrium, the height of the area was h feet and if the deposit of the products of erosion has raised it by dh feet, then since $h+dh$ is the actual visible height we necessarily use that quantity in computing the compensation, hence, unless the disturbance of equilibrium has been redressed by a subterranean flow induced by the increase of pressure, we shall always apply too large a negative correction to γ when computing γ_C and thus, γ_C being rendered too small, $g-\gamma_C$ will be positive. As already stated it is not conceivable that the increase of pressure due to deposits should produce a compensation corresponding to a larger mass than that which has actually been deposited.

If, therefore, observations at stations in areas of deposit lead to negative values of $g-\gamma_C$ the theory of isostasy is powerless to explain them. It would appear that something must have occurred which allowed the loose alluvial deposits to sink downwards and to occupy the space which had been filled by denser rocks when isostatic equilibrium existed.

It may be contended that there never had been a state of equilibrium; but we are now working on the hypothesis so well established in North America by Mr. Hayford, that unless there is some disturbing force at work a state of isostatic equilibrium must establish itself in the course of time. When we find a state of things which is not a stage on the way to the establishment of equilibrium we are necessarily led to seek for a disturbing cause.

Before, however, going further in this direction it is necessary to make sure that the anomalies cannot be made to disappear by some permissible modification of the Hayford hypothesis.

Captain Couchman examines the effect of supposing that the degree of subterranean compensation may not be in direct proportion to the individual masses standing above sea-level, but may correspond to the average topography of a wide area.

This touches on one of the difficulties of the theory of isostasy. It is scarcely credible that each minor feature of the earth's surface is balanced by a corresponding excess or deficiency in the density of the crust immediately below it, and on the other hand if the balance only holds good when a very large area is taken as the unit to be considered, then the hypothesis becomes vague and confused.

Moreover, it is obvious that the forms of such areas would not be geometrical, as has to be assumed in order to make the computation, but would correspond to some natural, perhaps geological, lines of separation.

Captain Couchman has made reasonable assumptions and approximations and has deduced the effects of several different arrangements. But even when modifications of this kind are made expressly in order to remove the anomalies, *i. e.* the differences between g and γ_C, only partial success is obtained. It is specially to be noted that the differences between g and γ cannot be removed by an alteration of the constants in the formula for γ, because differences of opposite sign are found at places only a few miles apart. If we increase γ so as to get rid of positive values of $g-\gamma_C$ at hill stations we increase the negative values of $g-\gamma_C$ at stations at the foot of the hills by the same amount. That is to say if we try to make out that under the hills there is isostatic equilibrium we are confronted by great deviations from equilibrium under the plains at their foot, or *vice versâ*, so that we are forced to the conclusion that we are not merely dealing with an isostatic equilibrium constantly disturbed by the effects of wind and weather and constantly readjusting itself, but that there are other forces at work which are, in certain regions, continually lifting the mountains higher and higher and allowing the material washed down from their sides to sink deeper and deeper.

So far as I am aware, the theory put forward by Sir Sidney Burrard in Professional Paper No. 12 of the Survey of India, "*On the Origin of the Himalaya Mountains*", is the only one that suggests a common cause for these two effects.

More gravity observations over the plains of the Punjab are much needed in order to see whether the deficiency noticed at the foot of the hills from Siliguri to Pathānkot extends over the whole of the alluvial plains or follows the line of the hills and bends round to the west into the Indus Valley and then follows the line of the Suleiman Mountains.

The whole of the region lying north of the line from Pathānkot to Dera Ghāzi Khān, along which a few observations have already been made, requires to be carefully probed by means of pendulum observations at stations not too far apart.

This programme would already have been carried out if the war had not brought all such work to an end.

Dehra Dūn:
December, 1915.

G. P. Lenox Conyngham.

PREFACE.

This paper consists of two main divisions, *viz*:—

(*a*) Chapters I—VII, containing full details of the observations made between January, 1908 and April, 1913.

(*b*) Chapters VIII and IX, giving an account of the Hayford or compensation method of correcting for mass, with a preliminary examination into the effect of this method on our gravity results in India.

Circumstances have prevented the completion of this examination and the compensation corrections at 35 stations have yet to be computed. As, however, it is unlikely that these corrections will be computed in the immediate future, it was considered advisable not to delay the publication of the paper; the more so, as it marks a change in our methods of computing γ_0 and $g-\gamma_B$. Although the paper bears my name, only a portion of the labour entailed in it is mine. In Chapters I—VII the names of the observers of each season are given and the short discussion of results in each of these chapters is as a rule based on the reports issued on each season's work. In chapter VIII the computation of the reduction tables for zones A to P was initiated by Major Cowie, carried on by Major Tandy and only completed by me. For those for the outer zones we are indebted to Mr. J. F. Hayford, late of the United States Coast and Geodetic Survey and his staff.

For the computation of the actual compensation corrections, also, I am by no means entirely responsible. The effects up to 100 miles were computed for 49 stations by Major Cowie, and an enormous amount of labour has been saved by the preparation by Major Tandy of the three charts from which the effects of the most distant zones can be interpolated.

To Lieut.-Col. Lenox Conyngham I am indebted for suggestions and advice and the interest shown by Colonel Burrard has been of real value.

In the actual preparation of the paper I have had much assistance from the computers of the Pendulum Party in abstracting and checking the many tables.

The list of those to whom acknowledgments are due would be incomplete with the omission of the many officers of the Civil Service, the Military Works Service, the Public Works and other departments who have assisted the observers in obtaining observation rooms at the field stations and, speaking for myself and my predecessors, I take this opportunity of thanking them.

Dehra Dūn:
April, 1914.

H. J. COUCHMAN.

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CHAPTER I.

Introductory.

This paper is a continuation of Professional Paper No. 10 "The Pendulum Operations in India, 1903 to 1907" and contains an account of the observations from January, 1908 to April, 1913. During this period there have been three observers, namely:—

Major G. P. Lenox Conyngham, R. E., up to April, 1908
Captain H. M. Cowie, R. E., up to May, 1911
Captain H. J. Couchman, R. E., up to April, 1914.

The apparatus and method of observation have remained the same throughout the period and are fully described in Professional Paper No. 10. For the last 7 or 8 years, however, the pendulum stand has been fixed to a hollow iron pedestal, the brick pillar being dispensed with. At the beginning and end of each field season the pendulums have been swung at the base station Dehra Dūn, the value of gravity at each field station being deduced from the difference of the time of vibration at the field station from the mean time of vibration for the season at Dehra Dūn. The exact formula is $s^2 g = s^2_0 g_0$

where	s_0 =	time of vibration at Dehra Dūn
	s =	,, ,, at field station
	g_0 =	acceleration of gravity at Dehra Dūn
	g =	,, ,, at field station.

For small variations of s, the formula may be more conveniently expressed thus:—

$$g = g_0 - 2g_0 \times \frac{s - s_0}{s_0}$$

The value of g at Dehra Dūn has been taken throughout the whole period of observations as 979·063 dynes.

This value depends ultimately on the value of g at Potsdam, 981·274 and was derived directly from the value of g at Kew, 981·200, the difference, Potsdam—Kew, having been previously determined.

The connection between Kew and Dehra Dūn should be strengthened when an opportunity occurs, but meanwhile we have other evidence that our value is not likely to be much in error. In 1905 Dr. Hecker swung his pendulums alongside ours at Jalpaiguri; his value of g differed from ours by only 0·002 dynes. In 1906 Commander Alessio made observations at Colāba in the same room as that occupied by Major Lenox Conyngham in 1904; his value of g was 0·004 dynes less than ours.

Value found for g at Jalpaiguri:	by Doctor Hecker 978·924:	by Major Lenox Conyngham 978·922
Value found for g at Colaba:	by Commander Alessio 978·627:	by Major Lenox Conyngham 978·631.

The values of s_0 at Dehra Dūn are shewn for each season in the subsequent chapters. They have varied in a curious way and no explanation can be given of the changes. Figure 1 shows the variations in the times of vibration of the individual pendulums and the actual values of the mean time of vibration at Dehra Dūn.

The curves of the four pendulums have some points of similarity. Thus from May, 1908 to November, 1909, all show a fall, and thence to November, 1911 all show a rise. At first sight therefore, one might suspect that gravity had varied, but it must be remembered that the pendulums are all of exactly similar construction and material and were probably made at the same time; consequently, it is likely that any molecular changes would be the same in all.

Furthermore, any error in the thermometers etc. would have a similar effect on all the pendulums so that apart from accidents, such as seems to have happened to No. 137 in November, 1906, we should expect the curves to be similar.

The apparent increase in length in all the pendulums since November, 1909 may be due to the wearing of the agate edges and, if this is so, the increase will probably continue.

A new pendulum of which the bob is of brass and the stem of fused quartz has lately been received and, as soon as its constants have been determined, will be brought into use; it will be interesting to observe whether its variations agree at all with those of the other pendulums

Having found g, the observed value of gravity at the field station, we then compare it with the normal value. To do this it is necessary to apply corrections for the height of the station and for surface masses. The practice in all our previous reports, and which is in accordance with that of the International Geodetic Association, has been to apply these corrections to the observed value, g, and thus obtain a value of gravity at sea-level, usually called g_0'', which can be compared with the normal value γ_0 based on the latitude formula. This practice seems theoretically unsound, as we are applying theoretical corrections to an observed value, and our g_0'' is thus a somewhat hybrid quantity. It seems preferable to apply our theoretical corrections for height and mass to the theoretical value, γ_0, of gravity at sea-level and thus obtain a theoretical value at the station which can be directly compared with the observed value. Obviously the value of $g - \gamma$ (with the appropriate suffixes) is the same whatever procedure is adopted, but the latter is used in this paper and will be continued.

The question of the appropriate suffixes to be employed now arises. The normal value of gravity at sea-level based on the latitude formula, and the observed value at the station have always been called γ_0 and g, and these will not be altered. The other generally accepted suffixes are g_0 for observed gravity corrected for height and g_0'' for observed gravity corrected for height and mass. As, however, we shall in future apply our corrections to γ_0 instead of g, these last will not be required. Moreover, there are at least three methods of allowing for the effect of surface masses on gravity, namely the Bouguer, the Free Air and the Hayford (or Isostatic Compensation) hypotheses. If suffixes are considered necessary then alphabetical ones are irresistibly suggested, viz:—

γ_A for the Free Air
γ_B for the Bouguer
γ_C for the Compensation hypothesis.

It may be urged that these letter suffixes will have no direct meaning in any other language but our own, but the order of them is a natural one and in this way. The Free Air method assumes that masses have no effect on gravity, the height alone being allowed for. The Bouguer method allows for height and surface masses, and the Compensation method for height, surface masses and their compensation.

In this paper, therefore, the above suffixes will be used.

In the abstracts of each season's work in Chapters II - VII, only the Bouguer residuals are shown, the discussion of the Hayford (or Compensation) method being given in Chapters VIII and IX.

In connection with the Bouguer correction we have another change of procedure to record. The formula for this is $\frac{2gh}{R} \times \frac{3\delta}{4\Delta}$

where
h = height of station
R = radius of earth = 20,900,000 feet
δ = mean surface density of earth
Δ = mean density of earth as a whole.

In our previous publications we have assumed $\delta = 2\cdot8$ and $\Delta = 5\cdot6$ *i.e.* $\frac{\delta}{\Delta} = \frac{1}{2}$ when the formula becomes $+\frac{3gh}{4R}$. Better values of δ and Δ are however 2·67 and 5·576 and using these, as we have done in this paper, the value of $\frac{\delta}{\Delta}$ becomes $\frac{1}{2\cdot09}$ and the formula is therefore $+\frac{3gh}{R \times 4\cdot18}$. This change alters the old values of the Bouguer corrections given in Professional Paper No. 10 by about $\frac{1}{23}$rd part, and explains why the values given in this paper differ from those in our Reports published since 1907.

A similar change has been made in the orographical correction which takes account of the departure of the actual surface of the ground from a plane of the same height as the station. The change is, however, small at all the stations dealt with in Professional Paper No. 10.

The correction for height has not been altered, and is $-\frac{2gh}{R}$.

It will, however, be noticed that at some stations the value of the height correction differs from that previously published. This is due to the fact that in some cases the radius of the earth, R, has been taken as 21,000,000 feet, whereas the value now used is 20,900,000 feet. The change in the correction is small.

The formula used in this paper for computing the normal value of gravity at sea-level is that deduced by Professor Helmert in 1911, viz:—

$$\gamma_0 = 978\cdot030\ (1 + 0\cdot005302\ \sin^2\phi - 0\cdot000007\ \sin^2 2\ \phi)$$

where ϕ is the latitude of the station.

Previous to the publication of this paper we have used Helmert's old formula which was

$$\gamma_0 = 978\cdot0\ (1 + 0\cdot005310\ \sin^2\phi)$$

and it is, therefore, to be noted that the new values of γ_0 will all be greater than the old ones and by amounts varying in India from ·029 to ·021.

A list of all the gravity stations dealt with in Professional Paper No. 10 is given below with the new values of γ_0 and of the Bouguer and orographical corrections:—

Station	Latitude	Longitude	Height	γ_0	Corrections: for height	Corrections: for mass (Bouguer)	Corrections: orographical	γ_B	g	$g-\gamma_B$
	° ′ ″	° ′ ″	*feet*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*
Dehra Dūn ...	30 19 29	78 3 15	2239	979·347	−0·210	+0·075	−0·004	979·208	979·063	−0·145
Madras ...	13 4 8	80 14 54	20	978·294	−0·002	+0·001	0	978·293	978·279	−0·014
Colāba ...	18 53 45	72 48 47	34	978·571	−0·003	+0·001	0	978·569	978·631	+0·062
Mussooree (Dunseverick) ...	30 27 28	78 3 33	7129	979·357	−0·668	+0·240	−0·025	978·904	978·776	−0·128
Mussooree (Camel's Back) ...	30 27 35	78 4 32	6924	979·357	−0·649	+0·233	−0·025	978·916	978·793	−0·123
Cuttack ...	20 29 5	85 52 1	92	978·662	−0·009	+0·003	0	978·656	978·659	+0·003
Chātra ...	24 12 40	88 23 27	64	978·898	−0·006	+0·002	0	978·894	978·878	−0·016
Kisnapur ...	25 2 26	88 28 29	113	978·955	−0·011	+0·004	0	978·948	978·956	+0·008
Rāmchāndpur ...	25 40 57	88 32 58	132	979·000	−0·013	+0·004	0	978·992	978·968	−0·024
Kesarbāri ...	26 7 41	88 31 26	204	979·031	−0·019	+0·007	0	979·019	978·952	−0·067
Jalpaiguri ...	26 31 16	88 44 13	268	979·060	−0·025	+0·009	−0·001	979·043	978·922	−0·121
Siliguri ...	26 41 47	88 24 50	387	979·072	−0·036	+0·013	−0·002	979·047	978·887	−0·160
Kurseong ...	26 52 51	88 16 45	4913	979·086	−0·460	+0·165	−0·018	978·773	978·626	−0·147
Darjeeling ...	27 2 47	88 16 8	6966	979·098	−0·652	+0·234	−0·025	978·655	978·501	−0·154
Sandakphu ...	27 6 6	88 0 15	11766	979·102	−1·101	+0·395	−0·051	978·345	978·190	−0·155
Simla ...	31 6 19	77 9 50	7043	979·409	−0·660	+0·237	−0·016	978·970	978·840	−0·130
Kālka ...	30 50 8	76 56 22	2202	979·387	−0·206	+0·074	−0·004	979·251	979·147	−0·104
Ludhiāna ...	30 55 25	75 51 9	835	979·394	−0·078	+0·028	0	979·344	979·274	−0·070
Miān Mīr ...	31 31 37	74 22 32	708	979·442	−0·066	+0·024	0	979·400	979·383	−0·017
Ferozepur ...	30 55 48	74 37 4	647	979·395	−0·061	+0·022	0	979·356	979·341	−0·015
Pathānkot ...	32 16 33	75 39 3	1088	979·503	−0·101	+0·037	−0·002	979·436	979·237	−0·199
Montgomery ...	30 39 47	73 6 18	557	979·373	−0·052	+0·019	0	979·340	979·321	−0·019
Dera Ghāzi Khān ...	30 3 49	70 45 38	397	979·326	−0·037	+0·013	0	979·302	979·192	−0·110
Multān ...	30 11 11	71 25 51	404	979·336	−0·038	+0·014	0	979·312	979·243	−0·069
Jacobābād ...	28 16 34	68 27 5	183	979·189	−0·017	+0·006	0	979·178	979·186	+0·008
Sibi ...	29 32 46	67 52 31	434	979·286	−0·040	+0·015	−0·002	979·258	979·119	−0·139
Mach ...	29 52 25	67 18 20	3522	979·311	−0·330	+0·118	−0·006	979·093	978·960	−0·133
Quetta ...	30 12 15	67 0 41	5520	979·337	−0·517	+0·186	−0·002	979·004	978·851	−0·153
Gesupur ...	28 33 2	77 42 3	691	979·210	−0·065	+0·023	0	979·168	979·125	−0·043
Meerut ...	29 0 26	77 41 40	734	979·244	−0·069	+0·025	0	979·200	979·151	−0·049
Kaliāna ...	29 30 55	77 39 6	810	979·284	−0·076	+0·027	0	979·235	979·154	−0·081
Nojli ...	29 53 28	77 40 25	879	979·313	−0·082	+0·030	−0·001	979·260	979·143	−0·117
Roorkee ...	29 52 20	77 53 59	867	979·311	−0·081	+0·029	−0·001	979·258	979·129	−0·129
Hardwār ...	29 56 29	78 9 19	949	979·317	−0·089	+0·032	−0·002	979·258	979·122	−0·136
Mohan ...	30 10 53	77 54 37	1660	979·335	−0·156	+0·056	−0·003	979·232	979·109	−0·123
Asarori ...	30 14 25	77 58 3	2467	979·340	−0·231	+0·083	−0·002	979·190	979·059	−0·131
Fatehpur ...	30 25 53	77 43 37	1434	979·355	−0·134	+0·048	−0·003	979·266	979·147	−0·119
Kālsi ...	30 31 8	77 50 26	1684	979·362	−0·158	+0·057	−0·010	979·251	979·131	−0·120
Rājpur ...	30 24 12	78 5 47	3321	979·353	−0·311	+0·112	−0·009	979·145	979·002	−0·143

CHAPTER II.

The Pendulum Operations in 1907-08.

The object of the observations made in the season 1907-08 was to ascertain whether, in montane and sub-montane regions in the southern portion of the Indian peninsula, the force of gravity varied from normal in like manner and degree as in northern India.

The two areas differ in many important particulars. Geologically, south India is far older than north, and the mountains are more probably the remains of extensive plateaux than the result of folding or upheaval of the crust. Physically, the pendulum stations occupied this season, though actually of about the same height as the Himalayan ones in northern India, are situated on the summits of the mountain masses, while the latter are but points on the outer slopes.

An entirely novel class of station was that at the bottom of the Edgar Shaft in the Kolār gold field. The other stations may be divided into three classes, namely :—

1.	Hilltop ...	Ootacamund.
		Kodaikānal
		Yercaud
2.	Sub-montane ...	Salem
3.	Plateau ...	Bangalore
		Mysore
		Edgar Shaft (*Surface station*).

The observations were made by Major G. P. Lenox Conyngham, R.E., assisted at all but two of the stations by Mr. J. de G. Hunter, M.A.

The descriptions of the stations are given below :—

Bangalore.

Latitude	...	13° 0′ 41″
Longitude	...	77° 35′ 1″
Height	...	3118 feet.

The pendulum station was in the building which contains the S.W. end of the Bangalore Base-line, and is therefore identical with the station at which Captain Basevi made pendulum observations in September-October, 1868. This station is thus described in G.T.S. Vol. V :—"The station is on rising ground about 2½ miles north from the new public offices of the Mysore Government, and a short distance west of the road to Nundydroog and Hyderābād". There is a note in G.T.S. Synoptical Volume XXIX to the effect that the station was reported in 1893 to have been completely destroyed, and the building which is now standing (1908) is not of cut stone. It has presumably been rebuilt since 1893 but the position may be considered identical for the purposes of the pendulum observations.

Mysore.

Latitude	...	12° 18′ 52″
Longitude	...	76° 40′ 20″
Height	...	2501 feet.

The pendulum station was situated in the large eastern room of the row of out-offices to the south of the building known as the Military Staff Quarters or the upper Residency, which stands on high ground about three quarters of a mile east of the Residency. A line of levels run from the rail level at the station showed that the floor of the room was 7·9 feet higher. The height of the rail level was given by the Railway Engineers as 2492·0 feet, hence the height of the floor is 2499·9 feet. An independent determination made by the Executive Engineer gave 2501·9 feet. The mean has been adopted.

Edgar Shaft. (*Underground station*).

Latitude	...	12° 55′ 46″
Longitude	...	78° 15′ 41″
Height	...	328 feet.

The underground pendulum station was at the bottom of the Edgar Shaft of the Mysore gold mine. This shaft is 2628 feet deep from the doors at the top. It is circular in section, 18 feet in diameter and brick lined. Three small platforms of bricks in cement were built to receive the pendulum stand, flash box and thermometer-reading telescope respectively and each had a heavy iron plate, bedded in cement, on its upper surface. The pendulum pedestal was cemented to one of these plates.

The bricking stage was suspended about 9 feet above the bottom, so as to form a sort of ceiling, and sheets of corrugated iron were attached to this in several places so as to protect the various instruments from dripping water. The amount of water which found its way into the shaft was sufficient to cover the floor to a depth of about 3 inches in 24 hours. The height of the doors above mean sea-level, as determined by levelling from one of the mine bench-marks, is 2955·7 feet. The height of this bench-mark depends on that of a railway bench-mark near Ooregum station.

Edgar Shaft. (*Surface station*).

Latitude	...	12° 55′ 47″
Longitude	...	78° 18′ 8″
Height	...	2945 feet.

The surface pendulum station was in a store godown situated about 100 feet north of the shaft. The room was large and had a tiled roof of fair quality. It had 5 windows closed by wooden shutters, and one door. From one of the windows on the north side the shutters were removed and glass was put in instead, the other windows were covered with mats on the

CORRECTION

Professional Paper No. 15.—The Pendulum Operations in India and Burma, 1908-1913.

Page 6, Longitude of Edgar Shaft (surface station).

For 78° 18′ 8″ *read* 78° 15′ 41″.

Dated 30-1-17.

outside as a protection against the sun's radiation. A thick curtain was put up outside the door. A special platform of brick on edge in cement was prepared for the pendulum pedestal.

Salem.

Latitude	...	11° 40′ 5″
Longitude	...	78° 9′ 10″
Height	...	948 feet.

The pendulum station was situated in a bungalow which stands about 300 yards south of the Salem Municipal Dāk Bungalow on the western side of the main road which runs north and south. A line of levels was run from the G.T.S. bench-mark on the platform of Salem (Suramangalam) railway station to the pendulum room by the Executive Engineer, P.W.D., and showed that the floor of the room is 24·7 feet higher than the bench-mark. The height of the latter above mean-sea-level is 922·8 feet.

Yercaud.

Latitude	...	11° 46′ 56″
Longitude	...	78° 12′ 29″
Height	...	4493 feet.

The pendulum station was situated in the S.W. room of the P.W.D. rest-house near the S.W. end of the lake. A line of levels was run from a point marked Δ 4448 on the map and it showed that the floor of the pendulum room was 44·5 feet higher than that point. The point in question is not well defined and there may be an error of 2 or 3 feet in this result, irrespective of any inaccuracy in the height given on the map.

Ootacamund.

Latitude	...	11° 24′ 37″
Longitude	...	76° 42′ 3″
Height	...	7395 feet.

The pendulum station was in a small room on the north side of the building which was formerly the Europeans' jail and which is now the office of the Epigraphical Department. This building is on a knoll which lies to the S.S.W. of St. Stephen's Church and N.E. of the embankment on which the railway crosses the lake. The distance of the building from the church is about 725 yards, and from the nearest point of the margin of the lake about 620 yards. There is a railway bench-mark, height 7220·5 feet on the road, near the point where the railway, at present in course of construction, will cross it. A line of levels run from this bench-mark made the height of the floor of the pendulum room 7392 feet. There was a station of the triangulation near St. Thomas' Church and its height as shown on the map was 7271 feet. The station could not be found but as the ground near the church is flat, the line of levels was continued to the flat ground: assuming the height of the latter to be 7271 feet, that of the floor of the pendulum room was found to be 7398 feet. The mean of these two values has been adopted.

Kodaikanal.

Latitude	...	10° 13′ 50″
Longitude	...	77° 27′ 56″
Height	...	7665 feet.

The pendulum station was situated in the store room which stands about 40 yards north of the transit house of the Solar Physics Observatory. The height of the cistern of the barometer of the Observatory was given by the Director and the difference in height between the cistern and the floor of pendulum room was determined by levelling. A small concrete pillar was built for the pendulum stand. The time observations were made by Mr. Hanuman Prasad with the transit instrument belonging to the Observatory, one of the transits of the original longitude equipment of the Survey of India.

On the whole satisfactory rooms were available for the observations and it was possible to ensure a fairly steady temperature. No corrections for lag have been applied in deducing the times of vibration.

The results of the determinations of the flexure correction are given in Table I.

Table I.—Flexure Correction.

Station	Date	Observed Correction 10^{-7} secs.	Adopted Correction 10^{-7} secs.	Station	Date	Observed Correction 10^{-7} secs.	Adopted Correction 10^{-7} secs.
Dehra Dūn	1908 January 1st	−57·0	Jan. 1st to 4th	Salem ...	1908 March 1st	−57·1	
		56·5	−56			55·6	
	,, 4th	53·9			,, 3rd	56·4	
		55·3				56·4	−56
	,, 13th	53·6	Jan. 4th to 13th				
		53·8	−54				
Bangalore...	February 2nd	−51·7		Yercaud ...	March 6th	−55·4	
		52·2				55·7	
	,, 5th	56·1			,, 9th	54·0	
		55·4	−54			55·5	−55
Mysore ...	February 6th	−58·0		Ootacamund	March 15th	−60·3	
		57·5				58·7	
	,, 9th	56·4			,, 18th	57·5	
		55·5	−57			57·9	−59
Edgar Shaft (*Under-ground*)	February 17th	−54·2		Kodaikānal	March 22nd	−89·9	
		55·9				90·4	
	,, 20th	50·9			,, 25th	82·7	
		50·9	−53			80·8	−86
Edgar Shaft (*Surface*)	February 21st	−49·4		Dehra Dūn	April 17th	−45·5	
		49·4				44·5	
	,, 24th	47·2			,, 23rd	44·9	
		48·5				43·4	−45
	,, 26th	48·2	−49				

At Kodaikānal the marble slab carrying the pendulum support was cemented to an isolated concrete pillar built specially for the purpose; the large correction is therefore probably due to the nature of this pillar.

During this season the new bent transit instrument, made by Messrs. Troughton and Simms, was taken into use for the first time. It gave thoroughly satisfactory results, the mean p. e. of the clock rate being $\pm 0 \cdot 014$ secs.

The details of the observations are given in Table II.

Table II.—Details of the Observations.

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Dehra Dun.															
		h m	s	s	′	°	°		s						s
1st. Jan. 1908 Night	137	4 24	34·463	− 4·58	20	14·33	+ 0·10	0·879	0·5073610	+ 269	− 11	− 702	− 522	− 56	0·5072588
	139	5 25	34·915	4·58	20	14·41	0·10	0·879	0·5072643	269	11	706	533	56	0·5071606
	138	6 26	33·380	4·58	21	14·53	0·10	0·878	0·5076033	269	12	712	502	56	0·5075020
	140	7 24	35·263	4·58	20	14·58	0·10	0·878	0·5071913	269	11	714	532	56	0·5070869
													Mean	...	0·5072521
2nd Jan. Day	137	16 26	34·483	− 4·58	20	13·93	+ 0·10	0·882	0·5073566	+ 269	− 11	− 683	− 524	− 56	0·5072561
	139	17 25	34·934	4·58	21	13·99	0·10	0·881	0·5072605	269	12	686	534	56	0·5071586
	138	18 29	33·395	4·58	20	14·13	0·10	0·880	0·5076000	269	11	692	503	56	0·5075007
	140	19 27	35·279	4·58	20	14·21	0·10	0·880	0·5071882	269	11	696	533	56	0·5070855
													Mean	...	0·5072502
												Mean of Day and Night ...			**0·5072512**
2nd Jan. Night	140	4 24	35·254	− 4·20	22	14·57	+ 0·08	0·879	0·5071935	+ 247	− 13	− 714	− 533	− 56	0·5070866
	138	5 22	33·371	4·20	20	14·65	0·08	0·879	0·5076056	247	11	718	503	56	0·5075015
	139	6 22	34·899	4·20	19	14·74	0·08	0·879	0·5072678	247	10	722	533	56	0·5071604
	137	7 21	34·448	4·20	18	14·80	0·08	0·878	0·5073643	247	9	725	522	56	0·5072578
													Mean	...	0·5072516
3rd Jan. Day	140	16 25	35·264	− 4·20	20	14·38	+ 0·08	0·881	0·5071913	+ 247	− 11	− 705	− 534	− 56	0·5070854
	138	17 24	33·381	4·20	20	14·49	0·08	0·880	0·5076031	247	11	710	503	56	0·5074998
	139	18 23	34·911	4·20	20	14·55	0·08	0·879	0·5072651	247	11	713	533	56	0·5071585
	137	19 23	34·464	4·20	18	14·63	0·08	0·879	0·5073607	247	9	717	522	56	0·5072550
													Mean	...	0·5072497
												Mean of Day and Night ...			**0·5072506**
4th Jan. Night	137	4 39	34·405	− 3·80	19	17·12	+ 0·06	0·873	0·5073736	+ 223	− 10	− 839	− 519	− 54	0·5072537
	139	5 37	34·832	3·80	20	17·22	0·06	0·871	0·5072820	223	11	844	528	54	0·5071606
	138	6 34	33·305	3·80	21	17·27	0·06	0·873	0·5076209	223	12	846	499	54	0·5075021
	140	7 33	35·178	3·80	19	17·29	0·06	0·874	0·5072093	223	10	847	530	54	0·5070875
													Mean	...	0·5072510
5th Jan. Day	137	16 43	34·387	− 3·80	19	17·16	+ 0·07	0·874	0·5073775	+ 223	− 10	− 841	− 519	− 54	0·5072574
	139	17 42	34·836	3·80	17	17·28	0·07	0·874	0·5072811	223	8	847	530	54	0·5071595
	138	18 40	33·306	3·80	21	17·33	0·07	0·874	0·5076206	223	12	849	500	54	0·5075014
	140	19 41	35·179	3·80	24	17·39	0·07	0·873	0·5072090	223	15	852	529	54	0·5070863
													Mean	...	0·5072512
												Mean of Day and Night ...			**0·5072511**
7th-8th Jan.	137	5 2	34·405	− 4·33	19	17·01	+ 0·06	0·875	0·5073733	+ 254	− 10	− 833	− 520	− 54	0·5072570
	138	7 1	33·322	4·33	20	17·13	0·06	0·874	0·5076168	254	11	839	500	54	0·5075018
	139	17 1	34·857	4·33	19	17·07	0·06	0·874	0·5072767	254	10	836	530	54	0·5071591
	140	19 0	35·193	4·33	19	17·18	0·06	0·873	0·5071844	254	10	842	529	54	0·5070879
													Mean	...	0·5072515
8th-9th Jan.	140	5 22	35·194	− 4·33	19	17·23	+ 0·05	0·873	0·5072059	+ 254	− 10	− 844	− 529	− 54	0·5070876
	138	6 26	33·323	4·33	20	17·29	0·05	0·873	0·5076167	254	11	847	499	54	0·5075010
	139	17 37	34·852	4·33	20	17·06	0·04	0·873	0·5072776	254	11	836	529	54	0·5071600
	137	18 41	34·403	4·33	18	17·10	0·04	0·873	0·5073741	254	9	838	519	54	0·5072575
													Mean	...	0·5072515

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Dehra Dun—(contd.)						
		h m	s	s	′	°	°		s						s
9th-	137	5 7	34·406	− 4·33	18	16·96	+0·15	0·870	0·5073734	+ 254	− 9	−831	−517	−54	0·5072577
10th	139	6 11	34·857	4·33	18	17·13	0·15	0·869	0·5072766	254	9	839	527	54	0·5071591
Jan.	138	17 19	33·345	4·33	20	16·74	0·08	0·871	0·5076115	254	11	820	498	54	0·5074986
	140	18 22	35·209	4·33	19	16·83	0·08	0·870	0·5072029	254	10	825	527	54	0·5070867
													Mean	...	0·5072505
10th-	140	6 14	35·218	− 4·33	19	16·55	+0·09	0·870	0·5072010	+ 254	−10	−811	−527	−54	0·5070862
11th	138	7 38	33·340	4·33	18	16·67	0·09	0·869	0·5076126	254	9	817	497	54	0·5075003
Jan.	139	18 33	34·871	4·33	20	16·48	0·05	0·872	0·5072736	254	11	808	528	54	0·5071589
	137	19 48	34·422	4·33	19	16·55	0·05	0·872	0·5073699	254	10	811	518	54	0·5072560
													Mean	...	0·5072504
11th-	137	6 18	34·424	− 4·33	19	16·34	+0·09	0·872	0·5073696	+ 254	− 10	−801	−518	−54	0·5072567
12th	139	7 23	34·870	4·33	19	16·44	0·09	0·872	0·5072737	254	10	806	528	54	0·5071593
Jan.	138	18 40	33·350	4·33	21	15·98	0·14	0·876	0·5076102	254	12	783	501	54	0·5075006
	140	19 45	35·224	4·33	19	16·13	0·14	0·876	0·5071996	254	10	790	531	54	0·5070865
													Mean	...	0·5072508
												Mean of 7th to 12th January		...	**0·5072509**
									Bangalore.						
		h m	s	s	′	°	°		s						s
2nd	137	6 37	32·726	+10·53	18	23·92	+0·14	0·819	0·5077579	− 618	− 8	−1172	−486	−54	0·5075241
Feb.	139	7 56	33·118	10·53	21	24·21	0·14	0·816	0·5076645	618	12	1186	494	54	0·5074281
1908	138	9 15	31·730	10·53	26	24·35	0·14	0·816	0·5080051	618	18	1193	467	54	0·5077701
Night	140	10 16	33·422	10·53	22	24·47	0·14	0·815	0·5075937	618	14	1199	494	54	0·5073558
													Mean	...	0·5075195
3rd	137	18 45	32·719	+10·53	21	23·80	+0·15	0·819	0·5077594	− 618	−12	−1166	−486	−54	0·5075258
Feb.	139	19 55	33·120	10·53	21	23·99	0·15	0·817	0·5076644	618	12	1176	495	54	0·5074289
Day	138	21 5	31·733	10·53	21	24·15	0·15	0·816	0·5080042	618	12	1183	467	54	0·5077708
	140	22 2	33·425	10·53	22	24·28	0·15	0·815	0·5075930	618	13	1190	494	54	0·5073561
													Mean	...	0·5075204
											Mean of Day and Night			...	**0·5075200**
3rd	140	6 36	33·423	+10·75	23	24·38	+0·12	0·816	0·5078935	−631	−14	−1195	−494	−54	0·5073547
Feb.	138	7 44	31·726	10·75	20	24·49	0·12	0·815	0·5080061	631	11	1200	466	54	0·5077699
Night	139	8 48	33·105	10·75	21	24·68	0·12	0·814	0·5076677	631	12	1209	493	54	0·5074278
	137	9 52	32·695	10·75	19	24·75	0·12	0·814	0·5077653	631	10	1213	484	54	0·5075261
													Mean	...	0·5075196
4th	140	18 40	33·416	+10·75	22	24·52	+0·07	0·817	0·5075951	− 631	−13	−1201	− 495	−54	0·5073557
Feb.	138	19 44	31·722	10·75	21	24·59	0·07	0·815	0·5080072	631	12	1205	466	54	0·5077704
Day	139	20 58	33·102	10·75	19	24·71	0·07	0·814	0·5076683	631	10	1211	493	54	0·5074284
	137	21 60	32·689	10·75	19	24·72	0·07	0·814	0·5077666	631	10	1211	484	54	0·5075276
													Mean	...	0·5075205
											Mean of Day and Night			...	**0·5075201**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
		Mysore.													
		h m	s	s	′	°	°		s						s
7th	137	6 58	32·987	− 1·45	17	26·12	−0·05	0·834	0·5076955	+ 85	− 8	−1280	−495	−57	0·5075200
Feb.	139	8 0	33·402	1·45	18	26·09	0·05	0·835	0·5075983	85	9	1278	506	57	0·5074218
1908	140	10 4	33·715	1·45	17	25·98	0·05	0·834	0·5075267	85	8	1273	505	57	0·5073509
Night	138	11 8	31·994	1·45	20	25·93	0·05	0·834	0·5079381	85	11	1271	477	57	0·5077650
													Mean	...	0·5075144
8th	137	19 9	33·008	− 1·45	19	24·71	+0·13	0·841	0·5076906	+ 85	−10	−1211	−500	−57	0·5075213
Feb.	139	20 12	33·421	1·45	18	24·82	0·13	0·839	0·5075940	85	9	1216	508	57	0·5074235
Day	140	21 57	33·730	1·45	19	25·03	0·13	0·837	0·5075231	85	10	1226	507	57	0·5073516
	138	22 58	32·002	1·45	20	25·21	0·13	0·835	0·5079358	85	11	1235	478	57	0·5077662
													Mean	...	0·5075157
												Mean of Day and Night		...	**0·5075151**
8th	138	6 56	31·999	− 1·11	21	25·70	−0·02	0·838	0·5079367	+65	−12	−1259	−479	−57	0·5077625
Feb.	140	7 54	33·719	1·11	19	25·69	0·02	0·838	0·5075256	65	10	1259	508	57	0·5073487
Night	139	8 59	33·400	1·11	18	25·66	0·02	0·838	0·5075988	65	9	1257	508	57	0·5074222
	137	10 5	32·990	1·11	15	25·65	0·02	0·836	0·5076948	65	6	1257	497	57	0·5075196
													Mean	...	0·5075133
9th	138	19 4	32·011	− 1·11	21	24·77	+0·09	0·841	0·5079338	+65	−12	−1214	−481	−57	0·5077639
Feb.	140	20 1	33·725	1·11	19	24·88	0·09	0·841	0·5075246	65	10	1219	510	57	0·5073515
Day	139	21 3	33·405	1·11	19	24·93	0·09	0·839	0·5075975	65	10	1222	508	57	0·5074243
	137	22 7	32·989	1·11	18	25·09	0·09	0·837	0·5076949	65	9	1229	497	57	0·5075222
													Mean	...	0·5075155
												Mean of Day and Night		...	**0·5075144**
		Edgar Shaft. (Underground station).													
		h m	s	s	′	°	°		s						s
17th	137	8 10	32·830	+ 4·47	14	30·39	+0·02	0·876	0·5077327	−262	−5	−1489	−520	−53	0·5074998
Feb	139	9 10	33·236	4·47	16	30·40	0·02	0·876	0·5076369	262	7	1490	531	53	0·5074026
1908	138	10 19	31·847	4·47	17	30·44	0·02	0·876	0·5079752	262	8	1492	501	53	0·5077436
Night	140	11 19	33·554	4·47	15	30·46	0·02	0·876	0·5075633	262	6	1493	531	53	0·5073288
													Mean	...	0·5074937
18th	137	20 12	32·846	+ 4·47	14	30·14	+0·09	0·877	0·5077290	−262	−5	−1477	−521	−53	0·5074972
Feb.	139	21 21	33·253	4·47	18	30·18	0·09	0·876	0·5076328	262	9	1479	531	53	0·5073994
Day	138	22 28	31·863	4·47	17	30·34	0·09	0·875	0·5079712	262	8	1487	501	53	0·5077401
	140	23 28	33·566	4·47	16	30·34	0·09	0·873	0·5075608	262	7	1487	529	53	0·5073270
													Mean	...	0·5074909
												Mean of Day and Night		...	**0·5074923**
18th	140	8 1	33·566	+ 4·51	18	29·94	+0·08	0·877	0·5075607	−265	− 9	−1467	−531	−53	0·5073282
Feb.	138	9 17	31·856	4·51	19	30·03	0·08	0·876	0·5079729	265	10	1471	501	53	0·5077429
Night	139	10 22	33·238	4·51	18	30·15	0·08	0·876	0·5076363	265	9	1477	531	53	0·5074028
	137	11 28	32·836	4·51	16	30·15	0·08	0·876	0·5077313	265	7	1477	520	53	0·5074991
													Mean	...	0·5074933
19th	140	20 7	33·571	+ 4·51	18	29·91	+0·01	0·877	0·5075597	−265	− 9	−1466	−531	−53	0·5073273
Feb.	138	21 7	31·864	4·51	19	29·94	0·01	0·877	0·5079709	265	10	1467	502	53	0·5077412
Day	139	22 11	33·256	4·51	16	29·95	0·01	0·877	0·5076322	265	7	1468	531	53	0·5073998
	137	23 16	32·852	4·51	13	29·96	0·01	0·876	0·5077276	265	5	1468	520	53	0·5074965
													Mean	..	0·5074912
												Mean of Day and Night		...	**0·5074922**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Edgar Shaft—(contd.) (Underground station).															
		h m	s	s	′	°	°		s						s
19th Feb. Night	137	7 56	32·850	+ 4·41	16	29·56	+0·07	0·879	0·5077281	−259	−7	−1448	−522	−53	0·5074992
	139	8 49	33·257	4·41	18	29·68	0·07	0·879	0·5076320	259	9	1454	533	53	0·5074012
	138	9 52	31·868	4·41	15	29·75	0·07	0·879	0·5079700	259	6	1458	503	53	0·5077421
	140	10 50	33·575	4·41	15	29·76	0·07	0·878	0·5075587	259	6	1458	532	53	0·5073279
													Mean	...	0·5074926
20th Feb. Day	137	20 9	32·861	+ 4·41	15	29·54	+0·07	0·879	0·5077253	−259	−6	−1447	−522	−53	0·5074966
	139	21 4	33·265	4·41	17	29·57	0·07	0·878	0·5076300	259	8	1449	532	53	0·5073999
	138	22 2	31·874	4·41	17	29·67	0·07	0·878	0·5079683	259	8	1454	502	53	0·5077407
	140	23 0	33·582	4·41	16	29·72	0·07	0·877	0·5075571	259	7	1456	531	53	0·5073265
													Mean	...	0·5074909
												Mean of Day and Night			**0·5074918**
Edgar Shaft. (Surface station).															
		h m	s	s	′	°	°		s						s
21st Feb. 1908 Night	137	12 11	32·903	+ 4·81	16	24·41	−0·21	0·826	0·5077152	−282	−7	−1196	−491	−49	0·5075127
	139	13 10	33·319	4·81	17	24·18	0·21	0·825	0·5076173	282	8	1185	500	49	0·5074149
	138	14 8	31·926	4·81	18	23·98	0·21	0·826	0·5079553	282	9	1175	472	49	0·5077566
	140	15 7	33·645	4·81	16	23·81	0·21	0·824	0·5075427	282	7	1167	499	49	0·5073423
													Mean	...	0·5075066
22nd Feb. Day	137	0 25	32·940	+ 4·81	19	22·58	+0·10	0·829	0·5077066	−282	−10	−1106	−492	−49	0·5075127
	139	1 27	33·356	4·81	20	22·67	0·10	0·828	0·5076091	282	11	1111	502	49	0·5074136
	138	2 29	31·948	4·81	21	22·74	0·10	0·826	0·5079497	282	12	1114	472	49	0·5077568
	140	3 25	33·661	4·81	19	22·91	0·10	0·824	0·5075391	282	10	1123	499	49	0·5073428
													Mean	...	0·5075065
												Mean of Day and Night			**0·5075066**
22nd Feb. Night	140	12 17	33·640	+ 4·92	21	23·76	+0·08	0·823	0·5075438	−289	−12	−1164	−499	−49	0·5073425
	138	13 19	31·924	4·92	21	23·88	0·08	0·822	0·5079557	289	12	1170	470	49	0·5077567
	139	14 16	33·320	4·92	20	23·93	0·08	0·822	0·5076173	289	11	1173	498	49	0·5074153
	137	15 17	32·907	4·92	18	24·01	0·08	0·821	0·5077145	289	9	1176	488	49	0·5075134
													Mean	...	0·5075070
23rd Feb. Day	140	0 26	33·630	+ 4·92	20	24·20	+0·05	0·822	0·5075460	−289	−11	−1186	−498	−49	0·5073427
	138	1 25	31·915	4·92	23	24·31	0·05	0·821	0·5079581	289	14	1191	470	49	0·5077568
	139	2 38	33·308	4·92	22	24·34	0·05	0·821	0·5076201	289	13	1193	498	49	0·5074159
	137	3 38	32·901	4·92	19	24·40	0·05	0·820	0·5077157	289	10	1196	487	49	0·5075126
													Mean	...	0·5075070
												Mean of Day and Night			**0·5075070**
23rd Feb. Night	137	12 26	32·908	+ 4·61	21	24·27	0·00	0·823	0·5077141	−271	−12	−1189	−489	−49	0·5075131
	139	13 21	33·317	4·61	20	24·25	0·00	0·823	0·5076181	271	11	1188	499	49	0·5074163
	138	14 23	31·921	4·61	21	24·24	0·00	0·821	0·5079565	271	12	1188	470	49	0·5077575
	140	15 21	33·632	4·61	19	24·27	0·00	0·821	0·5075455	271	10	1189	498	49	0·5073438
													Mean	...	0·5075077
24th Feb. Day	137	0 27	32·924	+ 4·61	19	23·66	+0·04	0·826	0·5077105	−271	−10	−1159	−491	−49	0·5075125
	139	1 27	33·334	4·61	20	23·69	0·04	0·824	0·5076141	271	11	1161	499	49	0·5074150
	138	2 34	31·937	4·61	20	23·72	0·04	0·823	0·5079525	271	11	1162	471	49	0·5077561
	140	3 26	33·647	4·61	20	23·80	0·04	0·821	0·5075422	271	11	1166	498	49	0·5073427
													Mean	...	0·5075066
												Mean of Day and Night		...	**0·5075071**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Edgar Shaft—(contd.) *(Surface station).*															
		h m	s	s	′	°	°		s						s
24th	140	12 20	33·632	+ 4·61	21	24·38	+0·01	0·822	0·5075457	−271	−12	−1195	−498	−49	0·5073432
Feb.	138	13 18	31·919	4·61	23	24·35	0·01	0·821	0·5079570	271	14	1193	470	49	0·5077573
Night	139	14 18	33·316	4·61	21	24·39	0·01	0·821	0·5076183	271	12	1195	498	49	0·5074158
	137	15 19	32·906	4·61	19	24·38	0·01	0·821	0·5077146	271	10	1195	488	49	0·5075133
													Mean	...	0·5075074
25th	140	0 32	33·640	+ 4·61	22	24·00	+0·06	0·825	0·5075437	−271	−13	−1176	−500	−49	0·5073428
Feb.	138	1 32	31·928	4·61	21	24·05	0·06	0·823	0·5079547	271	12	1178	471	49	0·5077566
Day	139	2 36	33·320	4·61	23	24·12	0·06	0·822	0·5076172	271	14	1182	498	49	0·5074158
	137	3 47	32·909	4·61	17	24·23	0·06	0·820	0·5077141	271	8	1187	487	49	0·5075139
													Mean	...	0·5075073
													Mean of Day and Night	...	**0·5075074**
													Mean of 23rd to 25th February	...	**0·5075072**
Salem.															
		h m	s	s	′	°	°		s						s
1st	137	8 35	32·813	+ 6·82	19	27·94	+0·06	0·868	0·5077367	−400	−10	−1369	−516	−56	0·5075016
Mar.	139	9 34	33·219	6·82	19	28·06	0·06	0·868	0·5076410	400	10	1375	526	56	0·5074043
1908	138	10 44	31·829	6·82	20	28·12	0·06	0·868	0·5079797	400	11	1378	496	56	0·5077456
Night	140	11 42	33·529	6·82	17	28·13	0·06	0·868	0·5075691	400	8	1378	526	56	0·5073323
													Mean	..	0·5074960
2nd	137	20 40	32·822	+ 6·82	20	27·25	+0·15	0·872	0·5077347	−400	−11	−1335	−518	−56	0·5075027
Mar.	139	21 44	33·228	6·82	19	27·35	0·15	0·871	0·5076388	400	10	1340	528	56	0·5074054
Day	138	22 43	31·836	6·82	20	27·50	0·15	0·870	0·5079780	400	11	1348	498	56	0·5077467
	140	23 43	33·536	6·82	19	27·68	0·15	0·868	0·5075675	400	10	1356	526	56	0·5073327
													Mean	...	0·5074969
													Mean of Day and Night	...	**0·5074964**
2nd	140	8 35	33·512	+ 7·04	21	28·50	0·00	0·869	0·5075731	−413	−12	−1397	−527	−56	0·5073326
Mar.	138	9 37	31·816	7·04	20	28·53	0·00	0·867	0·5079831	413	11	1398	496	56	0·5077457
Night	139	10 44	33·199	7·04	20	28·53	0·00	0·868	0·5076455	413	11	1398	526	56	0·5074051
	137	11 43	32·791	7·04	20	28·52	0·00	0·868	0·5077420	413	11	1397	516	56	0·5075027
													Mean	...	0·5074965
3rd	140	20 37	33·531	+ 7·04	22	27·65	+0·04	0·873	0·5075686	−413	−13	−1355	−529	−56	0·5073320
Mar.	138	21 36	31·833	7·04	21	27·68	0·04	0·873	0·5079790	413	2	1356	499	56	0·5077454
Day	139	22 38	33·215	7·04	18	27·73	0·04	0·871	0·5076420	413	9	1359	528	56	0·5074055
	137	23 39	32·807	7·04	17	27·76	0·04	0·870	0·5077383	413	18	1360	517	56	0·5075029
													Mean	...	0·5074965
													Mean of Day and Night	...	**0·5074965**
Yercaud.															
		h m	s	s	′	°	°		s						s
6th	137	8 54	33·029	− 4·02	19	20·18	0·00	0·793	0·5076852	+236	−10	−989	−471	−55	0·5075563
Mar.	139	9 56	33·440	4·02	20	20·20	0·00	0·793	0·5075895	236	10	990	481	55	0·5074595
1908	138	10 57	32·037	4·02	21	20·21	0·00	0·793	0·5079273	236	12	990	454	55	0·5077998
Night	140	11 57	33·761	4·02	18	20·18	0·00	0·793	0·5075163	236	9	989	481	55	0·5073865
													Mean	...	0·5075505
7th	137	20 51	33·053	− 4·02	19	19·17	+0·23	0·797	0·5076797	+236	−10	−939	−473	−55	0·5075556
Mar.	139	21 52	33·462	4·02	19	19·36	0·23	0·795	0·5075845	236	10	949	482	55	0·5074585
Day	138	23 0	32·049	4·02	19	19·63	0·23	0·794	0·5079243	236	10	962	454	55	0·5077998
	140	0 17	33·768	4·02	17	20·03	0·23	0·792	0·5075148	236	8	981	480	55	0·5073860
													Mean	...	0·5075500
													Mean of Day and Night	...	**0·5075503**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Correction on account of: Arc	Correction on account of: Temperature	Correction on account of: Density of Air	Correction on account of: Flexure	Reduced Time of Vibration
Yercaud—(contd.)															
		h m	s	s	′	°	°		s						s
7th	140	9 6	33·770	− 4·19	20	19·92	−0·09	0·794	0·5075143	+ 246	− 11	− 976	− 481	− 55	0·5073866
Mar.	138	10 0	32·045	4·19	20	19·93	0·09	0·795	0·5079252	246	11	977	455	55	0·5078000
Night	139	10 56	33·458	4·19	19	19·78	0·09	0·796	0·5075855	246	10	969	482	55	0·5074585
	137	11 52	33·044	4·19	17	19·72	0·09	0·795	0·5076820	246	8	966	472	55	0·5075565
													Mean	...	0·5075504
8th	140	20 53	33·782	− 4·19	19	19·53	+0·20	0·796	0·5075116	+ 246	− 10	− 957	− 482	− 55	0·5073858
Mar.	138	21 54	32·049	4·19	20	19·72	0·20	0·795	0·5079242	246	11	966	455	55	0·5078001
Day	139	22 53	33·455	4·19	19	19·93	0·20	0·794	0·5075860	246	10	977	481	55	0·5074583
	137	23 53	33·034	4·19	18	20·13	0·20	0·793	0·5076845	246	9	986	471	55	0·5075570
													Mean	...	0·5075503
										Mean of Day and Night				...	**0·5075503**
Ootacamund.															
		h m	s	s	′	°	°		s						s
15th	137	9 27	33·175	− 12·35	21	14·74	+0·07	0·730	0·5076511	+ 725	− 12	− 722	− 434	− 59	0·5076009
Mar.	139	10 25	33·593	12·35	21	14·78	0·07	0·729	0·5075547	725	12	724	442	59	0·5075035
1908	138	11 27	32·171	12·35	22	14·87	0·07	0·728	0·5078936	725	13	729	416	59	0·5078444
Night	140	12 21	33·910	12·35	22	14·92	0·07	0·728	0·5074829	725	13	731	441	59	0·5074310
													Mean	...	0·5075950
16th	137	21 17	33·170	− 12·35	21	14·87	+0·10	0·729	0·5076522	+ 725	− 12	− 729	− 433	− 59	0·5076014
Mar.	139	22 16	33·584	12·35	21	14·95	0·10	0·729	0·5075567	725	12	733	442	59	0·5075046
Day	138	23 16	32·165	12·35	21	15·06	0·10	0·729	0·5078951	725	12	738	417	59	0·5078450
	140	0 19	33·901	12·35	20	15·13	0·10	0·728	0·5074848	725	11	741	441	59	0·5074321
													Mean	...	0·5075958
										Mean of Day and Night				...	**0·5075954**
16th	140	9 25	33·895	− 12·06	22	15·32	+0·04	0·729	0·5074862	+ 708	− 13	− 751	− 442	− 59	0·5074305
Mar.	138	10 25	32·158	12·06	22	15·34	0·04	0·727	0·5078970	708	13	752	416	59	0·5078438
Night	139	11 23	33·573	12·06	21	15·38	0·04	0·727	0·5075591	708	12	754	441	59	0·5075033
	137	12 22	33·154	12·06	20	15·44	0·04	0·727	0·5076560	708	11	757	432	59	0·5076009
													Mean	...	0·5075946
17th	140	21 23	33·891	− 12·06	23	15·39	+0·07	0·728	0·5074871	+ 708	− 14	− 754	− 441	− 59	0·5074311
Mar.	138	22 22	32·152	12·06	22	15·52	0·07	0·728	0·5078985	708	13	760	416	59	0·5078445
Day	139	23 22	33·567	12·06	21	15·56	0·07	0·728	0·5075603	708	12	762	441	59	0·5075037
	137	0 21	33·151	12·06	20	15·64	0·07	0·726	0·5076566	708	11	766	431	59	0·5076007
													Mean	...	0·5075950
										Mean of Day and Night				...	**0·5075948**
Kodaikanal.															
		h m	s	s	′	°	°		s						s
22nd	137	22 4	32·679	+ 3·84	19	13·97	+0·07	0·725	0·5077690	− 225	− 10	− 685	− 431	− 86	0·5076253
Mar.	139	23 2	33·084	3·84	20	13·97	0·07	0·725	0·5076726	225	11	685	439	86	0·5075280
1908	138	0 1	31·707	3·84	22	14·06	0·07	0·724	0·5080110	225	13	689	414	86	0·5078683
Night	140	0 57	33·398	3·84	20	14·14	0·07	0·723	0·5075993	225	11	693	438	86	0·5074540
													Mean	...	0·5076189
23rd	137	10 59	32·682	+ 3·84	20	14·23	+0·25	0·723	0·5077683	− 225	− 11	− 697	− 429	− 86	0·5076235
Mar.	139	11 58	33·077	3·84	21	14·46	0·25	0·722	0·5076742	225	12	709	438	86	0·5075272
Day	138	12 58	31·694	3·84	22	14·71	0·25	0·721	0·5080143	225	13	721	412	86	0·5078686
	140	13 56	33·374	3·84	21	14·93	0·25	0·720	0·5076048	225	12	732	436	86	0·5074557
													Mean	...	0·5076188
										Mean of Day and Night				...	**0·5076188**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature		Density of Air	Observed Time of Vibration	Correction on account of					Reduced Time of Vibration
						Corrected Mean	Mean Change per hour			Clock Rate	Arc	Temperature	Density of Air	Flexure	
									Kodaikanal—(contd.)						
		h m	s	s	′	°	°		s						s
23rd Mar. Night	140	22 8	33·374	+ 3·84	22	15·14	−0·15	0·721	0·5076050	− 225	− 13	− 742	− 437	− 86	0·5074547
	138	23 7	31·691	3·84	22	15·12	0·15	0·721	0·5080151	225	13	741	412	86	0·5078674
	139	0 7	33·071	3·84	21	15·09	0·15	0·721	0·5076756	225	12	739	437	86	0·5075257
	137	1 8	32·665	3·84	19	15·10	0·15	0·719	0·5077725	225	10	740	427	86	0·5076237
													Mean	...	0·5076179
24th Mar. Day	140	10 16	33·361	+ 3·84	23	15·25	+0·20	0·720	0·5076079	− 225	− 14	− 747	− 436	− 86	0·5074571
	138	11 15	31·687	3·84	23	15·44	0·20	0·719	0·5080160	225	14	757	411	86	0·5078667
	139	12 15	33·054	3·84	22	15·63	0·20	0·718	0·5076796	225	13	766	435	86	0·5075271
	137	13 9	32·642	3·84	21	15·79	0·20	0·718	0.5077780	225	12	774	426	86	0·5076257
													Mean	...	0·5076192
													Mean of Day and Night	...	**0·5076185**
24th Mar. Night	137	22 5	32·640	+ 3·84	22	15·14	0·00	0·722	0·5077770	− 225	− 13	− 742	− 429	− 86	0·5076275
	139	23 10	33·056	3·84	20	15·14	0·00	0·721	0·5076792	225	11	742	437	86	0·5075291
25th Mar. Day	138	10 8	31·698	+ 3·84	23	14·88	+0·23	0·720	0·5080135	− 225	− 14	− 729	− 412	− 86	0·5078669
	140	11 5	33·371	3·84	21	15·11	0·23	0·719	0·5076053	225	12	740	436	86	0·5074554
													Mean of Day and Night	...	**0·5076197**
									Dehra Dun.						
		h m	s	s	′	°	°		s						s
17th Apr. Night	137	11 29	32·421	+66·91	21	25·91	+0·13	0·832	0·5078317	−3928	− 12	−1270	− 494	− 45	0·5072568
	139	12 39	32·819	66·91	22	26·06	0·13	0·833	0·5077356	3928	13	1277	505	45	0·5071588
22nd Apr. Night	140	12 0	34·794	+ 1·34	19	28·19	−0·11	0·828	0·5072899	− 79	− 10	−1381	− 502	− 45	0·5070882
	138	13 0	32·969	1·34	20	28·08	0·11	0·828	0·5076996	79	11	1376	474	45	0·5075011
													Mean	...	0·5072512
18th Apr. Day	137	23 32	32·425	+66·91	21	25·56	+0·16	0·834	0·5078309	−3928	− 12	−1252	− 495	− 45	0·5072577
	139	0 42	32·819	66·91	21	25·75	0·16	0·833	0·5077356	3928	12	1262	505	45	0·5071604
23rd Apr. Day	140	0 13	34·810	+ 1·34	20	27·76	+0·15	0·829	0·5072867	− 79	− 11	−1360	− 502	− 45	0·5070870
	138	1 13	32·975	1·34	20	27·91	0·15	0·829	0·5076983	79	11	1368	474	45	0·5075006
													Mean	...	0·5072514
													Mean of 17th, 18th and 22nd, 23rd April	...	**0·5072513**
20th Apr. Night	140	11 53	34·823	+ 1·17	21	27·15	−0·01	0·834	0·5072837	−69	− 12	−1330	− 505	− 45	0·5070876
	138	12 53	33·003	1·17	20	27·15	0·01	0·835	0·5076917	69	11	1330	478	45	0·5074984
	139	13 51	34·491	1·17	18	27·15	0·01	0·834	0·5073548	69	9	1330	505	45	0·5071590
	137	14 50	34·051	1·17	17	27·13	0·01	0·834	0·5074513	69	8	1329	495	45	0·5072567
													Mean	...	0·5072504
21st Apr. Day	140	23 53	34·824	+ 1·17	20	27·07	+0·27	0·835	0·5072837	−69	− 11	−1326	− 506	− 45	0·5070880
	138	0 56	32·990	1·17	20	27·17	0·27	0·835	0·5076947	69	11	1331	478	45	0·5075013
	139	1 56	34·481	1·17	20	27·33	0·27	0·833	0·5073571	69	11	1339	505	45	0·5071602
	137	2 0	34·035	1·17	17	27·49	0·27	0·833	0·5074549	69	8	1347	495	45	0·5072585
													Mean	...	0·5072520
													Mean of Day and Night	...	**0·5072512**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of Clock Rate	Correction on account of Arc	Correction on account of Temperature	Correction on account of Density of Air	Correction on account of Flexure	Reduced Time of Vibration
		Dehra Dun—(contd.)													
		h m	s	s	′	°	°		s						s
21st Apr. Night	137	11 46	34·026	+ 1·37	20	27·93	+0·05	0·831	0·5074568	−80	−11	−1369	− 494	−45	0·5072569
	139	12 48	34·465	1·37	19	28·01	0·05	0·831	0·5073606	80	10	1372	504	45	0·5071595
	138	13 48	32·973	1·37	20	28·06	0·05	0·831	0·5076987	80	11	1375	475	45	0·5075001
	140	14 48	34·802	1·37	18	28·06	0·05	0·829	0·5072881	80	9	1375	502	45	0·5070870
													Mean	...	0·5072509
22nd Apr. Day	137	23 50	34·041	+ 1·37	18	27·16	+0·20	0·834	0·5074536	−80	− 9	−1331	− 495	−45	0·5072576
	139	0 49	34·480	1·37	20	27·38	0·20	0·833	0·5073573	80	11	1342	505	45	0·5071590
	138	1 49	32·979	1·37	21	27·56	0·20	0·832	0·5076973	80	12	1350	476	45	0·5075010
	140	2 46	34·805	1·37	18	27·75	0·20	0·831	0·5072876	80	9	1360	504	45	0·5070878
													Mean	...	0·5072514
										Mean of Day and Night				...	**0·5072511**

In Table III the times of vibration of each pendulum at Dehra Dūn in January and April 1908 are collected.

Table III.—Times of vibration at Dehra Dūn.

Date	137	138	139	140	Mean
1908	s	s	s	s	s
January, 1- 2	0·5072575	0·5075013	0·5071596	0·5070862	0·5072512
„ 2- 3	2564	5007	1594	0860	2506
„ 4- 5	2556	5017	1601	0869	2511
„ 7-12	2570	5005	1593	0870	2509
Mean	0·5072566	0·5075011	0·5071596	0·5070865	0·5072510
April, 17-18	0·5072573	0·5075008	0·5071596	0·5070876	0·5072513
„ 20-21	2576	4999	1596	0878	2512
„ 21-22	2573	5005	1593	0874	2511
Mean	0·5072574	0·5075004	0·5071595	0·5070876	0·5072512
General Mean	0·5072570	0·5075008	0·5071595	0·5070871	0·5072511
Difference, Apr. – Jan.	+ 8	– 7	– 1	+ 11	+ 2

The agreement between the January and April values is satisfactory. It is desirable however, to examine the differences between the individual pendulums and the mean pendulum in order to see in what degree the pendulums have maintained an invariable character. These differences are exhibited in Table IV.

Table IV.—Differences between the mean and individual pendulums.

Station.	Date	137	v	138	v	139	v	140	v
	1908								
Dehra Dūn ...	Jan. 1-12	– 56	+ 4	– 2501	– 5	+ 914	– 1	+ 1645	+ 4
Bangalore ...	Feb. 2- 4	– 60	± 0	– 2502	– 6	+ 917	+ 2	+ 1644	+ 3
Mysore ...	Feb. 7- 9	– 61	– 1	– 2497	– 1	+ 917	+ 2	+ 1640	– 1
Edgar Shaft (*Underground*) ...	Feb. 17-20	– 60	± 0	– 2497	– 1	+ 911	– 4	+ 1645	+ 4
Edgar Shaft (*Surface*) ...	Feb. 21-25	– 61	– 1	– 2499	– 3	+ 917	+ 2	+ 1642	+ 1
Salem ...	Mar. 1- 3	– 60	± 0	– 2494	+ 2	+ 914	– 1	+ 1641	± 0
Yercand ...	Mar. 6- 8	– 61	– 1	– 2496	± 0	+ 916	+ 1	+ 1641	± 0
Ootacamund ...	Mar. 15-17	– 59	+ 1	– 2494	+ 2	+ 914	– 1	+ 1639	– 2
Kodaikānal ...	Mar. 22-25	– 62	– 2	– 2487	+ 9	+ 915	± 0	+ 1635	– 6
Dehra Dūn ...	Apr. 17-22	– 62	– 2	– 2492	+ 4	+ 917	+ 2	+ 1636	– 5
Means		– 60		– 2496		+ 915		+ 1641	
Means of 1906-07		– 55		– 2497		+ 912		+ 1639	

There is some evidence of a gradual change in pendulums 138 and 140, but the changes are small and need not be considered. The mean of the January and April values at Dehra Dūn may, therefore, be accepted.

In Table V are given for each station the observed times of vibration of each pendulum and the values of g deduced therefrom.

Table V.—Mean times of vibration and deduced values of g.

Station		137	138	139	140	Mean
Dehra Dūn ...	s.	0·5072570	0·5075008	0·5071595	0·5070871	0·5072511
Bangalore ...	s.	0·5075260	0·5077702	0·5074283	0·5073556	0·5075200
		+ 2690	+ 2694	+ 2688	+ 2685	+ 2689
	g.	978·025	978·024	978·025	978·026	978·025
Mysore ...	s.	0·5075208	0·5077644	0·5074230	0·5073507	0·5075147
		+ 2638	+ 2636	+ 2635	+ 2636	+ 2636
	g.	978·045	978·046	978·046	978·045	978·045
Edgar Shaft (*Underground*) ...	s.	0·5074981	0·5077418	0·5074010	0·5073276	0·5074921
		+ 2411	+ 2410	+ 2415	+ 2405	+ 2410
	g.	978·132	978·133	978·131	978·134	978·133
Edgar Shaft (*Surface*) ...	s.	0·5075130	0·5077568	0·5074152	0·5073427	0·5075069
		+ 2560	+ 2560	+ 2557	+ 2556	+ 2558
	g.	978·075	978·075	978·076	978·076	978·076
Salem ...	s.	0·5075025	0·5077459	0·5074051	0·5073324	0·5074965
		+ 2455	+ 2451	+ 2456	+ 2453	+ 2454
	g.	978·115	978·117	978·115	978·116	978·116
Yercaud ...	s.	0·5075564	0·5077999	0·5074587	0·5073862	0·5075503
		+ 2994	+ 2991	+ 2992	+ 2991	+ 2992
	g.	977·907	977·909	977·908	977·908	977·908
Ootacamund ...	s.	0·5076010	0·5078445	0·5075037	0·5074312	0·5075951
		+ 3440	+ 3437	+ 3442	+ 3441	+ 3440
	g.	977·735	977·737	977·734	977·734	977·735
Kodaikānal ...	s.	0·5076251	0·5078676	0·5075274	0·5074554	0·5076189
		+ 3681	+ 3668	+ 3679	+ 3683	+ 3678
	g.	977·642	977·648	977·643	977·641	977·643

The Reduction to Sea Level.

Orographical corrections were computed for all the stations except Bangalore and Mysore. That at the Edgar Shaft surface station was negligible and is therefore not given in detail; the details of the other corrections are given in the following pages. A slight change in method was introduced this season. The zones, into which the country round the station is divided by concentric circles were not, as before, subdivided by radial lines, but the area between each pair of contours was measured by planimeter and expressed as a fraction of the whole zone. Formerly, this area was estimated and the radial lines at 5° intervals were drawn to facilitate this estimation.

At Kodaikānal the detailed investigation was not possible beyond 1 mile from the station, on account of the want of suitable maps.

Consequent on the new values of δ and Δ that have been adopted, the value of k, the factor by which the "effect" is multiplied, is changed from 0·000035 to 0·000033584 (*vide* Chapter VIII). For the orographical correction, therefore, k is taken as 0·0000336. The "effect" is represented by

$$\left\{ r_2 - r_1 - \left(\sqrt{r_2^2 + d^2} - \sqrt{r_1^2 + d^2}\right) \right\}$$

where r_2 and r_1 are the radii of the zone and d is the difference of height between station and zone.

Table VI.—Orographical correction at Edgar Shaft underground station. Height, 328 feet.

Up to a radius of 1200 feet the station has been considered as lying on the lower surface of a cylinder of radius 1200 feet and height 2956 − 328 = 2628 feet. The attraction of the cylinder is

$$k\,(h+r-\sqrt{r^2+h^2})$$ which equals −0·03155.

Beyond 1200 feet the details are given below, the column "height" showing the actual height of the portion of the zone dealt with.

No. of zone	1	2	3	4	5	6	7
Inner radius Outer radius	1200 ft. ½ mile	½ mile 1 mile	1 mile 2 miles	2 miles 3 miles	3 miles 4 miles	4 miles 5 miles	5 miles 10 miles
Height	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*
feet							
3150	...	...	...	...	...	0·01	...
3050	...	...	0·03	0·01	...	...	...
2970	...	0·02	...	...	...	...	...
2950	0·16	0·02	0·01	...	...	...	...
2930	0·17	0·26	...	...	...	...	...
2910	0·19	...	...	...	...	...	...
2870	0·43	0·38	...	...	...	...	...
2850	...	...	0·73	0·53	0·17	0·22	...
2830	0·05	0·26	...	...	...	...	...
2800	...	0·06	...	...	...	...	...
2750	...	...	0·23	...	0·17	0·07	...
2650	...	...	...	0·46	0·66	0·70	0·63
2450	...	...	...	...	...	...	0·37
Effect	588·0	439·9	267·0	89·7	43·5	26·3	47·0

Total effect = 1501·4

Orographical correction outside 1200 ft. radius = 1501·4 × 0·0000336

= − 0·05045

Orographical correction inside 1200 ft. radius = − 0·03155

Total orographical correction = − 0·0820

Table VII.—Orographical correction at Salem.
Height, 948 feet.
(Up to a radius of two miles the inequalities may be neglected).

No. of zone	1	2	3	4	5	6	7
Inner radius Outer radius	2 miles 4 miles	4 miles 6 miles	6 miles 10 miles	10 miles 15 miles	15 miles 20 miles	20 miles 25 miles	25 miles 35 miles
Height	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*
feet							
4550	...	...	...	0·03	...	...	...
4450	...	...	0·05	...	...	...	...
4050	...	...	...	...	...	0·01	...
3550	...	...	0·03	0·04	0·02	0·04	0·04
3250	...	...	...	0·02	...	...	...
3050	...	...	...	...	...	...	0·02
2550	...	0·03	0·05	0·06	0·06	0·08	0·10
2250	...	0·04	...	...	...	...	...
1450	0·22	0·14	0·15	...	0·36	0·48	0·29
1350	...	0·26	0·16	0·26	...	...	...
1050	0·78	0·53	0·56	...	...	...	...
950	...	...	...	0·59	0·56	0·39	0·55
Effect	1·5	1·8	6·4	3·0	0·6	0·7	0·7

$$\text{Total effect} = 14{\cdot}7$$
$$\text{Orographical correction} = 14{\cdot}7 \times 0{\cdot}0000336$$
$$= -0{\cdot}00049 \text{ (negligible).}$$

Table VIII.—Orographical correction at Yercaud.
Height, 4493 feet.

(Up to a radius of 660 feet the inequalities may be neglected).

Zone No. 1		Zone No. 2		Zone No. 3		Zone No. 4		Zone No. 5		Zone No. 6	
⅛ to ¼ mile		¼ to ½ mile		½ to 1 mile		1 to 2 miles		2 to 3 miles		3 to 4 miles	
Height	*Fraction*	Height	*Fraction*	Height	*Fraction*	Height	*Fraction*	Height	*Fraction*	Height	*Fraction*
feet		*feet*		*feet*		*feet*		*feet*		*feet*	
4500	0·07	4750	0·01	4750	0·02	5000	0·01	5050	0·03	4800	0·10
4450	0·80	4650	0·08	4550	0·56	4500	0·22	4350	0·30	4200	0·07
4380	0·13	4550	0·21	4250	0·31	4200	0·31	3750	0·16	4100	0·02
		4450	0·52	4050	0·05	3700	0·18	3000	0·21	3800	0·14
		4350	0·15	3850	0·06	3300	0·13	2000	0·20	3250	0·12
		4300	0·03			2750	0·08	1300	0·10	2550	0·18
						2250	0·06			1700	0·12
						1800	0·01			1200	0·25
Effect	1·6		2·0		5·8		43·2		44·7		36·5

Zone No. 7		Zone No. 8		Zone No. 9		Zone No. 10		Zone No. 11		Zone No. 12	
4 to 6 miles		6 to 10 miles		10 to 15 miles		15 to 20 miles		20 to 25 miles		25 to 35 miles	
Height	*Fraction*	Height	*Fraction*	Height	*Fraction*	Height	*Fraction*	Height	*Fraction*	Height	*Fraction*
feet		*feet*		*feet*		*feet*		*feet*		*feet*	
4200	0·09	3500	0·05	2600	0·02	3500	0·02	2600	0·04	4000	0·01
3500	0·09	3200	0·06	1300	0·53	2500	0·06	1300	0·37	3500	0·02
3100	0·05	2500	0·12	1000	0·45	1300	0·43	1000	0·59	3000	0·02
2500	0·13	1200	0·41			1000	0·49			2500	0·11
1300	0·53	900	0·36							1600	0·14
1000	0·11									1300	0·18
										1000	0·52
Effect	58·9		61·9		34·4		17·2		10·6		10·4

$$\text{Total effect} = 327{\cdot}2$$
$$\text{Orographical correction} = 327{\cdot}2 \times 0{\cdot}0000336$$
$$= -0{\cdot}01099$$

Table IX.—Orographical correction at Ootacamund.
Height, 7395 feet.

(Up to a radius of one mile the inequalities may be neglected).

Zone No. 1		Zone No. 2		Zone No. 3		Zone No. 4		Zone No. 5	
1 to 2 miles		2 to 3 miles		3 to 4 miles		4 to 5 miles		5 to 7 miles	
Height	*Fraction*	Height	*Fraction*	Height	*Fraction*	Height	*Fraction*	Height	*Fraction*
feet		*feet*		*feet*		*feet*		*feet*	
8300	0·01	8400	0·05	8000	0·04	7600	0·11	7600	0·01
8050	0·08	8000	0·01	7600	0·11	7200	0·24	7500	0·03
7900	0·10	7900	0·11	7200	0·37	7000	0·01	7200	0·18
7850	0·07	7800	0·05	7000	0·01	6800	0·48	6800	0·36
7700	0·26	7600	0·24	6800	0·47	6500	0·16	6400	0·34
7500	0·22	7400	0·02					6100	0·08
7300	0·22	7200	0·35						
7050	0·04	6900	0·17						
Effect	5·9		2·6		1·0		1·5		3·3

Zone No. 6		Zone No. 7		Zone No. 8		Zone No. 9		Zone No. 10	
7 to 10 miles		10 to 15 miles		15 to 20 miles		20 to 25 miles		25 to 35 miles	
Height	*Fraction*	Height	*Fraction*	Height	*Fraction*	Height	*Fraction*	Height	*Fraction*
feet		*feet*		*feet*		*feet*		*feet*	
8000	0·01	8200	0·03	7500	0·02	6500	0·04	5500	0·02
7500	0·02	7500	0·15	7200	0·05	6200	0·01	4500	0·04
7200	0·10	6500	0·08	6500	0·09	5500	0·06	4200	0·03
6500	0·42	6200	0·01	6200	0·01	4500	0·08	3500	0·11
5500	0·29	5500	0·14	5500	0·08	3500	0·24	2500	0·10
4500	0·08	4500	0·18	4500	0·08	2300	0·57	2200	0·66
3500	0·08	3500	0·23	3500	0·13			1700	0·04
		2500	0·18	3200	0·04				
				2500	0·50				
Effect	13·4		31·1		25·3		18·4		24·9

$$\text{Total effect} = 127\cdot4$$
$$\text{Orographical correction} = 127\cdot4 \times 0\cdot0000336$$
$$= -\ 0\cdot00428.$$

For regions outside the 35 miles radius we may assume that the whole is a plain of height 1800 feet. The "effect" is represented by

$$\frac{1}{2}\, d^2 . \frac{1}{r_1}$$

where $d = 7400 - 1800 = 5600$ feet

$r_1 = 35$ miles.

The orographical correction due to this plain is thus 0·00285, and the total correction, − 0·0071.*

* The orographical correction for this station has recently been recomputed, including the area within a radius of 1 mile and using the new contoured 1″ maps. It was found to be −0·0074. The difference is negligible.

Table X.—Orographical correction at Kodaikānal. *Height, 7665 feet.*

No. of zone	1	2	3	4
Inner radius Outer radius	330 feet 660 feet	660 feet ¼ mile	¼ mile ½ mile	½ mile 1 mile
Height	*Fraction*	*Fraction*	*Fraction*	*Fraction*
feet				
7700	0·50	...	...	...
7600	...	0·13	0·01	0·08
7550	0·50	0·44	0·19	0·06
7450	...	0·27	0·22	0·12
7350	...	0·13	0·26	0·15
7250	...	0·03	0·16	0·17
7150	...	...	0·08	0·21
7050	...	...	0·03	0·10
6950	...	...	0·05	0·10
6850	...	...	...	0·01
Effect	5·0	14·2	22·6	31·5

$$\text{Total effect up to 1 mile radius} = 73 \cdot 3$$
$$\text{Orographical correction} = 73 \cdot 3 \times 0 \cdot 0000336$$
$$= -0 \cdot 00246.$$

No suitable maps are available for the examination of the country outside 1 mile radius. The orographical correction will, however, certainly be greater than at Ootacamund since the slopes at Kodaikānal are steeper and the station is nearer the sea. The correction outside 1 mile radius at Ootacamund being 0·0071, we will assume for Kodaikānal 0·0085. The total correction is therefore −0·0110.

The abstract of the season's results is shown in Table XI. A reference to Basevi's value of g at Bangalore will be found at the end of Chapter VII, where his results at all the stations which have been reoccupied during the present series of observations are given.

Table XI.—Abstract of results.

Station	Height	γ_0	Corrections			γ_B	g	$g-\gamma_B$
			for height	for mass (Bouguer)	orographical			
	feet	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*
Bangalore ...	3118	978·292	−0·292	+0·105	0	978·105	978·025	−0·080
Mysore ...	2501	978·265	−0·234	+0·084	0	978·115	978·045	−0·070
Edgar Shaft (*Surface*) ...	2945	978·288	−0·276	+0·099	0	978·111	978·076	−0·035
Edgar Shaft (*Underground*) ...	328	978·288	−0·031	+0·011	−0·082	978·186	978·133	−0·053
Salem ...	948	978·241	−0·089	+0·032	0	978·184	978·116	−0·068
Yercaud ...	4493	978·245	−0·420	+0·151	−0·011	977·965	977·908	−0·057
Ootacamund ...	7395	978·232	−0·692	+0·248	−0·007	977·781	977·735	−0·046
Kodaikānal ...	7665	978·193	−0·717	+0·257	−0·011	977·722	977·643	−0·079

It will be at once noted that the values of $g-\gamma_B$ at the South Indian hill stations are much less than at the Himalayan stations given in Chapter I, though the heights are much the same. We have seen, however, that the deficiency of gravity at sub-montane stations such as Dehra Dūn and Siliguri is nearly as great as at hill stations such as Mussooree and Darjeeling. The deficiency of gravity under a mountain mass, therefore, seems to extend beyond the limits of the mass and consequently the deficiencies at Mussooree and Darjeeling are probably more appropriate to a general altitude of 14000 to 15000 feet. In South India, however, the stations are at a height greater than that of the surrounding country and for this reason we should expect the deficiencies of gravity to be smaller.

The difference in residual between the two Edgar Shaft stations seems to point to the local masses being of greater density than 2·67. If we assume a density of 2·94 and thus obtain new values of the mass and orographical corrections, the values of $g-\gamma_B$ at both stations will be −0·046.

CHAPTER III.

The Pendulum Operations in 1908-09.

The area selected for pendulum operations during the winter of 1908-09 was the western portion of Central India, the stations visited lying, for the most part, in the Sātpura and Vindhyan hill tracts.

The reason for the selection of this locality was to attempt to define more accurately the limits of the belt of high density, the existence of which had been deduced by Colonel Burrard in 1901 from an examination of the deflections of the plumb line. These deflections had also indicated the existence of a tract, stretching from west of Ahmedābād to Mhow, where gravity is probably in defect, and observations were made to define this area also.

Of the stations visited, Ujjain and Mhow are on the Vindhyan plateau, and Asirgarh, Badnūr and Shāhpur in the Sātpura hills. Mukhtiāra, Mortakka and Hoshangābād are in the Narbada valley and Jalgaon in that of the Tāpti. Khandwa lies between the two rivers in a gap of the Sātpura hills. Amraoti and Ellichpur are on the Berār plains south of the Sātpuras.

For the greater part, the stations lie upon, or close to, the edge of the Deccan trap. Generally speaking, the trap to the north of the Narbada overlies Vindhyan beds while to the south, there is, presumably, the gneiss of peninsular India.

The observations throughout the season were made by Captain H. M. Cowie, R.E.

The descriptions of the stations are given below:—

Ujjain.

Latitude	...	23° 11′ 0″
Longitude	...	75° 47′ 0″
Height	...	1612 feet.

The pendulum apparatus was set up in the two small rooms at the eastern corner of the dāk bungalow. The building is opposite the Mahādeo College about ¼ mile from the railway station. The room in which the pendulums were swung is approximately 17 feet by 11 feet. The pendulum station was connected by spirit levelling with the B.B. & C.I. Railway level at the railway station.

Mhow.

Latitude	...	22° 33′ 10″
Longitude	...	75° 45′ 40″
Height	...	1903 feet.

The pendulum apparatus was set up in the small room, about 16½ feet by 8 feet, at the N.E. corner of the Honorary Magistrate's court, adjoining the Cantonment Magistrate's court. The floor of the pendulum room was connected with the G.T.S. bench-mark at the corner of the refreshment-room godown at the railway station by spirit levelling.

Mukhtiara.

Latitude	...	22° 23′ 40″
Longitude	...	75° 58′ 40″
Height	...	926 feet.

The pendulums were swung in the smaller, the northern, of the two rooms of the dāk bungalow, about 1 mile north of the railway station, situated on rising ground close to the level crossing. The observatory is close to the railway line which here runs in a cutting to the west. In consequence either of the trap rock on which the building stands or of the fact that the observatory is about 24 feet higher than the railway, the pendulums did not seem to be affected by any vibration due to passing trains. The floor of the pendulum room was connected with rail level at the centre of the station by spirit levelling.

Mortakka.

Latitude	...	22° 13′ 20″
Longitude	...	76° 2′ 50″
Height	...	576 feet.

The pendulums were swung in the southernmost of the two larger rooms of the house belonging to Seth Champa Lal of Sanāwād situated about ¼ mile north of the railway station on the west of the road from the railway station to the Narbada river. Before its present owner acquired it, this used to be a rest-house. Levels were run from rail level opposite the centre of the station building to the floor of the pendulum room.

Khandwa.

Latitude	...	21° 49′ 30″
Longitude	...	76° 21′ 30″
Height	...	1014 feet.

The pendulums were swung in the room at the northern end of Bungalow No. 23 belonging to the B.B. & C.I. Railway. It is about 200 yards south of the building known as the Convent and about 300 yards N.W. from the Masonic Lodge. The floor of the pendulum room was connected by spirit levelling with rail level at Khandwa railway station (Down line).

Asirgarh.

Latitude	...	21° 28′ 10″
Longitude	...	76° 17′ 50″
Height	...	2077 feet.

The pendulums were swung in the western room of the inspection bungalow in the fort on the summit of Asirgarh hill, 6 miles (to foot of hill) from Chāndni station on the G.I.P. Railway. The floor of the pendulum room was connected by spirit levelling with rail level at Chāndni station. The inspection bungalow is close to the tank and the Sally Port at the eastern end of the fort.

Jalgaon.

Latitude	...	21° 0′ 0″
Longitude	...	75° 33′ 50″
Height	...	760 feet.

The pendulums were swung in the room used as an office by the 1st Assistant Collector in the office of the Collector of East Khāndesh. The floor of the pendulum room was connected by spirit levelling with the G.T.S. bench-mark at Jalgaon railway station.

Amraoti.

Latitude	...	20° 55′ 50″
Longitude	...	77° 45′ 40″
Height	...	1123 feet.

The pendulums were swung in the western room of the dāk bungalow. The floor of the pendulum room was connected by spirit levelling with the G.T.S. bench-mark at the railway station.

Ellichpur.

Latitude	...	21° 18′ 20″
Longitude	...	77° 30′ 40″
Height	...	1314 feet.

The pendulums were swung in the old guard-room about 100 yards S.W. of the circuit house. This is a small two roomed building, the outside dimensions of which are 19¼ feet by 25 feet excluding verandah. The pendulum room is 16 feet by 12 feet. The floor of the room was connected by spirit levelling with the P.W.D. bench-mark at the Camp post office. The roof was not weather-proof and satisfactory control of the temperature impossible. The floor is of small stone slabs set in asphalte which yield as one walks over them. One side of the building gets the direct rays of the sun till midday. The other side is sheltered by trees growing close to the building. It was found that the level of the pedestal varied systematically during the 24 hours, the range of change being about one quarter of a minute of arc. High and gusty winds blew at night and tremors were communicated to the floor, doubtless by the roots of the trees.

Hoshangabad.

Latitude	...	22° 45′ 0″
Longitude	...	77° 43′ 50″
Height	...	1002 feet.

The pendulums were swung in the smaller of the two larger reception rooms of a large bungalow belonging to Sheikh Muhammad Fazal of Hoshangābād situated close to the jail. The floor of the pendulum room was connected by spirit levelling with a P.W.D. bench-mark.

Shahpur.

Latitude	...	22° 11′ 30″
Longitude	...	77° 54′ 10″
Height	...	1286 feet.

The pendulums were swung in the eastern room of the dāk bungalow to the S.W. of the village. The floor of the pendulum room was connected by spirit levelling with one of the Railway Construction bench-marks.

Badnur.

Latitude	...	21° 54′ 10″
Longitude	...	77° 54′ 10″
Height	...	2103 feet.

The pendulums were swung in the most westerly of a row of "Bells of Arms" now disused, built in a line running east from the dāk bungalow, across the triangular shaped *maidan* enclosed between the roads from the native city to the post office and to the Sadr Bāzār. The inside dimension of the Bell of Arms is about 12 feet square. The floor of the pendulum room was connected by spirit levelling with one of the Railway Construction bench-marks.

Thanks to the kindness of local officials, masonry buildings were available at all the stations. At most of these the temperature could be easily controlled, the exceptions being Ellichpur and Badnūr where the rooms were small and isolated, and Asirgarh on account of the prevailing high wind.

Flexure observations were made before and after work at each station, at least two sets being made on each occasion. The correction remained very steady at each place. Table I shows the mean of each set of observations and the values used in correcting the time of vibration.

Table I.—Flexure correction.

Station	Date	Means before and after work 10^{-7} secs.	Adopted Correction 10^{-7} secs.
Dehra Dūn ...	December 2, 1908 " 18	−45·2 44·5	−45
Ujjain ...	December 31 January 4, 1909	−51·3 50·8	−51
Mhow ...	January 8 " 12	−36·9 37·7	−37
Mukhtiāra ...	January 15 " 19	−47·0 44·9	−46
Mortakka ...	January 22 " 26	−68·7 66·2	−68
Khandwa ...	January 29 February 2	−52·1 51·9	−52
Asirgarh ...	February 7 " 13	−46·2 45·8	−46
Jalgaon ...	February 18 " 24	−39·3 38·5	−39
Amraoti ...	March 1 " 7	−44·9 44·6	−45
Ellichpur ...	March 13 " 16	−50·3 49·9	−50
Hoshangābād ...	March 26 " 30	−54·1 51·7	−53
Shāhpur ...	April 4 " 7	−52·6 51·8	−52
Badnūr ...	April 11 " 14	−44·3 42·7	−44
Dehra Dūn ...	April 29 May 3	−38·4 37·3	−38

The time observations throughout the season were made by Mr. Hanumān Prasād, the mean p. e. of the clock rate being $\pm 0·012$ sec.

The details of the observations are given in Table II.

Table II.—Details of the Observations.

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Correction on account of: Arc	Correction on account of: Temperature	Correction on account of: Density of Air	Correction on account of: Flexure	Reduced Time of Vibration
Dehra Dun.															
		h m	s	s	′	°	°		s						s
14th	137	1 51	34·538	− 7·71	18	15·44	+0·14	0·878	0·5073449	+ 453	− 9	− 757	−522	−45	0·5072569
Dec.	139	2 55	34·989	7·71	19	15·58	0·14	0·876	0·5072487	453	10	763	531	45	0·5071591
1908	138	4 1	33·451	7·71	14	15·73	0·14	0·876	0·5075870	453	5	771	501	45	0·5075001
Night	140	4 55	35·333	7·71	19	15·85	0·14	0·875	0·5071772	453	10	777	530	45	0·5070863
													Mean	...	0·5072506
15th	137	13 51	34·550	− 7·71	19	14·95	+0·17	0·879	0·5073421	+ 453	−10	− 733	−522	−45	0·5072564
Dec.	139	14 54	35·005	7·71	20	15·15	0·17	0·878	0·5072452	453	11	742	532	45	0·5071575
Day	138	16 1	33·456	7·71	21	15·32	0·17	0·877	0·5075858	453	12	751	502	45	0·5075001
	140	16 55	35·341	7·71	19	15·46	0·17	0·874	0·5071755	453	10	758	530	45	0·5070865
													Mean	...	0·5072501
													Mean of Day and Night	...	**0·5072504**
15th	140	1 50	35·338	− 7·66	19	15·60	+0·11	0·874	0·5071762	+ 450	−10	− 764	−530	−45	0·5070863
Dec.	138	2 45	33·454	7·66	20	15·74	0·11	0·874	0·5075862	450	11	771	500	45	0·5074985
Night	139	3 43	34·990	7·66	19	15·82	0·11	0·874	0·5072485	450	10	775	530	45	0·5071575
	137	4 41	34·528	7·66	18	15·91	0·11	0·874	0·5073470	450	9	780	519	45	0·5072567
													Mean	...	0·5072497
16th	140	13 50	35·359	− 7·66	19	14·96	+0·20	0·877	0·5071717	+ 450	−10	− 733	−531	−45	0·5070848
Dec.	138	14 52	33·463	7·66	20	15·19	0·20	0·875	0·5075843	450	11	744	501	45	0·5074992
Day	139	15 53	35·008	7·66	20	15·39	0·20	0·873	0·5072447	450	11	754	529	45	0·5071558
	137	16 51	34·534	7·66	18	15·55	0·20	0·873	0·5073457	450	9	762	519	45	0·5072572
													Mean	...	0·5072493
													Mean of Day and Night	...	**0·5072495**
16th	137	1 49	34·532	− 7·48	18	15·56	+0·13	0·874	0·5073460	+ 439	− 9	− 762	−519	−45	0·5072564
Dec.	139	2 44	34·989	7·48	19	15·68	0·13	0·874	0·5072487	439	10	768	530	45	0·5071573
Night	138	3 44	33·449	7·48	20	15·78	0·13	0·873	0·5075875	439	11	773	499	45	0·5074986
	140	4 37	35·324	7·48	19	15·93	0·13	0·872	0·5071788	439	10	781	528	45	0·5070863
													Mean	...	0·5072496
17th	137	13 52	34·544	− 7·48	17	14·96	+0·21	0·878	0·5073435	+ 439	− 8	− 733	−522	−45	0·5072566
Dec.	139	14 49	35·001	7·48	19	15·16	0·21	0·877	0·5072462	439	10	743	531	45	0·5071572
Day	138	15 48	33·456	7·48	20	15·37	0·21	0·874	0·5075860	439	11	753	500	45	0·5074990
	140	16 40	35·331	7·48	19	15·55	0·21	0·874	0·5071775	439	10	762	530	45	0·5070867
													Mean	...	0·5072499
													Mean of Day and Night	...	**0·5072498**
17th	140	2 1	35·329	− 7·50	19	15·57	+0·14	0·873	0·5071780	+ 440	−10	− 763	−529	−45	0·5070873
Dec.	138	2 59	33·439	7·50	20	15·73	0·14	0·873	0·5075899	440	11	771	499	45	0·5075013
Night	139	3 57	34·989	7·50	19	15·86	0·14	0·872	0·5072487	440	10	777	528	45	0·5071567
	137	4 50	34·514	7·50	18	15·95	0·14	0·871	0·5073498	440	9	782	517	45	0·5072585
													Mean	...	0·5072510
18th	140	14 1	35·358	− 7·50	18	14·89	+0·18	0·875	0·5071718	+ 440	− 9	− 730	−530	−45	0·5070844
Dec.	138	14 58	33·463	7·50	19	15·08	0·18	0·874	0·5075843	440	10	739	500	45	0·5074989
Day	139	15 56	35·011	7·50	19	15·25	0·18	0·874	0·5072441	440	10	747	530	45	0·5071549
	137	16 50	34·540	7·50	18	15·40	0·18	0·872	0·5073443	440	9	755	518	45	0·5072556
													Mean	...	0·5072484
													Mean of Day and Night	...	**0·5072497**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
							Ujjain.								
		h m	s	s	′	°	°		s						s
31st	137	3 14	34·413	−24·73	17	20·54	+0·14	0·879	0·5073717	+1452	−8	−1006	−522	−51	0·5073582
Dec.	139	4 11	34·879	24·73	19	20·71	0·14	0·878	0·5072718	1452	10	1015	532	51	0·5072562
1908	138	5 14	33·343	24·73	20	20·85	0·14	0·877	0·5076118	1452	11	1022	502	51	0·5075984
Night	140	6 9	35·206	24·73	18	20·93	0·14	0·877	0·5072036	1452	9	1026	531	51	0·5071871
													Mean	...	0·5073500
1st	137	15 14	34·428	−24·73	17	20·05	+0·08	0·882	0·5073685	+1452	−8	−982	−524	−51	0·5073572
Jan.	139	16 11	34·800	24·73	20	20·07	0·08	0·882	0·5072697	1452	11	983	534	51	0·5072570
1909	138	17 12	33·360	24·73	20	20·13	0·08	0·881	0·5076081	1452	11	986	504	51	0·5075981
Day	140	18 9	35·222	24·73	19	20·29	0·08	0·880	0·5072000	1452	10	994	533	51	0·5071864
													Mean	...	0·5073497
													Mean of Day and Night	...	**0·5073498**
1st	140	3 16	35·196	−24·73	19	21·30	+0·03	0·876	0·5072053	+1452	−10	−1044	−531	−51	0·5071869
Jan.	138	4 13	33·331	24·73	20	21·34	0·03	0·876	0·5076148	1452	11	1046	501	51	0·5075991
Night	139	5 13	34·855	24·73	16	21·36	0·03	0·876	0·5072770	1452	7	1047	531	51	0·5072586
	137	6 11	34·395	24·73	18	21·38	0·03	0·874	0·5073758	1452	9	1048	519	51	0·5073583
													Mean	...	0·5073507
2nd	140	15 17	35·225	−24·73	19	20·29	+0·06	0·880	0·5071996	+1452	−10	−994	−533	−51	0·5071860
Jan.	138	16 13	33·356	24·73	20	20·31	0·06	0·879	0·5076091	1452	11	995	503	51	0·5075983
Day	139	17 13	34·882	24·73	19	20·35	0·06	0·878	0·5072712	1452	10	997	532	51	0·5072574
	137	18 11	34·419	24·73	17	20·48	0·06	0·875	0·5073705	1452	8	1004	520	51	0·5073574
													Mean	...	0·5073498
													Mean of Day and Night	...	**0·5073503**
2nd	137	3 17	34·384	−24·54	17	21·83	+0·04	0·871	0·5073781	+1440	−8	−1070	−517	−51	0·5073575
Jan.	139	4 16	34·845	24·54	19	21·87	0·04	0·871	0·5072790	1440	10	1072	528	51	0·5072569
Night	138	5 16	33·317	24·54	20	21·92	0·04	0·871	0·5076180	1440	11	1074	498	51	0·5075986
	140	6 11	35·181	24·54	19	21·93	0·04	0·871	0·5072086	1440	10	1075	528	51	0·5071862
													Mean	...	0·5073498
3rd	137	15 17	34·403	−24·54	17	21·12	+0·17	0·875	0·5073740	+1440	−8	−1035	−520	−51	0·5073566
Jan	139	16 16	34·864	24·54	19	21·16	0·17	0·875	0·5072750	1440	10	1037	530	51	0·5072562
Day	138	17 17	33·329	24·54	20	21·35	0·17	0·872	0·5076151	1440	11	1046	499	51	0·5075984
	140	18 12	35·189	24·54	18	21·56	0·17	0·870	0·5072068	1440	9	1056	527	51	0·5071865
													Mean	..	0·5073494
													Mean of Day and Night	...	**0·5073496**
3rd	140	3 20	34·166	−24·42	18	22·35	+0·06	0·871	0·5072117	+1433	−9	−1095	−528	−51	0·5071867
Jan.	138	4 18	33·304	24·42	20	22·42	0·06	0·870	0·5076210	1433	11	1099	498	51	0·5075984
Night	139	5 18	34·832	24·42	19	22·51	0·06	0·870	0·5072817	1433	10	1103	527	51	0·5072559
	137	6 24	34·362	24·42	18	22·53	0·06	0·870	0·5073828	1433	9	1104	517	51	0·5073580
													Mean	...	0·5073498
4th	140	15 21	35·190	−24·42	22	21·40	+0·06	0·876	0·5072068	+1433	−13	−1049	−531	−51	0·5071857
Jan.	138	16 21	33·324	24·42	20	21·44	0·06	0·876	0·5076166	1433	11	1051	501	51	0·5075985
Day	139	17 19	34·857	24·42	19	21·51	0·06	0·874	0·5072766	1433	10	1054	530	51	0·5072554
	137	18 23	34·387	24·42	18	21·57	0·06	0·873	0·5073775	1433	9	1057	519	51	0·5073572
													Mean	...	0·5073492
													Mean of Day and Night	...	**0·5073495**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature		Density of Air	Observed Time of Vibration	Correction on account of					Reduced Time of Vibration
						Corrected Mean	Mean Change per hour			Clock Rate	Arc	Temperature	Density of Air	Flexure	
						Mhow.									
		h m	s	s	′	c	°		s						s
8th	137	5 17	34·454	−27·47	21	19·52	0·00	0·871	0·5073629	+1612	−12	−956	−517	−37	0·5073719
Jan	139	6 13	34·914	27·47	22	19·58	0·00	0·871	0·5072646	1612	13	959	528	37	0·5072721
1909	138	7 17	33·382	27·47	23	19·55	0·00	0·872	0·5076030	1612	14	958	499	37	0·5076134
Night	140	8 14	35·253	27·47	22	19·52	0·00	0·871	0·5071935	1612	13	956	528	37	0·5072013
													Mean	...	0·5073647
9th	137	17 17	34·489	−27·47	21	18·23	+0·36	0·874	0·5073553	+1612	−12	−893	−519	−37	0·5073704
Jan.	139	18 21	34·936	27·47	22	18·58	0·36	0·872	0·5072600	1612	13	910	528	37	0·5072724
Day	138	19 20	33·394	27·47	23	18·96	0·36	0·870	0·5076002	1612	14	929	498	37	0·5076136
	140	20 21	35·255	27·47	22	19·30	0·36	0·869	0·5071933	1612	13	946	527	37	0·5072022
													Mean	...	0·5073647
													Mean of Day and Night	...	**0·5073647**
9th	140	4 41	35·259	−27·33	21	19·39	+0·15	0·871	0·5071923	+1604	−12	−950	−528	−37	0·5072000
Jan.	138	5 45	33·381	27·33	17	19·54	0·15	0·869	0·5076031	1604	8	957	497	37	0·5076136
Night	139	6 45	34·907	27·33	22	19·71	0·15	0·868	0·5072658	1604	13	966	526	37	0·5072720
	137	7 45	34·450	27·33	11	19·81	0·15	0·868	0·5073638	1604	3	971	516	37	0·5073715
													Mean	...	0·5073643
10th	140	16 40	35·303	−27·33	21	18·80	+0·38	0·872	0·5071833	+1604	−12	−921	−528	−37	0·5071939
Jan.	138	17 45	33·377	27·33	22	19·22	0·38	0·869	0·5076042	1604	13	942	497	37	0·5076157
Day	139	18 47	34·900	27·33	22	19·61	0·38	0·866	0·5072675	1604	13	961	525	37	0·5072743
	137	19 45	34·433	27·33	20	19·93	0·38	0·865	0·5073675	1604	11	977	514	37	0·5073740
													Mean	...	0·5073645
													Mean of Day and Night	...	**0·5073644**
10th	137	4 58	34·439	−27·03	20	19·89	+0·18	0·868	0·5073661	+1587	−11	−975	−516	−37	0·5073709
Jan.	139	5 56	34·895	27·03	22	20·00	0·18	0·868	0·5072685	1587	13	980	526	37	0·5072716
Night	138	7 0	33·356	27·03	23	20·27	0·18	0·867	0·5076091	1587	14	993	496	37	0·5076138
	140	7 58	35·220	27·03	21	20·36	0·18	0·865	0·5072005	1587	12	998	524	37	0·5072021
													Mean	...	0·5073646
11th	137	16 58	34·441	−27·03	19	19·73	+0·31	0·872	0·5073658	+1587	−10	−967	−518	−37	0·5073713
Jan.	139	17 55	34·898	27·03	21	19·93	0·31	0·870	0·5072680	1587	12	977	527	37	0·5072714
Day	138	19 2	33·356	27·03	23	20·32	0·31	0·867	0·5076091	1587	14	996	496	37	0·5076135
	140	19 58	35·217	27·03	21	20·60	0·31	0·866	0.5072010	1587	12	1009	525	37	0·5072014
													Mean	...	0·5073644
													Mean of Day and Night	...	**0·5073645**
11th	140	4 45	35·235	−27·22	21	20·01	+0·03	0·871	0·5071975	+1598	−12	−980	−528	−37	0·5072016
Jan.	138	5 41	33·363	27·22	22	20·11	0·03	0·871	0·5076075	1598	13	985	498	37	0·5076140
Night	139	6 40	34·891	27·22	22	20·11	0·03	0·871	0·5072695	1598	13	985	528	37	0·5072730
	137	7 36	34·435	27·22	21	20·10	0·03	0·871	0·5073671	1598	12	985	517	37	0·5073718
													Mean	...	0·5073651
12th	140	16 48	35·276	−27·22	21	18·39	+0·28	0·878	0·5071888	+1598	−12	−901	−532	−37	0·5072004
Jan.	138	17 47	33·394	27·22	22	18·70	0·28	0·876	0·5076002	1598	13	916	501	37	0·5076133
Day	139	18 44	34·922	27·22	22	18·97	0·28	0·875	0·5072629	1598	13	930	530	37	0·5072717
	137	19 40	34·460	27·22	20	19·22	0·28	0·872	0·5073616	1598	11	942	518	37	0·5073706
													Mean	...	0·5073640
													Mean of Day and Night	...	**0·5073646**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Mukhtiara.						
		h m	s	s	′	°	°		s						s
15th	137	3 37	34·345	−25·97	19	24·41	−0·02	0·885	0·5073867	+1524	−10	−1196	−526	−46	0·5073613
Jan.	139	4 34	34·801	25·97	2:	24·42	0·02	0·888	0·5072882	1524	12	1197	538	46	0·5072613
1909	138	5 47	33·277	25·97	22	24·42	0·02	0·888	0·5076272	1524	13	1197	508	46	0·5076032
Night	140	6 50	35·144	25·97	20	24·33	0·02	0·888	0·5072163	1524	11	1192	538	46	0·5071900
													Mean	...	0·5073540
16th	137	15 38	34·385	−25·97	19	23·01	+0·09	0·892	0·5073780	+1524	−10	−1127	−530	−46	0·5073591
Jan.	139	16 36	34·844	25·97	21	22·97	0·09	0·893	0·5072792	1524	12	1126	541	46	0·5072591
Day	138	17 48	33·315	25·97	22	23·10	0·09	0·891	0·5076185	1524	13	1132	510	46	0·5076008
	140	18 50	35·170	25·97	21	23·29	0·09	0·889	0·5072108	1524	12	1141	539	46	0·5071894
													Mean	...	0·5073521
													Mean of Day and Night	...	**0·5073530**
16th	140	3 36	35·125	−25·47	21	24·83	+0·07	0·882	0·5072202	+1495	−12	−1217	−534	−46	0·5071888
Jan.	138	4 30	33·264	25·47	22	24·93	0·07	0·882	0·5076302	1495	13	1222	505	46	0·5076011
Night	139	5 34	34·789	25·47	21	25·00	0·07	0·882	0·5072909	1495	12	1225	534	46	0·5072587
	137	6 35	34·328	25·47	20	25·03	0·07	0·882	0·5073902	1495	11	1226	524	46	0·5073590
													Mean	...	0·5073519
17th	140	15 39	35·152	−25·47	20	23·64	+0·01	0·890	0·5072147	+1495	−11	−1158	−539	−46	0·5071888
Jan.	138	16 36	33·288	25·47	22	23·55	0·01	0·889	0·5076249	1495	13	1154	509	46	0·5076022
Day	139	17 35	34·814	25·47	21	23·57	0·01	0·889	0·5072858	1495	12	1155	539	46	0·5072601
	137	18 36	34·355	25·47	20	23·68	0·01	0·889	0·5073843	1495	11	1160	528	46	0·5073593
													Mean	...	0·5073526
													Mean of Day and Night	...	**0·5073523**
17th	137	3 33	34·328	−25·69	20	24·54	−0·07	0·883	0·5073905	+1508	−11	−1202	−525	−46	0·5073629
Jan.	139	4 28	34·783	25·69	21	24·56	0·07	0·884	0·5072921	1508	12	1203	536	46	0·5072632
Night	138	5 35	33·267	25·69	22	24·47	0·07	0·885	0·5076297	1508	13	1199	506	46	0·5076041
	140	6 29	35·131	25·69	20	24·34	0·07	0·886	0·5072190	1508	11	1193	537	46	0·5071911
													Mean	...	0·5073553
18th	137	15 33	34·382	−25·69	19	22·43	+0·16	0·892	0·5073785	+1508	−10	−1099	−530	−46	0·5073608
Jan.	139	16 28	34·844	25·69	21	22·54	0·16	0·892	0·5072793	1508	12	1104	541	46	0·5072598
Day	138	17 34	33·305	25·69	22	22·71	0·16	0·892	0·5076206	1508	13	1113	510	46	0·5076032
	140	18 30	35·173	25·69	21	22·89	0·16	0·890	0·5072103	1508	12	1122	539	46	0·5071891
													Mean	...	0·5073533
													Mean of Day and Night	...	**0·5073543**
18th	140	3 38	35·188	−27·51	21	24·34	+0·02	0·884	0·5072071	+1615	−12	−1193	−536	−46	0·5071899
Jan.	138	4 38	33·320	27·51	22	24·36	0·02	0·885	0·5076172	1615	13	1194	506	46	0·5076028
Night	139	5 38	34·849	27·51	21	24·38	0·02	0·885	0·5072782	1615	12	1195	536	46	0·5072608
	137	6 37	34·391	27·51	20	24·38	0·02	0·884	0·5073767	1615	11	1195	525	46	0·5073605
													Mean	...	0·5073535
19th	140	15 38	35·238	−27·51	20	22·67	+0·12	0·893	0·5071968	+1615	−11	−1111	−541	−46	0·5071874
Jan.	138	16 38	33·362	27·51	21	22·73	0·12	0·892	0·5076077	1615	12	1114	510	46	0·5076010
Day	139	17 35	34·884	27·51	21	22·85	0·12	0·892	0·5072708	1615	12	1120	541	46	0·5072604
	137	18 34	34·423	27·51	20	22·99	0·12	0·891	0·5073697	1615	11	1127	529	46	0·5073599
													Mean	...	0·5073522
													Mean of Day and Night	...	**0·5073528**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Mortakka.						
		h m	s	s	′	°	°		s						s
22nd Jan. 1909 Night	137	4 30	34·347	−24·72	17	24·72	+0·11	0·896	0·5073861	+1451	−8	−1211	−532	−68	0·5073493
	139	5 29	34·800	24·72	17	24·82	0·11	0·895	0·5072886	1451	8	1216	542	68	0·5072503
	138	6 30	33·271	24·72	18	24·94	0·11	0·895	0·5076288	1451	9	1222	512	68	0·5075928
	140	7 26	35·127	24·72	17	25·03	0·11	0·895	0·5072199	1451	8	1226	542	68	0·5071806
													Mean	...	0·5073433
23rd Jan. Day	137	16 31	34·360	−24·72	16	23·81	+0·23	0·902	0·5073835	+1451	−7	−1167	−536	−68	0·5073508
	139	17 28	34·818	24·72	17	23·98	0·23	0·901	0·5072849	1451	8	1175	546	68	0·5072503
	138	18 33	33·288	24·72	18	24·28	0·23	0·899	0·5076248	1451	9	1190	514	68	0·5075918
	140	19 31	35·137	24·72	17	24·47	0·23	0·897	0·5072178	1451	8	1199	544	68	0·5071810
													Mean	...	0·5073435
										Mean of Day and Night				...	**0·5073434**
23rd Jan. Night	140	4 30	35·130	−24·57	17	24·85	+0·09	0·895	0·5072191	+1442	−8	−1218	−542	−68	0·5071797
	138	5 29	33·274	24·57	18	24·94	0·09	0·895	0·5076280	1442	9	1222	512	68	0·5075911
	139	6 26	34·793	24·57	17	25·03	0·09	0·895	0·5072901	1442	8	1226	542	68	0·5072499
	137	7 24	34·328	24·57	16	25·11	0·09	0·895	0·5073903	1442	7	1230	532	68	0·5073508
													Mean	...	0·5073429
24th Jan. Day	140	16 31	35·155	−24·57	17	23·91	+0·20	0·900	0·5072141	+1442	−8	−1172	−545	−68	0·5071790
	138	17 29	33·294	24·57	18	24·10	0·20	0·899	0·5076233	1442	9	1181	514	68	0·5075903
	139	18 33	34·810	24·57	17	24·31	0·20	0·896	0·5072865	1442	8	1191	543	68	0·5072497
	137	19 29	34·338	24·57	16	24·50	0·20	0·896	0·5073883	1442	7	1201	532	68	0·5073517
													Mean	...	0·5073427
										Mean of Day and Night				...	**0·5073428**
24th Jan. Night	137	4 17	34·334	−24·53	16	25·11	+0·02	0·893	0·5073892	+1440	−7	−1230	−530	−68	0·5073497
	139	5 13	34·792	24·53	18	25·12	0·02	0·893	0·5072905	1440	9	1231	541	68	0·5072496
	138	6 15	33·267	24·53	18	25·16	0·02	0·892	0·5076297	1440	9	1233	510	68	0·5075917
	140	7 10	35·119	24·53	17	25·17	0·02	0·893	0·5072215	1440	8	1233	541	68	0·5071805
													Mean	...	0·5073429
25th Jan. Day	137	16 21	34·350	−24·53	16	24·33	+0·22	0·899	0·5073856	+1440	−7	−1192	−534	−68	0·5073495
	139	17 17	34·803	24·53	17	24·49	0·22	0·897	0·5072881	1440	8	1200	544	68	0·5072501
	138	18 27	33·284	24·53	13	24·78	0·22	0·896	0·5076257	1440	5	1214	513	68	0·5075897
	140	19 21	35·124	24·53	17	24·93	0·22	0·895	0·5072205	1440	8	1222	542	68	0·5071805
													Mean	...	0·5073425
										Mean of Day and Night				...	**0·5073427**
25th Jan. Night	140	4 14	35·111	−24·52	17	25·42	−0·04	0·893	0·5072232	+1439	−8	−1246	−541	−68	0·5071808
	138	5 10	33·261	24·52	18	25·45	0·04	0·893	0·5076309	1439	9	1247	511	68	0·5075913
	139	6 9	34·781	24·52	15	25·40	0·04	0·893	0·5072927	1439	6	1245	541	68	0·5072506
	137	7 5	34·322	24·52	16	25·34	0·04	0·893	0·5073916	1439	7	1242	530	68	0·5073508
													Mean	...	0·5073434
26th Jan. Day	140	16 16	35·147	−24·52	17	24·23	+0·19	0·897	0·5072156	+1439	−8	−1187	−544	−68	0·5071788
	138	17 12	33·291	24·52	18	24·34	0·19	0·896	0·5076240	1439	9	1193	513	68	0·5075896
	139	18 10	34·801	24·52	17	24·55	0·19	0·896	0·5072885	1439	8	1203	543	68	0·5072502
	137	19 6	34·338	24·52	16	24·75	0·19	0·894	0·5073882	1439	7	1213	531	68	0·5073502
													Mean	...	0·5073422
										Mean of Day and Night				...	**0·5073428**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Khandwa.															
		h m	s	s	′	°	°		s						s
29th	137	4 33	34·475	−24·95	16	19·06	+0·09	0·899	0·5073585	+1465	−7	−934	−534	−52	0·5073523
Jan.	139	5 29	34·921	24·05	18	19·14	0·09	0·898	0·5072630	1465	9	938	544	52	0·5072552
1909	138	6 32	33·391	24·05	19	19·25	0·09	0·899	0·5076008	1465	10	943	514	52	0·5075954
Night	140	7 27	35·257	24·95	18	19·29	0·09	0·899	0·5071927	1465	9	945	545	52	0·5071841
													Mean	...	0·5073468
30th	137	16 39	34·540	−24·95	17	16·62	+0·30	0·908	0·5073443	+1465	−8	−814	−539	−52	0·5073495
Jan.	139	17 37	34·981	24·95	18	16·83	0·30	0·907	0·5072503	1465	9	825	550	52	0·5072532
Day	138	18 41	33·448	24·95	18	17·16	0·30	0·905	0·5075878	1465	9	841	518	52	0·5075923
	140	19 38	35·310	24·95	17	17·49	0·30	0·904	0·5071820	1465	8	857	548	52	0·5071820
													Mean	...	0·5073442
										Mean of Day and Night				...	**0·5073455**
30th	140	4 26	35·248	−25·25	19	19·72	0·00	0·895	0·5071948	+1482	−10	−966	−542	−52	0·5071860
Jan.	138	5 25	33·384	25·25	19	19·76	0·00	0·895	0·5076025	1482	10	968	512	52	0·5075965
Night	139	6 31	34·928	25·25	18	19·73	0·00	0·897	0·5072615	1482	9	967	544	52	0·5072525
	137	7 29	34·475	25·25	18	19·72	0·00	0·897	0·5073585	1482	9	966	533	52	0·5073507
													Mean	...	0·5073464
31st	140	16 31	35·338	−25·25	18	16·87	+0·22	0·908	0·5071760	+1482	−9	−827	−550	−52	0·5071804
Jan.	138	17 27	33·457	25·25	19	17·05	0·22	0·906	0·5075857	1482	10	835	518	52	0·5075924
Day	139	18 28	34·980	25·25	19	17·33	0·22	0·905	0·5072506	1482	10	849	548	52	0·5072529
	137	19 28	34·502	25·25	18	17·90	0·22	0·901	0·5073523	1482	9	877	535	52	0·5073532
													Mean	...	0·5073447
										Mean of Day and Night				...	**0·5073456**
31st	137	4 18	34·470	−25·26	17	19·63	+0·04	0·896	0·5073595	+1483	−8	−962	−532	−52	0·5073524
Jan.	139	5 27	34·916	25·26	20	19·72	0·04	0·896	0·5072640	1483	11	966	543	52	0·5072551
Night	138	6 26	33·387	25·26	20	19·76	0·04	0·896	0·5076018	1483	11	968	513	52	0·5075957
	140	7 19	35·249	25·26	18	19·75	0·04	0·897	0·5071946	1483	9	968	544	52	0·5071856
													Mean	...	0·5073472
1st	137	16 22	34·536	−25·26	17	17·01	+0·21	0·907	0·5073452	+1483	−8	−833	−539	−52	0·5073503
Feb.	139	17 18	34·985	25·26	18	17·16	0·21	0·907	0·5072495	1483	9	841	550	52	0·5072526
Day	138	18 18	33·462	25·26	18	17·36	0·21	0·907	0·5075846	1483	9	851	519	52	0·5075898
	140	19 11	35·321	25·26	18	17·59	0·21	0·906	0·5071796	1483	9	862	549	52	0·5071807
													Mean	...	0·5073434
										Mean of Day and Night				...	**0·5073453**
1st	140	4 28	35·256	−25·73	18	19·89	+0·02	0·896	0·5071929	+1510	−9	−975	−543	−52	0·5071860
Feb.	138	5 25	33·389	25·73	19	19·93	0·02	0·897	0·5076013	1510	10	977	513	52	0·5075971
Night	139	6 23	34·926	25·73	18	19·95	0·02	0·897	0·5072621	1510	9	978	544	52	0·5072548
	137	7 19	34·467	25·73	17	19·94	0·02	0·897	0·5073601	1510	8	977	533	52	0·5073541
													Mean	...	0·5073480
2nd	140	16 29	35·330	−25·73	17	17·46	+0·30	0·906	0·5071778	+1510	−8	−856	−549	−52	0·5071823
Feb.	138	17 24	33·450	25·73	18	17·66	0·30	0·905	0·5075871	1510	9	865	518	52	0·5075937
Day	139	18 23	34·977	25·73	17	17·98	0·30	0·904	0·5072511	1510	8	881	548	52	0·5072532
	137	19 19	34·516	25·73	17	18·30	0·30	0·902	0·5073495	1510	8	897	536	52	0·5073512
													Mean	...	0·5073451
										Mean of Day and Night				...	**0·5073465**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Asirgarh.							
		h m	s	s	′	°	°		s						s
8th	137	5 32	33·655	+ 0·84	17	20·04	+0·19	0·865	0·5075401	− 49	− 8	− 982	− 514	− 46	0·5073802
Feb	139	6 28	34·088	0·84	19	20·26	0·19	0·865	0·5074433	49	10	993	524	46	0·5072811
1909	138	7 26	32·628	0·84	19	20·46	0·19	0·863	0·5077815	49	10	1003	494	46	0·5076213
Night	140	8 21	34·400	0·84	18	20·56	0·19	0·863	0·5073747	49	9	1007	523	46	0·5072113
													Mean	...	0·5073735
9th	137	17 31	33·647	+ 0·84	17	20·12	+0·23	0·868	0·5075422	− 49	− 8	− 986	− 516	− 46	0·5073817
Feb	139	18 28	34·079	0·84	19	20·30	0·23	0·867	0·5074451	49	10	995	525	46	0·5072826
Day	138	19 25	32·615	0·84	19	20·54	0·23	0·864	0·5077846	49	10	1006	494	46	0·5076241
	140	20 22	34·383	0·84	19	20·74	0·23	0·863	0·5073785	49	10	1016	523	46	0·5072141
													Mean	...	0·5073756
										Mean of Day and Night				...	**0·5073746**
9th	140	5 20	34·367	+ 1·56	18	21·42	+0·14	0·861	0·5073818	− 92	− 9	− 1050	− 522	− 46	0·5072099
Feb.	138	6 15	32·596	1·56	19	21·54	0·14	0·860	0·5077892	92	10	1055	492	46	0·5076197
Night	139	7 13	34·039	1·56	19	21·71	0·14	0·860	0·5074540	92	10	1064	521	46	0·5072807
	137	8 16	33·597	1·56	18	21·82	0·14	0·860	0·5075536	92	9	1069	511	46	0·5073809
													Mean	...	0·5073728
10th	140	17 21	34·387	+ 1·56	18	20·36	+0·21	0·865	0·5073772	− 92	− 9	− 998	− 524	− 46	0·5072103
Feb.	138	18 17	32·605	1·56	19	20·50	0·21	0·866	0·5077869	92	10	1005	495	46	0·5076221
Day	139	19 14	34·055	1·56	18	20·71	0·21	0·864	0·5074503	92	9	1015	524	46	0·5072817
	137	20 16	33·612	1·56	17	20·96	0·21	0·863	0·5075502	92	8	1027	513	46	0·5073816
													Mean	...	0·5073739
										Mean of Day and Night				...	**0·5073733**
10th	137	5 16	33·593	+ 2·10	17	21·88	+0·13	0·860	0·5075547	− 123	− 8	− 1072	− 511	− 46	0·5073787
Feb	139	6 11	34·023	2·10	19	22·04	0·13	0·859	0·5074575	123	10	1080	521	46	0·5072705
Night.	138	7 19	32·572	2·10	18	22·17	0·13	0·859	0·5077949	123	9	1086	491	46	0·5076194
	140	8 14	34·338	2·10	18	22·29	0·13	0·859	0·5073882	123	9	1092	521	46	0·5072091
													Mean	...	0·5073717
11th	137	17 16	33·599	+ 2·10	17	21·33	+0·22	0·863	0·5075532	− 123	− 8	− 1045	− 513	− 46	0·5073797
Feb.	139	18 12	34·028	2·10	17	21·47	0·22	0·862	0·5074565	123	8	1052	522	46	0·5072814
Day	138	19 19	32·568	2·10	17	21·80	0·22	0·862	0·5077950	123	8	1068	493	46	0·5076221
	140	20 16	34·334	2·10	18	21·91	0·22	0·861	0·5073891	123	9	1074	522	46	0·5072117
													Mean	...	0·5073737
										Mean of Day and Night				...	**0·5073727**
11th	140	5 20	34·304	+ 2·29	18	22·99	+0·12	0·856	0·5073957	− 134	− 9	− 1127	− 519	− 46	0·5072122
Feb.	138	6 16	32·537	2·29	19	23·17	0·12	0·856	0·5078036	134	10	1135	490	46	0·5076221
Night	139	7 14	33·982	2·29	18	23·29	0·12	0·856	0·5074667	134	9	1141	519	46	0·5072818
	137	8 9	33·548	2·29	18	23·32	0·12	0·856	0·5075648	134	9	1143	508	46	0·5073808
													Mean	...	0·5073742
12th	140	17 20	34·325	+ 2·29	18	22·15	+0·22	0·860	0·5073910	− 134	− 9	− 1085	− 521	− 46	0·5072115
Feb.	138	18 16	32·558	2·29	19	22·33	0·22	0·859	0·5077985	134	10	1094	491	46	0·5076210
Day	139	19 14	34·000	2·29	19	22·53	0·22	0·858	0·5074627	134	10	1104	520	46	0·5072813
	137	20 10	33·550	2·29	17	22·76	0·22	0·857	0·5075645	134	8	1115	509	46	0·5073833
													Mean	...	0·5073743
										Mean of Day and Night				...	**0·5073743**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Asirgarh—(contd.)															
		h m	s	s	′	°	°		s						s
12th	137	5 37	33·538	+ 2·78	17	23·39	+0·18	0·852	0·5075670	− 163	− 8	−1146	−506	−46	0·5073801
Feb.	139	6 30	33·966	2·78	19	23·55	0·18	0·852	0·5074701	163	10	1154	516	46	0·5072812
Night															
13th	138	17 37	32·523	+ 2·78	19	23·20	+0·16	0·855	0·5078069	− 163	−10	−1137	−489	−46	0·5076224
Feb.	140	18 31	34·289	2·78	19	23·34	0·16	0·854	0·5073988	163	10	1144	518	46	0·5072107
Day															
													Mean of Day and Night	...	**0·5073736**
Jalgaon.															
		h m	s	s	′	°	°		s						s
18th	140	7 53	34·158	+ 5·57	16	28·69	−0·07	0·877	0·5074277	− 327	− 7	−1406	−531	−39	0·5071967
Feb.	138	8 51	32·407	5·57	18	28·53	0·07	0·877	0·5078352	327	9	1398	502	39	0·5076077
1909	139	9 47	33·839	5·57	18	28·49	0·07	0·877	0·5074986	327	9	1396	531	39	0·5072684
Night	137	10 45	33·409	5·57	15	28·44	0·07	0·876	0·5075968	327	6	1394	520	39	0·5073682
													Mean	...	0·5073603
19th	140	19 53	34·162	+ 5·57	18	28·09	+0·10	0·877	0·5074268	− 327	− 9	−1376	−531	−39	0·5071986
Feb.	138	20 50	32·405	5·57	19	28·16	0·10	0·877	0·5078358	327	10	1380	502	39	0·5076100
Day	139	21 47	33·838	5·57	19	28·31	0·10	0·876	0·5074989	327	10	1387	531	39	0·5072695
	137	22 45	33·401	5·57	18	28·34	0·10	0·875	0·5075986	327	9	1389	520	39	0·5073702
													Mean	...	0·5073621
													Mean of Day and Night	...	**0·5073612**
19th	137	7 49	33·392	+ 5·77	18	28·53	−0·18	0·877	0·5076007	− 339	− 9	−1398	−521	−39	0·5073701
Feb.	139	8 44	33·837	5·77	19	28·38	0·18	0·878	0·5074992	339	10	1391	532	39	0·5072681
Night	138	9 43	32·407	5·77	19	28·15	0·18	0·878	0·5078352	339	10	1379	502	39	0·5076083
	140	10 37	34·160	5·77	18	28·09	0·18	0·878	0·5074271	339	9	1376	532	39	0·5071976
													Mean	...	0·5073610
20th	137	19 50	33·417	+ 5·77	17	27·76	+0·12	0·878	0·5075949	− 339	− 8	−1360	−522	−39	0·5073681
Feb.	139	20 49	33·846	5·77	17	27·88	0·12	0·878	0·5074971	339	8	1366	532	39	0·5072687
Day	138	21 45	32·409	5·77	19	27·97	0·12	0·879	0·5078348	339	10	1371	503	39	0·5076086
	140	22 37	34·155	5·77	18	28·09	0·12	0·877	0·5074285	339	9	1376	531	39	0·5071991
													Mean	...	0·5073611
													Mean of Day and Night	...	**0·5073611**
22nd	140	8 6	34·152	+ 6·04	18	28·19	+0·02	0·876	0·5074289	− 355	− 9	−1381	−531	−39	0·5071974
Feb.	138	9 1	32·394	6·04	19	28·27	0·02	0·877	0·5078385	355	10	1385	502	39	0·5076094
Night	139	10 0	33·831	6·04	19	28·25	0·02	0·876	0·5075005	355	10	1384	531	39	0·5072686
	137	10 55	33·395	6·04	16	28·26	0·02	0·876	0·5076001	355	7	1385	520	39	0·5073695
													Mean	...	0·5073612
23rd	140	20 6	34·180	+ 6·04	17	26·71	+0·27	0·881	0·5074228	− 355	− 8	−1309	−534	−39	0·5071983
Feb.	138	21 3	32·421	6·04	19	26·98	0·27	0·880	0·5078318	355	10	1322	503	39	0·5076089
Day	139	21 58	34·420	6·04	18	27·22	0·27	0·878	0·5074950	355	9	1334	532	39	0·5072681
	137	22 53	33·411	6·04	17	27·46	0·27	0·878	0·5075963	355	8	1346	522	39	0·5073693
													Mean	...	0·5073612
													Mean of Day and Night	...	**0·5073612**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
							Amraoti.								
		h m	s	s	′	°	°		s						s
2nd	139	6 44	33·845	+ 4·01	18	28·61	+0·04	0·865	0·5074975	− 235	− 9	− 1402	− 524	− 45	0·5072760
Mar.	137	7 39	33·407	4·01	17	28·75	0·04	0·864	0·5075972	235	8	1409	513	45	0·5073762
1909	138	8 43	32·411	4·01	19	28·76	0·04	0·867	0·5078345	235	10	1409	496	45	0·5076150
Night	140	9 39	34·166	4·01	18	28·75	0·04	0·867	0·5074260	235	9	1409	525	45	0·5072037
													Mean	...	0·5073677
3rd	139	18 43	33·880	+ 4·01	19	26·65	+0·38	0·875	0·5074895	− 235	− 10	− 1306	− 530	− 45	0·5072769
Mar.	137	19 40	33·445	4·01	17	26·95	0·38	0·874	0·5075883	235	8	1321	519	45	0·5073755
Day	138	20 43	32·436	4·01	20	27·36	0·38	0·872	0·5078282	235	11	1341	499	45	0·5076151
	140	21 39	34·180	4·01	19	27·73	0·38	0·870	0·5074228	235	10	1359	527	45	0·5072052
													Mean	...	0·5073682
											Mean of Day and Night			...	**0·5073680**
4th	140	6 52	34·137	+ 5·23	18	28·95	+0·16	0·862	0·5074325	− 307	− 9	− 1419	− 522	− 45	0·5072023
Mar.	138	7 50	32·376	5·23	19	29·14	0·16	0·861	0·5078428	307	10	1428	492	45	0·5076146
Night	139	8 47	33·807	5·23	19	29·33	0·16	0·862	0·5075059	307	10	1437	522	45	0·5072738
	137	9 43	33·366	5·23	19	29·39	0·16	0·861	0·5076066	307	10	1440	511	45	0·5073753
													Mean	...	0·5073665
5th	140	18 53	34·147	+ 5·23	20	28·21	+0·24	0·867	0·5074302	− 307	− 11	− 1382	− 525	− 45	0·5072032
Mar.	138	19 51	32·383	5·23	18	28·38	0·24	0·867	0·5078411	307	9	1391	496	45	0·5076163
Day	139	20 46	33·825	5·23	18	28·61	0·24	0·864	0·5075021	307	9	1402	524	45	0·5072734
	137	21 42	33·369	5·23	18	28·88	0·24	0·864	0·5076060	307	9	1415	513	45	0·5073771
													Mean	...	0·5073675
											Mean of Day and Night			...	**0·5073670**
5th	137	6 55	33·349	+ 5·40	20	29·54	+0·05	0·860	0·5076106	− 317	− 11	− 1447	− 511	− 45	0·5073775
Mar.	139	7 49	33·800	5·40	19	29·60	0·05	0·861	0·5075077	317	10	1450	522	45	0·5072733
Night	138	8 50	32·357	5·40	19	29·67	0·05	0·861	0·5078477	317	10	1454	492	45	0·5076159
	140	9 44	34·108	5·40	19	29·66	0·05	0·861	0·5074387	317	10	1453	522	45	0·5072040
													Mean	...	0·5073677
6th	137	18 57	33·395	+ 5·40	18	27·66	+0·42	0·868	0·5076001	− 317	− 9	− 1355	− 516	− 45	0·5073759
Mar.	139	19 49	33·834	5·40	18	28·05	0·42	0·867	0·5074998	317	9	1374	525	45	0·5072728
Day	138	20 49	32·385	5·40	19	28·48	0·42	0·864	0·5078408	317	10	1396	494	45	0·5076146
	140	21 43	34·121	5·40	19	28·83	0·42	0·863	0·5074358	317	10	1413	523	45	0·5072050
													Mean	...	0·5073671
											Mean of Day and Night			...	**0·5073674**
6th	140	7 15	34·096	+ 5·45	19	29·74	+0·11	0·861	0·5074412	− 320	− 10	− 1457	− 522	− 45	0·5072058
Mar.	138	8 11	32·355	5·45	19	29·88	0·11	0·860	0·5078481	320	10	1464	492	45	0·5076150
Night	139	9 6	33·782	5·45	19	29·96	0·11	0·860	0·5075116	320	10	1468	521	45	0·5072752
	137	10 1	33·339	5·45	18	30·08	0·11	0·860	0·5076129	320	9	1474	511	45	0·5073770
													Mean	...	0·5073683
7th	140	19 15	34·151	+ 5·45	19	27·83	+0·39	0·870	0·5074293	− 320	− 10	− 1364	− 527	− 45	0·5072027
Mar.	138	20 11	32·393	5·45	20	28·13	0·39	0·868	0·5078387	320	11	1378	496	45	0·5076137
Day	139	21 7	33·827	5·45	19	28·52	0·39	0·867	0·5075015	320	10	1397	525	45	0·5072718
	137	22 1	33·374	5·45	19	28·87	0·39	0·865	0·5076048	320	10	1415	514	45	0·5073744
													Mean	...	0·5073656
											Mean of Day and Night			...	**0·5073670**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature		Density of Air	Observed Time of Vibration	Correction on account of					Reduced Time of Vibration
						Corrected Mean	Mean Change per hour			Clock Rate	Arc	Temperature	Density of Air	Flexure	
Ellichpur.															
		h m	s	s	′	°	°		s						s
13th Mar. 1909 Night	139	7 39	33·863	+ 2·89	19	30·33	−0·11	0·855	0·5074933	−170	−10	−1486	−518	−50	0·5072699
	137	8 35	33·419	2·89	18	30·29	0·11	0·855	0·5075943	170	9	1484	508	50	0·5073722
	138	9 37	32·425	2·89	18	30·17	0·11	0·856	0·5078308	170	9	1478	490	50	0·5076111
	140	10 31	34·182	2·89	17	30·00	0·11	0·856	0·5074223	170	8	1470	519	50	0·5072006
													Mean	...	0·5073635
14th Mar. Day	139	19 39	33·913	+ 2·89	17	27·46	+0·54	0·864	0·5074822	−170	−8	−1346	−524	−50	0·5072724
	137	20 36	33·462	2·89	18	27·86	0·54	0·863	0·5075846	170	9	1365	513	50	0·5073739
	138	21 37	32·446	2·89	18	28·45	0·54	0·860	0·5078258	170	9	1394	492	50	0·5076143
	140	22 32	34·195	2·89	18	28·97	0·54	0·858	0·5074196	170	9	1420	520	50	0·5072027
													Mean	..	0·5073658
												Mean of Day and Night		...	**0·5073646**
14th Mar. Night	140	7 48	34·142	+ 3·40	18	30·93	−0·07	0·853	0·5074313	−200	−9	−1516	−517	−50	0·5072021
	138	8 47	32·390	3·40	18	30·91	0·07	0·853	0·5078396	200	9	1515	488	50	0·5076134
	139	9 48	33·832	3·40	17	30·82	0·07	0·853	0·5075003	200	8	1510	517	50	0·5072718
	137	10 42	33·390	3·40	19	30·75	0·07	0·854	0·5076011	200	10	1507	507	50	0·5073737
													Mean	...	0·5073653
15th Mar. Day	140	19 50	34·215	+ 3·40	19	27·84	+0·60	0·863	0·5074152	−200	−10	−1364	−523	−50	0·5072005
	138	20 48	32·433	3·40	20	28·39	0·60	0·861	0·5078290	200	11	1391	492	50	0·5076146
	139	21 49	33·865	3·40	19	29·01	0·60	0·858	0·5074929	200	10	1421	520	50	0·5072728
	137	22 43	33·411	3·40	17	29·54	0·60	0·856	0·5075963	200	8	1447	508	50	0·5073750
													Mean	...	0·5073657
												Mean of Day and Night		...	**0·5073655**
15th Mar. Night	137	7 50	33·377	+ 3·50	17	31·13	−0·13	0·855	0·5076041	−205	−8	−1525	−508	−50	0·5073745
	139	8 43	33·820	3·50	19	31·02	0·13	0·855	0·5075031	205	10	1520	518	50	0·5072728
	138	9 40	32·386	3·50	19	30·91	0·13	0·855	0·5078403	205	10	1515	489	50	0·5076134
	140	10 33	34·147	3·50	19	30·76	0·13	0·856	0·5074303	205	10	1507	519	50	0·5072012
													Mean	...	0·5073655
16th Mar. Day	137	19 49	33·457	+ 3·50	17	27·69	+0·66	0·863	0·5075857	−205	−8	−1357	−513	−50	0·5073724
	139	20 43	33·885	3·50	19	28·26	0·66	0·861	0·5074885	205	10	1385	522	50	0·5072713
	138	21 43	32·430	3·50	19	28·94	0·66	0·858	0·5078296	205	10	1418	491	50	0·5076122
	140	22 38	34·166	3·50	19	29·55	0·66	0·854	0·5074261	205	10	1448	518	50	0·5072030
													Mean	...	0·5073647
												Mean of Day and Night		...	**0·5073651**
Hoshangabad.															
		h m	s	s	′	°	°		s						s
26th Mar. 1909 Night	137	8 42	33·408	+ 8·42	17	28·65	+0·02	0·870	0·5075970	−494	−8	−1404	−517	−53	0·5073494
	139	9 39	33·855	8·42	16	28·63	0·02	0·870	0·5074951	494	7	1403	527	53	0·5072467
	138	10 41	32·412	8·42	17	28·67	0·02	0·870	0·5078340	494	8	1405	498	53	0·5075882
	140	11 34	34·171	8·42	16	28·66	0·02	0·870	0·5074248	494	7	1404	527	53	0·5071763
													Mean	...	0·5073402
27th Mar. Day	137	20 42	33·427	+ 8·42	16	28·04	+0·14	0·875	0·5075925	−494	−7	−1374	−520	−53	0·5073477
	139	21 39	33·867	8·42	17	28·14	0·14	0·874	0·5074925	494	8	1379	530	53	0·5072461
	138	22 41	32·430	8·42	17	28·30	0·14	0·872	0·5078296	494	8	1387	499	53	0·5075855
	140	23 34	34·170	8·42	17	28·40	0·14	0·871	0·5074250	494	8	1392	528	53	0·5071775
													Mean	...	0·5073392
												Mean of Day and Night		...	**0·5073397**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Hoshangabad—(contd.)															
		h m	s	s	′	°	°		s						s
27th	140	8 34	34·155	+ 8·52	17	28·99	+0·01	0·867	0·5074282	− 500	− 8	−1421	−525	−53	0·5071775
Mar.	138	9 31	32·417	8·52	18	28·98	0·01	0·867	0·5078327	500	9	1420	496	53	0·5075849
Night	139	10 24	33·853	8·52	17	28·99	0·01	0·867	0·5074956	500	8	1421	525	53	0·5072449
	137	11 25	33·409	8·52	15	29·00	0·01	0·867	0·5075968	500	6	1421	515	53	0·5073473
													Mean	...	0·5073387
28th	140	20 34	34·175	+ 8·52	16	28·31	+0·12	0·871	0·5074238	− 500	− 7	−1387	−528	−53	0·5071763
Mar.	138	21 31	32·429	8·52	17	28·38	0·12	0·870	0·5078299	500	8	1391	498	53	0·5075849
Day	139	22 25	33·863	8·52	16	28·51	0·12	0·870	0·5074935	500	7	1397	527	53	0·5072451
	137	23 26	33·402	8·52	15	28·64	0·12	0·869	0·5075983	500	6	1403	516	53	0·5073505
													Mean	...	0·5073392
										Mean of Day and Night				...	**0·5073389**
28th	137	8 35	33·401	+ 8·58	15	29·01	+0·03	0·866	0·5075987	− 504	− 6	−1421	−514	−53	0·5073489
Mar.	139	9 27	33·850	8·58	17	29·04	0·03	0·866	0·5074961	504	8	1423	525	53	0·5072448
Night	138	10 24	32·417	8·58	17	29·07	0·03	0·866	0·5078329	504	8	1424	495	53	0·5075845
	140	11 15	34·162	8·58	16	29·08	0·03	0·866	0·5074268	504	7	1425	525	53	0·5071754
													Mean	...	0·5073384
29th	137	20 38	33·423	+ 8·58	16	28·31	+0·13	0·872	0·5075933	− 504	− 7	−1387	−518	−53	0·5073464
Mar.	139	21 31	33·864	8·58	16	28·36	0·13	0·872	0·5074929	504	7	1390	528	53	0·5072447
Day	138	22 27	32·426	8·58	17	28·51	0·13	0·871	0·5078307	504	8	1397	498	53	0·5075847
	140	23 20	34·166	8·58	17	28·62	0·13	0·870	0·5074260	504	8	1402	527	53	0·5071766
													Mean	...	0·5073381
										Mean of Day and Night				...	**0·5073383**
29th	140	8 30	34·150	+ 9·13	17	28·94	+0·03	0·864	0·5074295	− 536	− 8	−1418	−524	−53	0·5071756
Mar.	138	9 23	32·400	9·13	17	28·95	0·03	0·866	0·5078371	536	8	1419	495	53	0·5075860
Night	139	10 15	33·838	9·13	17	28·99	0·03	0·867	0·5074989	536	8	1421	525	53	0·5072446
	137	11 10	33·390	9·13	15	29·03	0·03	0·866	0·5076011	536	7	1422	514	53	0·5073479
													Mean	...	0·5073385
30th	140	20 31	34·153	+ 9·13	16	28·81	+0·08	0·869	0·5074288	− 536	− 7	−1412	−527	−53	0·5071753
Mar.	138	21 26	32·403	9·13	17	28·89	0·08	0·868	0·5078362	536	8	1416	496	53	0·5075853
Day	139	22 20	33·841	9·13	17	28·95	0·08	0·867	0·5074983	536	8	1419	525	53	0·5072442
	137	23 14	33·391	9·13	16	29·04	0·08	0·867	0·5076009	536	7	1423	515	53	0·5073475
													Mean	...	0·5073381
										Mean of Day and Night				...	**0·5073383**
Shahpur.															
		h m	s	s	′	°	°		s						s
4th	137	8 42	33·380	+ 7·12	15	29·74	+0·02	0·854	0·5076036	− 418	− 6	−1457	−507	−52	0·5073596
Apr.	139	9 38	33·800	7·12	18	29·88	0·02	0·854	0·5075075	418	9	1464	518	52	0·5072614
1909	138	10 39	32·354	7·12	19	29·87	0·02	0·855	0·5078483	418	10	1464	489	52	0·5076050
Night	140	11 32	34·131	7·12	18	29·81	0·02	0·855	0·5074337	418	9	1461	518	52	0·5071879
													Mean	...	0·5073535
5th	137	20·41	33·414	+ 7·12	18	28·47	+0·23	0·861	0·5075955	− 418	− 9	−1395	−511	−52	0·5073570
Apr.	139	21·38	33·823	7·12	19	28·60	0·23	0·859	0·5075022	418	10	1401	521	52	0·5072620
Day	138	22·39	32·375	7·12	18	28·87	0·23	0·859	0·5078431	418	9	1415	491	52	0·5076046
	140	23·37	34·146	7·12	17	29·13	0·23	0·857	0·5074306	418	8	1427	519	52	0·5071882
													Mean	...	0·5073530
										Mean of Day and Night				...	**0·5073532**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Shahpur—(contd.)						
		h m	s	s	′	°	°		s						s
5th Apr. Night	140	8 47	34·123	+ 7·18	17	29·87	+0·02	0·853	0·5074355	− 421	− 8	−1464	−517	−52	0·5071893
	138	9 44	32·354	7·18	18	29·92	0·02	0·853	0·5078482	421	9	1466	488	52	0·5076046
	139	10 39	33·793	7·18	18	29·94	0·02	0·853	0·5075092	421	9	1467	517	52	0·5072626
	137	11 35	33·382	7·18	16	29·94	0·02	0·856	0·5076030	421	7	1467	508	52	0·5073575
													Mean	...	0·5073535
6th Apr. Day	140	20 48	34·151	+ 7·18	17	28·52	+0·21	0·860	0·5074293	− 421	− 8	−1397	−521	−52	0·5071894
	138	21 43	32·382	7·18	19	28·69	0·21	0·859	0·5078413	421	10	1406	491	52	0·5076033
	139	22 39	33·817	7·18	18	28·90	0·21	0·859	0·5075037	421	9	1416	521	52	0·5072618
	137	23 36	33·393	7·18	18	29·10	0·21	0·856	0·5076005	421	9	1426	508	52	0·5073589
													Mean	...	0·5073534
											Mean of Day and Night			...	**0·5073534**
6th Apr. Night	137	8 47	33·376	+ 7·35	18	29·93	+0·08	0·853	0·5076045	− 431	− 9	−1467	−507	−52	0·5073579
	139	9 41	33·792	7·35	19	29·95	0·08	0·854	0·5075096	431	10	1468	518	52	0·5072617
	138	10 38	32·351	7·35	19	30·05	0·08	0·854	0·5078492	431	10	1472	488	52	0·5076039
	140	11 30	34·110	7·35	19	30·11	0·08	0·854	0·5074382	431	10	1475	518	52	0·5071896
													Mean	...	0·5073533
7th Apr. Day	137	20 46	33·384	+ 7·35	17	29·40	+0·22	0·857	0·5076025	− 431	− 8	−1441	−509	−52	0·5073584
	139	21 43	33·796	7·35	19	29·53	0·22	0·856	0·5075086	431	10	1447	519	52	0·5072627
	138	22 39	32·350	7·35	20	29·76	0·22	0·855	0·5078492	431	11	1458	489	52	0·5076051
	140	23 31	34·109	7·35	19	29·97	0·22	0·853	0·5074385	431	10	1469	517	52	0·5071906
													Mean	...	0·5073542
											Mean of Day and Night			...	**0·5073538**
									Badnur.						
		h m	s	s	′	°	°		s						s
11th Apr. 1909 Night	137	9 29	33·489	+ 3·14	18	26·67	+0·02	0·838	0·5075783	− 184	− 9	−1307	−498	−44	0·5073741
	139	10 25	33·919	3·14	18	26·71	0·02	0·838	0·5074807	184	9	1309	508	44	0·5072753
	138	11 29	32·470	3·14	19	26·71	0·02	0·839	0·5078198	184	10	1309	480	44	0·5076171
	140	12 22	34·244	3·14	17	26·72	0·02	0·839	0·5074087	184	8	1309	508	44	0·5072034
													Mean	...	0·5073675
12th Apr. Day	137	21 28	33·500	+ 3·14	17	26·59	+0·19	0·841	0·5075757	− 184	− 8	−1303	−500	−44	0·5073718
	139	22 23	33·911	3·14	19	26·71	0·19	0·840	0·5074825	184	10	1309	509	44	0·5072769
	138	23 24	32·464	3·14	16	26·90	0·19	0·837	0·5078215	184	7	1318	479	44	0·5076183
	140	0 19	34·230	3·14	18	27·11	0·19	0·837	0·5074120	184	9	1328	507	44	0·5072048
													Mean	...	0·5073679
											Mean of Day and Night			...	**0·5073677**
12th Apr. Night	140	9 21	34·241	+ 3·18	17	26·80	+0·13	0·836	0·5074093	− 187	− 8	−1313	−507	−44	0·5072034
	138	10 16	32·459	3·18	20	26·93	0·13	0·835	0·5078227	187	11	1320	478	44	0·5076187
	139	11 12	33·902	3·18	19	27·08	0·13	0·835	0·5074848	187	10	1327	506	44	0·5072774
	137	12 8	33·479	3·18	17	27·15	0·13	0·836	0·5075807	187	8	1330	497	44	0·5073741
													Mean	...	0·5073684
13th Apr. Day	140	21 18	34·240	+ 3·18	17	26·66	+0·22	0·839	0·5074097	− 187	− 8	−1306	−508	−44	0·5072044
	138	22 13	32·461	3·18	20	26·81	0·22	0·837	0·5078222	187	11	1314	479	44	0·5076187
	139	23 8	33·905	3·18	19	27·04	0·22	0·837	0·5074840	187	10	1325	507	44	0·5072767
	137	0 2	33·479	3·18	17	27·23	0·22	0·836	0·5075807	187	8	1334	497	44	0·5073737
													Mean	...	0·5073684
											Mean of Day and Night			...	**0·5073684**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Badnur—(contd.)						
		h m	s	s	′	°	°		s						s
13th Apr. Night	137	9 26	33·489	+ 3·34	17	27·08	+0·06	0·836	0·5075782	− 196	− 8	− 1327	− 497	− 44	0·5073710
	139	10 20	33·901	3·34	18	27·16	0·06	0·836	0·5074849	196	9	1331	507	44	0·5072762
	138	11 15	32·451	3·34	19	27·24	0·06	0·836	0·5078246	196	10	1335	478	44	0·5076183
	140	12 7	34·225	3·34	17	27·21	0·06	0·837	0·5074129	196	8	1333	507	44	0·5072041
													Mean	...	0·5073674
14th Apr. Day	137	21 25	33·483	+ 3·34	16	27·04	+0·20	0·839	0·5075797	− 196	− 7	− 1325	− 498	− 44	0·5073727
	139	22 17	33·901	3·34	18	27·17	0·20	0·839	0·5074849	196	9	1331	508	44	0·5072761
	138	23 13	32·448	3·34	19	27·39	0·20	0·838	0·5078251	196	10	1342	479	44	0·5076180
	140	0 7	34·211	3·34	21	27·55	0·20	0·835	0·5074159	196	12	1350	506	44	0·5072051
													Mean	...	0·5073680
										Mean of Day and Night				...	**0·5073677**
									Dehra Dun.						
		h m	s	s	′	°	°		s						s
29th Apr. 1909 Night	137	10 30	33·576	+ 22·15	18	24·14	+0·21	0·835	0·5075583	− 1300	− 9	− 1183	− 496	− 38	0·5072557
	139	11 27	34·000	22·15	19	24·35	0·21	0·834	0·5074628	1300	10	1193	505	38	0·5071582
	138	12 27	32·542	22·15	19	24·56	0·21	0·834	0·5078023	1300	10	1203	477	38	0·5074995
	140	13 20	34·319	22·15	19	24·71	0·21	0·834	0·5073923	1300	10	1211	505	38	0·5070859
													Mean	...	0·5072498
30th Apr. Day	137	22 28	33·571	+ 22·15	18	24·28	+0·18	0·836	0·5075596	− 1300	− 9	− 1190	− 497	− 38	0·5072562
	139	23 21	33·994	22·15	19	24·40	0·18	0·835	0·5074641	1300	10	1196	506	38	0·5071591
	138	0 19	32·544	22·15	19	24·58	0·18	0·835	0·5078016	1300	10	1204	478	38	0·5074986
	140	1 10	34·315	22·15	19	24·73	0·18	0·834	0·5073930	1300	10	1212	505	38	0·5070865
													Mean	...	0·5072501
										Mean of Day and Night				...	**0·5072500**
30th Apr. Night	140	11 10	34·310	+ 22·30	19	25·24	+ 0·14	0·832	0·5073943	− 1309	− 10	− 1237	− 504	− 38	0·5070845
	138	12 6	32·526	22·30	19	25·41	0·14	0·832	0·5078063	1309	10	1245	476	38	0·5074985
	139	13 5	33·973	22·30	20	25·53	0·14	0·831	0·5074687	1309	11	1251	504	38	0·5071574
	137	14 1	33·535	22·30	18	25·66	0·14	0·831	0·5075678	1309	9	1257	494	38	0·5072571
													Mean	...	0·5072494
1st May Day	140	23 10	34·302	+ 22·30	19	25·30	+ 0·15	0·834	0·5073959	− 1309	− 10	− 1240	− 505	− 38	0·5070857
	138	0 7	32·525	22·30	18	25·44	0·15	0·834	0·5078063	1309	9	1247	477	38	0·5074983
	139	1 2	33·968	22·30	20	25·58	0·15	0·833	0·5074698	1309	11	1253	505	38	0·5071582
	137	1 57	33·536	22·30	18	25·72	0·15	0·833	0·5075673	1309	9	1260	495	38	0·5072562
													Mean	...	0·5072496
										Mean of Day and Night				...	**0·5072495**
1st May Night	137	10 57	33·535	+ 22·37	18	25·97	+ 0·06	0·833	0·5075676	− 1313	− 9	− 1273	− 495	− 38	0·5072548
	139	11 52	33·955	22·37	19	26·07	0·06	0·833	0·5074727	1313	10	1277	505	38	0·5071584
	138	12 50	32·508	22·37	20	26·12	0·06	0·833	0·5078107	1313	11	1280	476	38	0·5074989
	140	13 43	34·282	22·37	19	26·14	0·06	0·833	0·5074005	1313	10	1281	505	38	0·5070858
													Mean	...	0·5072495
2nd May Day	137	22 57	33·543	+ 22·37	18	25·71	+ 0·16	0·834	0·5075660	− 1313	− 9	− 1260	− 495	− 38	0·5072545
	139	23 50	33·964	22·37	20	25·83	0·16	0·833	0·5074707	1313	11	1266	505	38	0·5071574
	138	0 47	32·511	22·37	19	26·01	0·16	0·833	0·5078098	1313	10	1274	476	38	0·5074987
	140	1 39	34·281	22·37	18	26·14	0·16	0·833	0·5074006	1313	9	1281	505	38	0·5070860
													Mean	...	0·5072493
										Mean of Day and Night				...	**0·5072493**

In Table III are shown the times of vibration at Dehra Dūn at the beginning and end of the season.

Table III.—Times of vibration at Dehra Dūn.

Date	137	138	139	140	Mean
1908-09	s	s	s	s	s
December, 14-15	0·5072567	0·5075001	0·5071583	0·5070864	0·5072504
„ 15-16	2570	4988	1567	0855	2495
„ 16-17	2565	4988	1573	0865	2498
„ 17-18	2570	5001	1558	0858	2497
Mean	0·5072568	0·5074995	0·5071570	0·5070861	0·5072499
April 29-30	0·5072560	0·5074990	0·5071587	0·5070862	0·5072500
„ 30-May 1	2567	4984	1578	0851	2495
May 1-2	2547	4988	1579	0859	2493
Mean	0·5072558	0·5074987	0·5071581	0·5070857	0·5072496
General Mean	0·5072563	0·5074991	0·5071576	0·5070859	0·5072497
Difference, May–Dec.	− 10	− 8	+ 11	− 4	− 3

The agreement between the two sets is satisfactory, but it is, as usual, advisable to tabulate the differences between the mean and individual pendulums.

Table IV.—Differences between the mean and individual pendulums.

Station	137	v	138	v	139	v	140	v
Dehra Dūn ...	− 69	+ 2	− 2496	− 9	+ 929	+ 4	+ 1638	+ 4
Ujjain ...	− 78	− 7	− 2486	+ 1	+ 931	+ 6	+ 1634	0
Mhow ...	− 70	+ 1	− 2493	− 6	+ 923	− 2	+ 1642	+ 8
Mukhtiāra ...	− 72	− 1	− 2492	− 5	+ 927	+ 2	+ 1638	+ 4
Mortakka ...	− 75	− 4	− 2481	+ 6	+ 928	+ 3	+ 1628	− 6
Khandwa ...	− 60	+ 11	− 2484	+ 3	+ 920	− 5	+ 1623	− 11
Asirgarh ...	− 70	+ 1	− 2480	+ 7	+ 925	0	+ 1625	− 9
Jalgaon ...	− 80	− 9	− 2477	+ 10	+ 927	+ 2	+ 1632	− 2
Amraoti ...	− 87	− 16	− 2477	+ 10	+ 932	+ 7	+ 1634	0
Ellichpur ...	− 85	− 14	− 2481	+ 6	+ 933	+ 8	+ 1634	0
Hoshangābād ...	− 94	− 23	− 2467	+ 20	+ 936	+ 11	+ 1625	− 9
Shāhpur ...	− 47	+ 24	− 2509	− 22	+ 915	− 10	+ 1643	+ 9
Badnūr ...	− 50	+ 21	− 2503	− 16	+ 915	− 10	+ 1637	+ 3
Dehra Dūn ...	− 62	+ 9	− 2491	− 4	+ 915	− 10	+ 1639	+ 5
Means	− 71		− 2487		+ 925		+ 1634	
Means of 1907-08	− 60		− 2496		+ 915		+ 1641	

The table shows that there have been large fluctuations in the differences, the most noticeable being that between Hoshangābād and Shāhpur. It is difficult to suggest any cause for this change and it does not appear that any one pendulum was at fault. If it had been, then the differences of the other pendulums would have changed by the same amount and in the same direction, whereas in this case the differences of two pendulums have increased and two have decreased. The changes can, therefore, only be considered as accidental errors and no correction can be applied. It is perhaps worthy of note that the pendulum clock was cleaned at Dehra Dūn at the beginning of the season, and it is possible that its rate may not be so steady as it was formerly.

In Table V are shown the times of vibration of each pendulum at each station and the value of g deduced. These values are naturally somewhat discordant owing to the accidental errors mentioned above.

Table V.—Mean times of vibration and deduced values of g.

Station		137	138	139	140	Mean
Dehra Dūn ...	s.	0·5072563	0·5074991	0·5071576	0·5070859	0·5072497
Ujjain ...	s.	0·5073576	0·5075984	0·5072567	0·5071864	0·5073498
		+1013	+993	+991	+1005	+1001
	g.	978·672	978·680	978·680	978·675	978·677
Mhow ...	s.	0·5073716	0·5076139	0·5072723	0·5072004	0·5073646
		+1153	+1148	+1147	+1145	+1149
	g.	978·618	978·620	978·620	978·621	978·620
Mukhtiāra ...	s.	0·5073603	0·5076023	0·5072604	0·5071893	0·5073531
		+1040	+1032	+1028	+1034	+1034
	g.	978·662	978·665	978·666	978·664	978·664
Mortakka ...	s.	0·5073504	0·5075910	0·5072501	0·5071801	0·5073429
		+941	+919	+925	+942	+932
	g.	978·700	978·708	978·706	978·699	978·703
Khandwa ...	s.	0·5073517	0·5075941	0·5072537	0·5071834	0·5073457
		+954	+950	+961	+975	+960
	g.	978·695	978·696	978·692	978·687	978·692
Asirgarh ...	s.	0·5073807	0·5076217	0·5072812	0·5072112	0·5073737
		+1244	+1226	+1236	+1253	+1240
	g.	978·583	978·590	978·586	978·579	978·584
Jalgaon ...	s.	0·5073692	0·5076089	0·5072685	0·5071980	0·5073612
		+1129	+1098	+1109	+1121	+1115
	g.	978·627	978·639	978·635	978·630	978·633
Amraoti ...	s.	0·5073761	0·5076151	0·5072742	0·5072040	0·5073674
		+1198	+1160	+1166	+1181	+1177
	g.	978·601	978·615	978·613	978·607	978·609
Ellichpur ...	s.	0·5073736	0·5076132	0·5072718	0·5072017	0·5073651
		+1173	+1141	+1142	+1158	+1154
	g.	978·610	978·623	978·622	978·616	978·618
Hoshangābād ...	s.	0·5073482	0·5075855	0·5072452	0·5071763	0·5073388
		+919	+864	+876	+904	+891
	g.	978·708	978·730	978·725	978·714	978·719
Shāhpur ...	s.	0·5073582	0·5076044	0·5072620	0·5071892	0·5073534
		+1019	+1053	+1044	+1033	+1037
	g.	978·670	978·657	978·660	978·664	978·663
Badnūr ...	s.	0·5073729	0·5076182	0·5072764	0·5072042	0·5073679
		+1166	+1191	+1188	+1183	+1182
	g.	978·613	978·604	978·604	978·606	978·607

The Reduction to Sea Level.

Orographical corrections were computed for all the stations except Ujjain, but were found to be inappreciable (*i. e.* less than 0·0005) except at Asirgarh, the details of which are given below.

Table VI.—Orographical correction at Asirgarh.
Height, 2077 feet.

Within $\frac{1}{8}$ mile we may assume that half the area is 200 feet below, and half at the level of the station. The correction based on this assumption is − 0·0028.

No. of zone	1	2	3	4	5	6	7	8	9	10	11	12	13
Inner radius Outer radius	$\frac{1}{8}$ mile $\frac{1}{4}$ mile	$\frac{1}{4}$ mile $\frac{1}{2}$ mile	$\frac{1}{2}$ mile 1 mile	1 mile 2 miles	2 miles 3 miles	3 miles 4 miles	4 miles 5 miles	5 miles 7 miles	7 miles 10 miles	10 miles 15 miles	15 miles 20 miles	20 miles 25 miles	25 miles 35 miles
Height	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*	*Fraction*
feet													
2200	0·27	...	...	...	...	...	...	...	...	...	0·02	0·03	0·11
2100	0·21	0·23	...	...	...	...	...	...	...	...	...	...	...
1900	0·45	0·37	0·15	...	...	...	...	...	...	...	...	...	...
1750	...	...	...	...	0·08	0·07	0·14	0·16	0·06	0·15	...	...	...
1700	0·07	0·33	0·42	0·25	...	...	...	...	...	...	...	...	...
1500	...	0·07	0·43	...	...	...	...	...	...	...	0·71	0·77	0·51
1250	...	...	...	0·75	0·68	0·44	0·30	0·30	0·52	0·40	...	...	...
1000	..	...	...	...	0·24	0·49	0·56	...	...	...	...	...	...
900	...	...	...	...	...	...	...	0·54	0·42	0·45	0·20	0·20	0·38
Effect	10·4	15·3	19·2	25·8	12·0	6·9	4·7	5·3	3·9	2·9	1·0	0·5	0·7

$$\text{Total effect} = 108\cdot6$$
$$\text{Orographical correction} = 108\cdot6 \times 0\cdot0000336$$
$$= -0\cdot0036$$
$$\text{The total correction is, therefore,} = -0\cdot006$$

The abstract of the season's results is given in Table VII.

Table VII.—Abstract of results.

Station	Height	γ_0	Corrections			γ_B	g	$g-\gamma_B$
			for height	for mass (Bouguer)	orographical			
	feet	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*
Ujjain ...	1612	978·830	−0·151	+0·054	0	978·733	978·677	−0·056
Mhow ...	1903	978·789	−0·178	+0·064	0	978·675	978·620	−0·055
Mukhtiāra ...	926	978·779	−0·087	+0·031	0	978·723	978·664	−0·059
Mortakka ...	576	978·768	−0·054	+0·019	0	978·733	978·703	−0·030
Khandwa ...	1014	978·743	−0·095	+0·034	0	978·682	978·692	+0·010
Asirgarh ...	2077	978·721	−0·194	+0·070	−0·006	978·591	978·584	−0·007
Jalgaon ...	760	978·693	−0·071	+0·026	0	978·648	978·633	−0·015
Amraoti ...	1123	978·689	−0·105	+0·038	0	978·622	978·609	−0·013
Ellichpur ..	1314	978·711	−0·123	+0·044	0	978·632	978·618	−0·014
Badnūr ...	2103	978·748	−0·197	+0·071	0	978·622	978·607	−0·015
Shāhpur ...	1286	978·766	−0·120	+0·043	0	978·689	978·663	−0·026
Hoshangābād ...	1002	978·802	−0·094	+0·034	0	978·742	978·719	−0·023

It is better to postpone any discussion of these results until the next chapter, when the operations of the two seasons will be considered together.

CHAPTER IV.

The Pendulum Operations in 1909-10.

The area in which observations were made during the season 1909-10 is immediately to the east of that occupied the previous year and the reason for its selection the same, *viz.* the more precise determination of the limits of the belt of high density.

Latitude observations had indicated that the southern edge of this belt passed just south of Amraoti through Amgaon and between Bilāspur and Pendra while its northern edge probably lay some distance to the north of the season's area and was not likely to be met with. These observations had, however, shewn that a small area of low density existed between Saugor and Umaria and it was hoped that the pendulums would confirm this also.

It may be well to explain here the method by which areas of high and low density are deduced from latitude observations.

If we take two latitude stations on approximately the same meridian and find that the plumb-lines are inclined towards one another or in other words that the deflection at the southern station is more northerly or less southerly than at the northern station, we may assume that between the two stations there exists an area of attraction or of high density. Since we call northerly deflections negative and southerly ones positive we have the following simple rule for determining whether the area between two stations is of relatively high or low density.

If deflection at north station minus that at south station is positive then the area between them is of high density and *vice versa.*

Of the stations visited, Saugor, Damoh and Katni are on high ground, tolerably level, north of the Narbada river. The former is on the trap, the two latter on Vindhyan beds, as is Umaria where the surface features are irregular. Pendra lies on higher rolling country which divides the drainage areas of the Ganges, Narbada and Mahānadi rivers. Amgaon, Seoni and Jubbulpore are in and near the Sātpura high-lands with Bilāspur and Raipur on the plains to the south. Maihar is on the southern edge of the Gangetic plain and Allahābād and Sultānpur are in this plain.

The observations throughout the season were made by Captain H. M. Cowie, R.E. with the exception of those at Dehra Dūn in April, 1910, some of which were made by Captain H. J. Couchman, R.E.

The descriptions of the stations are given below :—

Saugor.

Latitude	...	23° 51′ 47″
Longitude	...	78° 48′
Height	...	1757 feet.

The pendulums were swung in Quarter No. 7 of Block No. 3, Married quarters, old B. I.

Lines. The floor of the room was connected by spirit levelling with G.T.S. $\frac{BM.34}{55\ I}$ of Main-Line 60 (Katni to Sironj).

Damoh.

Latitude	...	23° 49′ 54″
Longitude	...	79° 26′
Height	...	1213 feet.

The pendulums were swung in the most westerly *main room* of the dak bungalow. The floor of the pendulum room was connected by spirit levelling with G.T.S. $\frac{BM.63}{55\ M}$ of Main-Line 60 (Katni to Sironj).

Katni.

Latitude	...	23° 50′ 25″
Longitude	...	80° 26′
Height	...	1254 feet.

The pendulums were swung in the S.W. of the four rooms of a small bungalow belonging to Mr. Cook of Cook & Co., lime and stone contractors. It lies on the south side of the road from Katni E.I.Railway station to Katni Merwāra and adjoins the office of the District Tahsildār. The floor of the room was connected by spirit levelling with G.T.S. $\frac{BM.81}{64\ A}$ of Main-Line 58 (Bilāspur to Katni).

Umaria.

Latitude	...	23° 31′ 37″
Longitude	...	80° 54′
Height	...	1499 feet.

The pendulums were swung in the most westerly of the three rooms of the Rewah State Inspection bungalow adjoining the house of the Manager of Rewah State Colliery, about 1 mile from the B.N. Railway station. The height of the G.T.S. bench-mark on plinth of the building, *viz.* $\frac{BM.23}{64\ A}$ of Main-Line 58 (Bilāspur to Katni) is 1498·184 feet.

Pendra.

Latitude	...	22° 46′ 41″
Longitude	...	82° 0′
Height	...	1996 feet.

The pendulums were swung in the more easterly of the rooms of the school house on the outside of the village of Pendra, some 5 miles to the east of Pendra Road station on the B. N. Railway between Katni and Bilāspur. The floor of the room was connected by spirit levelling with G.T.S. $\frac{BM.39}{64\ F}$ of Main-Line 58 (Bilāspur to Katni).

Bilaspur.

Latitude	...	22° 3′ 53″
Longitude	...	82° 12′
Height	...	878 feet.

The pendulums were swung in the personal office of the District Traffic Superintendent, B. N. Railway. The room is in the centre of the block containing the District Offices of the Railway. This building is on the east side of the main road from the railway station to the town and about 1 mile from the former. The floor of the room was connected by spirit levelling with G.T.S. $\frac{BM.9}{64\ J}$ of Main-Line 38 (Raipur to Bilāspur).

Raipur.

Latitude ... 21° 13′ 56″
Longitude ... 81° 41′
Height ... 996 feet.

The pendulums were swung in the more northerly of the two rooms of the old Quarter Guard. This building lies to the west of the site of the old cantonments and on the west side of the road running from Raipur to Deopuri village and is the central one of the last three *pukka* built houses on the west of this road as one leaves Raipur. It has at times been used as a clerk's office by the Settlement Survey. The Boorah tank lies about ½ mile to the S.W. The floor of the room was connected by spirit levelling with G.T.S. $\frac{\text{BM.73}}{\text{64 G}}$ of Main-Line 37 (Vizianagram to Raipur).

Amgaon.

Latitude ... 21° 21′ 31″
Longitude ... 80° 28′
Height ... 1032 feet.

The pendulums were swung in the room in the S.W. corner of the inspection bungalow to the E.N.E. of the railway station, (B.N.Railway). Amgaon is a small village on the Bilāspur side of Gondia on the B.N.Railway. The floor of the room was connected by spirit levelling with G.T.S.$\frac{\text{BM.37}}{\text{64 C}}$ of Main-Line 35 (Nandgaon to Raipur).

Seoni.

Latitude ... 22° 5′ 29″
Longitude ... 77° 29′
Height ... 2032 feet.

The pendulums were swung in the more easterly of the two rooms of the Camp clerk's office building attached to the circuit house (about 100 yards east of the latter). The circuit house lies across the road to the north from the Episcopal Church. The floor of the room was connected with G.T.S. $\frac{\text{BM. 46}}{\text{55 N}}$ of Branch-Line 60 A (Katni to Nagpur).

Jubbulpore.

Latitude ... 23° 8′ 54″
Longitude ... 79° 59′
Height ... 1467 feet.

The pendulums were swung in the S.W. room of the Orderly Room, Block No. 15 of the New (1910) British Infantry Lines built on the Chhitapahār Ridge. In a direct line it lies about 2 miles from the E.I.R. station. The Orderly Room is situated some 100 yards S.E. of the Soldiers' Institute. The level of the plinth of the Orderly Room was obtained from the M.W. Office.

Maihar.

Latitude ... 24° 15′ 38″
Longitude ... 80° 48′
Height ... 1161 feet.

The pendulums were swung in the more northern of the two main rooms of the travellers' bungalow, close to the village and N.W. from the railway station. The floor of the rooms was connected by spirit levelling with G.T.S. $\frac{\text{BM.37}}{\text{68 D}}$ of Main-Line 59 (Katni to Allahābād).

Allahabad.

Latitude ... 25° 25′ 55″
Longitude ... 81° 55′
Height ... 288 feet.

The pendulums were swung in the casemate below the quarters of the Commandant, between the Church and the R.A.Mess in Allahābād fort; both Church and Mess are on the front of the fort facing the Jumna river. The floor of the casemate was connected by spirit levelling with G.T.S. $\frac{\text{BM.58}}{\text{63 G}}$ of the Main Line 59 (Katni to Allahābād).

Sultanpur.

Latitude ... 26° 16′ 6″
Longitude ... 82° 4′ 36″
Height ... 314 feet.

The pendulums were swung in the room at the west end of the dak bungalow. The pendulum room was connected with rail level at the railway station by spirit levelling.

On the whole satisfactory rooms were available at all the stations. At Umaria and Seoni the rooms were small and at Saugor, Pendra and Seoni the protection against the sun's rays was not as perfect as could have been wished.

Determinations of the flexure of the pendulum support were made before and after work at each station. Table I gives the mean value of each set and the values used in correcting the time of vibration.

Table I.—Flexure correction.

Station	Date	Means before and after work 10^{-7} secs.	Adopted Correction 10^{-7} secs.	Station	Date	Means before and after work 10^{-7} secs.	Adopted Correction 10^{-7} secs.
	1909				1910		
Dehra Dūn	Nov. 8th	−38·6		Raipur	January 20th	−39·3	
	„ 13th	37·8	−38		„ 24th	38·8	−39
Saugor	Nov. 26th	−50·8		Amgaon	January 31st	−46·0	
	„ 30th	51·1	−51		February 4th	44·4	−45
Damoh	Dec. 4th	−42·7		Seoni	Feb. 13th	−45·0	
	„ 9th	42·3	−43		„ 18th	45·0	−45
Katni	Dec. 12th	−54·9		Jubbulpore	Feb. 25th	−42·0	
	„ 15th	54·6	−55		March 2nd	41·5	−42
Umaria	Dec. 19th	−37·4		Maihar	March 15th	−46·4	
	„ 23rd	38·6	−38		„ 19th	45·9	−46
Pendra	Dec. 30th	−54·3		Allahābād	March 25th	−44·3	
	January 4th, 1910	49·9	−52		„ 31st	45·5	−45
Bilāspur	January 10th	−48·2		Sultānpur	April 7th	−44·1	
	„ 14th	45·4			„ 11th	42·9	−44
	„ 15th	46·2	−47	Dehra Dūn	April 20th	−38·2	
					„ 25th	34·3	−37

The time observations were made by Mr. Hanumān Prasād, the mean p. e. of the mean value of a clock rate being ± 0·014 sec. while that of single value was ± 0·051 sec.

The details of the observations are given in Table II.

Table II.—Details of the Observations.

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Dehra Dun.							
		h m	s	s	′	°	°		s						s
8th Nov. 1909 Night	137	0 22	33·682	+20·04	17	21·53	+0·09	0·850	0·5075343	−1176	−8	−1055	−505	−38	0·5072561
	139	1 18	34·123	20·04	19	21·63	0·09	0·849	0·5074355	1176	10	1060	514	38	0·5071557
	138	2 21	32·668	20·04	19	21·72	0·09	0·849	0·5077718	1176	10	1064	486	38	0·5074944
	140	3 18	34·448	20·04	18	21·73	0·09	0·849	0·5073643	1176	9	1065	514	38	0·5070841
													Mean		0·5072476
9th Nov. Day	137	12 21	33·721	+20·04	18	20·26	+0·31	0·856	0·5075252	−1176	−9	−993	−508	−38	0·5072528
	139	13 15	34·142	20·04	19	20·59	0·31	0·853	0·5074312	1176	10	1009	517	38	0·5071562
	138	14 15	32·676	20·04	19	20·89	0·31	0·853	0·5077698	1176	10	1024	488	38	0·5074962
	140	15 8	34·456	20·04	18	21·13	0·31	0·851	0·5073626	1176	9	1035	516	38	0·5070852
													Mean	...	0·5072476
													Mean of Day and Night	...	**0·5072476**
9th Nov. Night	140	0 21	34·442	+20·16	18	21·51	+0·14	0·852	0·5073656	−1183	−9	−1054	−516	−38	0·5070856
	138	1 19	32·661	20·16	15	21·65	0·14	0·851	0·5077735	1183	6	1061	487	38	0·5074960
	139	2 18	34·110	20·16	19	21·79	0·14	0·850	0·5074382	1183	10	1068	515	38	0·5071568
	137	3 17	33·678	20·16	17	21·90	0·14	0·850	0·5075350	1183	8	1073	505	38	0·5072543
													Mean	...	0·5072482
10th Nov. Day	140	12 23	34·452	+20·16	18	20·90	+0·18	0·855	0·5073633	−1183	−9	−1024	−518	−38	0·5070861
	138	13 19	32·666	20·16	19	21·10	0·18	0·855	0·5077723	1183	10	1034	489	38	0·5074969
	139	14 17	34·116	20·16	18	21·29	0·18	0·852	0·5074371	1183	9	1043	516	38	0·5071582
	137	15 17	33·686	20·16	17	21·43	0·18	0·851	0·5075333	1183	8	1050	505	38	0·5072549
													Mean	...	0·5072490
													Mean of Day and Night	...	**0·5072486**
10th Nov. Night	137	0 32	33·682	+20·23	17	21·42	+0·12	0·851	0·5075342	−1187	−8	−1050	−505	−38	0·5072554
	139	1 25	34·111	20·23	18	21·53	0·12	0·850	0·5074381	1187	9	1055	515	38	0·5071577
	138	2 25	32·650	20·23	19	21·67	0·12	0·849	0·5077761	1187	10	1062	486	38	0·5074978
	140	3 17	34·429	20·23	19	21·73	0·12	0·849	0·5073682	1187	10	1065	514	38	0·5070868
													Mean	...	0·5072494
11th Nov. Day	137	12 33	33·701	+20·23	17	20·85	+0·18	0·853	0·5075298	−1187	−8	−1022	−507	−38	0·5072536
	139	13 25	34·124	20·23	19	21·03	0·18	0·853	0·5074352	1187	10	1030	517	38	0·5071570
	138	14 21	32·661	20·23	19	21·19	0·18	0·851	0·5077733	1187	10	1038	487	38	0·5074973
	140	15 12	34·438	20·23	18	21·33	0·18	0·851	0·5073665	1187	9	1045	516	38	0·5070870
													Mean	...	0·5072487
													Mean of Day and Night	...	**0·5072491**
11th Nov. Night	140	0 33	34·443	+20·46	18	21·29	+0·11	0·852	0·5073655	−1201	−9	−1043	−516	−38	0·5070848
	138	1 29	32·655	20·46	19	21·35	0·11	0·851	0·5077749	1201	10	1046	487	38	0·5074967
	139	2 34	34·114	20·46	19	21·51	0·11	0·851	0·5074375	1201	10	1054	516	38	0·5071556
	137	3 31	33·679	20·46	17	21·59	0·11	0·851	0·5075350	1201	8	1058	505	38	0·5072540
													Mean	...	0·5072478
12th Nov. Day	140	12 38	34·448	+20·46	18	20·71	+0·24	0·856	0·5073643	−1201	−9	−1015	−519	−38	0·5070861
	138	13 34	32·653	20·46	19	20·91	0·24	0·853	0·5077755	1201	10	1025	488	38	0·5074993
	139	14 28	34·113	20·46	18	21·15	0·24	0·852	0·5074376	1201	9	1036	516	38	0·5071576
	137	15 22	33·676	20·46	18	21·32	0·24	0·851	0·5075357	1201	9	1045	505	38	0·5072559
													Mean	...	0·5072497
													Mean of Day and Night	...	**0·5072488**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature		Density of Air	Observed Time of Vibration	Correction on account of					Reduced Time of Vibration
						Corrected Mean	Mean Change per hour			Clock Rate	Arc	Temperature	Density of Air	Flexure	
Saugor.															
		h m	s	s	′	°	°		s						s
26th Nov. 1909 Night	137	0 25	33·638	+ 5·58	19	21·52	+0·02	0·868	0·5075441	− 328	− 10	− 1054	− 516	− 51	0·5073482
	139	1 24	34·073	5·58	19	21·53	0·02	0·868	0·5074463	328	10	1055	526	51	0·5072493
	138	2 26	32·618	5·58	20	21·55	0·02	0·868	0·5077837	328	11	1056	496	51	0·5075895
	140	3 22	34·406	5·58	19	21·57	0·02	0·868	0·5073733	328	10	1057	526	51	0·5071761
													Mean	...	0·5073408
27th Nov. Day	137	12 25	33·712	+ 5·58	17	20·53	+0·22	0·872	0·5075273	− 328	− 8	− 1006	− 518	− 51	0·5073362
	139	13 20	34·136	5·58	19	20·73	0·22	0·871	0·5074326	328	10	1016	528	51	0·5072393
	138	14 21	32·663	5·58	20	20·97	0·22	0·871	0·5077731	328	11	1028	498	51	0·5075815
	140	15 13	34·456	5·58	18	21·17	0·22	0·868	0·5073626	328	9	1037	526	51	0·5071675
													Mean	...	0·5073311
										Mean of Day and Night				...	**0·5073360**
27th Nov. Night	140	0 18	34·442	+ 5·00	18	21·52	−0·02	0·870	0·5073656	− 294	− 9	− 1054	− 527	− 51	0·5071721
	138	1 14	32·650	5·00	20	21·52	0·02	0·870	0·5077759	294	11	1054	498	51	0·5075851
	139	2 14	34·119	5·00	19	21·50	0·02	0·870	0·5074362	294	10	1054	527	51	0·5072426
	137	3 12	33·677	5·00	18	21·48	0·02	0·870	0·5075352	294	9	1053	517	51	0·5073428
													Mean	...	0·5073356
28th Nov. Day	140	12 20	34·481	+ 5·00	19	20·46	+0·30	0·873	0·5073572	− 294	− 10	− 1003	− 529	− 51	0·5071685
	138	13 21	32·677	5·00	20	20·70	0·30	0·872	0·5077696	294	11	1014	499	51	0·5075827
	139	14 32	34·128	5·00	19	21·07	0·30	0·870	0·5074343	294	10	1032	527	51	0·5072429
	137	15 31	33·693	5·00	18	21·28	0·30	0·870	0·5075316	294	9	1043	517	51	0·5073402
													Mean	...	0·5073336
										Mean of Day and Night				...	**0·5073346**
28th Nov. Night	137	0 29	33·704	+ 4·40	17	21·33	+0·07	0·870	0·5075293	− 258	− 8	− 1045	− 517	− 51	0·5073414
	139	1 25	34·135	4·40	19	21·40	0·07	0·870	0·5074328	258	10	1049	527	51	0·5072433
	138	2 31	32·661	4·40	20	21·49	0·07	0·870	0·5077735	258	11	1053	498	51	0·5075864
	140	3 25	34·450	4·40	19	21·52	0·07	0·870	0·5073638	258	10	1054	527	51	0·5071738
													Mean	...	0·5073362
29th Nov. Day	137	12 31	33·749	+ 4·40	18	20·28	+0·25	0·875	0·5075191	− 258	− 9	− 994	− 520	− 51	0·5073359
	139	13 27	34·168	4·40	19	20·49	0·25	0·874	0·5074253	258	10	1004	530	51	0·5072400
	138	14 27	32·683	4·40	19	20·76	0·25	0·873	0·5077682	258	10	1017	499	51	0·5075847
	140	15 20	34·466	4·40	18	20·96	0·25	0·873	0·5073603	258	9	1027	529	51	0·5071729
													Mean	...	0·5073334
										Mean of Day and Night				...	**0·5073348**
29th Nov. Night	140	0 34	34·473	+ 4·18	18	21·12	+0·05	0·873	0·5073588	− 245	− 9	− 1035	− 529	− 51	0·5071719
	138	1 34	32·689	4·18	19	21·15	0·05	0·873	0·5077667	245	10	1036	499	51	0·5075826
	139	2 35	34·142	4·18	19	21·22	0·05	0·873	0·5074313	245	10	1040	529	51	0·5072438
	137	3 34	33·701	4·18	18	21·26	0·05	0·873	0·5075301	245	9	1042	519	51	0·5073435
													Mean	...	0·5073355
30th Nov. Day	140	12 36	34·507	+ 4·18	18	19·96	+0·22	0·877	0·5073515	− 245	− 9	− 978	− 531	− 51	0·5071701
	138	13 37	32·716	4·18	19	20·16	0·22	0·876	0·5077601	245	10	988	501	51	0·5075806
	139	14 33	34·171	4·18	19	20·37	0·22	0·875	0·5074248	245	10	998	530	51	0·5072414
	137	15 29	33·719	4·18	12	20·56	0·22	0·874	0·5075258	245	4	1007	519	51	0·5073432
													Mean	...	0·5073338
										Mean of Day and Night				...	**0·5073346**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Correction on account of: Arc	Correction on account of: Temperature	Correction on account of: Density of Air	Correction on account of: Flexure	Reduced Time of Vibration
								Damoh.							
		h m	s	s	′	°	°		s						s
5th	137	0 54	33·773	+ 3·62	17	20·26	+0·09	0·886	0·5075137	− 212	− 8	− 993	−526	−43	0·5073355
Dec.	139	1 48	34·211	3·62	18	20·33	0·09	0·886	0·5074160	212	9	996	537	43	0·5072363
1909	138	2 49	32·739	3·62	19	20·42	0·09	0·886	0·5077547	212	10	1001	507	43	0·5075774
Night	140	3 46	34·531	3·62	18	20·52	0·09	0·886	0·5073461	212	9	1005	537	43	0·5071655
													Mean	...	0·5073287
6th	137	12 57	33·811	+ 3·62	17	18·65	+0·24	0·894	0·5075051	− 212	− 8	− 914	−531	−43	0·5073343
Dec.	139	13 54	34·245	3·62	19	18·82	0·24	0·893	0·5074085	212	10	922	541	43	0·5072357
Day	138	14 54	32·767	3·62	21	19·08	0·24	0·891	0·5077477	212	12	935	510	43	0·5075765
	140	15 49	34·563	3·62	19	19·33	0·24	0·890	0·5073395	212	10	947	539	43	0·5071644
													Mean	...	0·5073277
													Mean of Day and Night	...	**0·5073282**
6th	140	0 58	34·535	+ 3·62	19	20·52	+0·03	0·886	0·5073453	− 212	− 10	− 1005	−537	−43	0·5071646
Dec.	138	1 54	32·729	3·62	20	20·54	0·03	0·885	0·5077570	212	11	1006	506	43	0·5075792
Night	139	2 52	34·206	3·62	19	20·59	0·03	0·886	0·5074171	212	10	1009	537	43	0·5072360
	137	3 49	33·771	3·62	17	20·56	0·03	0·887	0·5075141	212	8	1007	527	43	0·5073344
													Mean	...	0·5073286
7th	140	12 59	34·591	+ 3·62	18	18·44	+0·29	0·895	0·5073333	− 212	− 9	− 904	−542	−43	0·5071623
Dec.	138	13 57	32·774	3·62	19	18·69	0·29	0·894	0·5077462	212	10	916	511	43	0·5075770
Day	139	15 3	34·236	3·62	19	19·04	0·29	0·893	0·5074106	212	10	933	541	43	0·5072367
	137	16 4	33·798	3·62	17	19·34	0·29	0·891	0·5075080	212	8	948	529	43	0·5073340
													Mean	...	0·5073275
													Mean of Day and Night	...	**0·5073280**
7th	137	1 5	33·777	+ 3·50	17	20·53	+0·08	0·887	0·5075127	− 205	− 8	− 1006	−527	−43	0·5073338
Dec.	139	2 1	34·204	3·50	19	20·59	0·08	0·886	0·5074176	205	10	1009	537	43	0·5072372
Night	138	2 59	32·729	3·50	20	20·69	0·08	0·886	0·5077570	205	11	1014	507	43	0·5075790
	140	3 51	34·537	3·50	19	20·72	0·08	0·886	0·5073450	205	10	1015	537	43	0·5071640
													Mean	...	0·5073285
8th	137	13 5	33·834	+ 3·50	17	18·38	+0·33	0·897	0·5074998	− 205	− 8	− 901	−533	−43	0·5073308
Dec.	139	14 0	34·256	3·50	19	18·64	0·33	0·894	0·5074061	205	10	913	542	43	0·5072348
Day	138	14 56	32·767	3·50	19	18·96	0·33	0·893	0·5077478	205	10	929	511	43	0·5075780
	140	15 50	34·566	3·50	18	19·25	0·33	0·891	0·5073388	205	9	943	540	43	0·5071648
													Mean	..	0·5073271
													Mean of Day and Night	...	**0·5073278**
8th	140	1 19	34·529	+ 3·43	18	20·87	+0·06	0·886	0·5073467	− 201	− 9	− 1023	−537	−43	0·5071654
Dec.	138	2 14	32·730	3·43	20	20·92	0·06	0·886	0·5077568	201	11	1025	507	43	0·5075781
Night	139	3 9	34·197	3·43	19	20·98	0·06	0·886	0·5074191	201	10	1028	537	43	0·5072372
	137	4 6	33·758	3·43	17	21·05	0·06	0·885	0·5075171	201	8	1031	526	43	0·5073362
													Mean	...	0·5073292
9th	140	13 23	34·594	+ 3·43	19	18·55	+0·30	0·895	0·5073327	− 201	− 10	− 909	−542	−43	0·5071622
Dec.	138	14 24	32·782	3·43	19	18·81	0·30	0·893	0·5077442	201	10	922	511	43	0·5075765
Day	139	15 20	34·237	3·43	19	19·08	0·30	0·893	0·5074103	201	10	935	541	43	0·5072373
	137	16 16	33·800	3·43	17	19·39	0·30	0·891	0·5075077	201	8	950	529	43	0·5073346
													Mean	...	0·5073274
													Mean of Day and Night	...	**0·5073283**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Katni.															
		h m	s	s	′	°	°		s						s
12th Dec. 1909 Night	137	1 30	33·775	+ 2·96	18	20·13	+ 0·15	0·888	0·5075133	− 174	− 9	− 986	− 527	− 55	0·5073382
	139	2 28	34·212	2·96	19	20·31	0·15	0·887	0·5074157	174	10	995	538	55	0·5072385
	138	3 29	32·742	2·96	20	20·47	0·15	0·886	0·5077540	174	11	1003	507	55	0·5075790
	140	4 24	34·537	2·96	19	20·53	0·15	0·886	0·5073449	174	10	1006	537	55	0·5071667
													Mean	...	0·5073306
13th Dec. Day	137	13 30	33·819	+ 2·96	18	19·49	+ 0·27	0·890	0·5075033	− 174	− 9	− 955	− 529	− 55	0·5073311
	139	14 25	34·238	2·96	20	19·68	0·27	0·890	0·5074100	174	11	964	539	55	0·5072357
	138	15 24	32·757	2·96	21	19·98	0·27	0·889	0·5077502	174	12	979	509	55	0·5075773
	140	16 20	34·547	2·96	19	20·25	0·27	0·886	0·5073428	174	10	992	537	55	0·5071660
													Mean	...	0·5073275
													Mean of Day and Night	...	**0·5073290**
13th Dec. Night	140	1 50	34·542	+ 3·00	20	20·91	+ 0·14	0·884	0·5073437	− 176	− 11	− 1025	− 536	− 55	0·5071634
	138	2 46	32·740	3·00	21	21·05	0·14	0·885	0·5077545	176	12	1031	506	55	0·5075765
	139	3 39	34·206	3·00	20	21·17	0·14	0·884	0·5074172	176	11	1037	536	55	0·5072357
	137	4 34	33·776	3·00	19	21·31	0·14	0·884	0·5075129	176	10	1044	525	55	0·5073319
													Mean	...	0·5073269
14th Dec. Day	140	13 48	34·537	+ 3·00	20	20·69	+ 0·15	0·886	0·5073449	− 176	− 11	− 1014	− 537	− 55	0·5071656
	138	14 44	32·744	3·00	21	20·88	0·15	0·886	0·5077533	176	12	1023	507	55	0·5075760
	139	15 39	34·202	3·00	21	21·00	0·15	0·885	0·5074179	176	12	1029	536	55	0·5072371
	137	16 35	33·775	3·00	19	21·12	0·15	0·885	0·5075132	176	10	1035	526	55	0·5073330
													Mean	...	0·5073279
													Mean of Day and Night	...	**0·5073274**
14th Dec. Night	137	1 44	33·769	+ 2·91	19	21·01	+ 0·17	0·884	0·5075145	− 171	− 10	− 1029	− 525	− 55	0·5073355
	139	2 43	34·207	2·91	21	21·19	0·17	0·883	0·5074167	171	12	1038	535	55	0·5072356
	138	3 44	32·731	2·91	21	21·35	0·17	0·883	0·5077565	171	12	1046	505	55	0·5075776
	140	4 38	34·519	2·91	21	21·49	0·17	0·883	0·5073488	171	12	1053	535	55	0·5071662
													Mean	...	0·5073287
15th Dec. Day	137	13 50	33·785	+ 2·91	19	20·30	+ 0·23	0·889	0·5075108	− 171	− 10	− 995	− 528	− 55	0·5073349
	139	14 46	34·221	2·91	21	20·49	0·23	0·888	0·5074140	171	12	1004	538	55	0·5072360
	138	15 48	32·744	2·91	21	20·76	0·23	0·886	0·5077533	171	12	1017	507	55	0·5075771
	140	16 40	34·538	2·91	20	20·93	0·23	0·885	0.5073448	171	11	1026	536	55	0·5071649
													Mean	...	0·5073282
													Mean of Day and Night	...	**0·5073285**
Umaria.															
		h m	s	s	′	°	°		s						s
20th Dec. 1909 Night	137	2 8	33·861	+ 1·06	18	17·93	+ 0·08	0·890	0·5074940	− 62	− 9	− 879	− 528	− 38	0·5073424
	139	3 4	34·305	1·06	20	18·01	0·08	0·889	0·5073955	62	11	882	539	38	0·5072423
	138	4 5	32·828	1·06	20	18·11	0·08	0·890	0·5077332	62	11	887	509	38	0·5075825
	140	5 1	34·637	1·06	20	18·13	0·08	0·890	0·5073233	62	11	888	539	38	0·5071695
													Mean	...	0·5073342
21st Dec. Day	137	14 12	33·915	+ 1·06	18	16·15	+ 0·33	0·898	0·5074817	− 62	− 9	− 791	− 533	− 38	0·5073384
	139	15 9	34·349	1·06	20	16·42	0·33	0·896	0·5073858	62	11	805	543	38	0·5072399
	138	16 11	32·855	1·06	20	16·79	0·33	0·894	0·5077267	62	11	823	511	38	0·5075822
	140	17 6	34·660	1·06	19	17·09	0·33	0·892	0·5073186	62	10	837	541	38	0·5071698
													Mean	...	0·5073326
													Mean of Day and Night	...	**0·5073334**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Correction on account of: Arc	Correction on account of: Temperature	Correction on account of: Density of Air	Correction on account of: Flexure	Reduced Time of Vibration
							Umaria—(contd.)								
		h m	s	s	′	°	°		s						s
21st Dec. Night	140	2 32	34·642	+ 0·97	19	17·71	−0·02	0·892	0·5073222	− 57	−10	− 868	−541	−38	0·5071708
	138	3 27	32·839	0·97	20	17·71	0·02	0·892	0·5077307	57	11	868	510	38	0·5075823
	139	4 28	34·321	0·97	19	17·70	0·02	0·892	0·5073918	57	10	867	541	38	0·5072405
	137	5 25	33·890	0·97	18	17·64	0·02	0·891	0·5074873	57	9	864	529	38	0·5073376
													Mean	...	0·5073328
22nd Dec. Day	140	14 35	34·701	+ 0·97	19	15·32	+0·38	0·899	0·5073097	− 57	−10	− 751	−545	−38	0·5071696
	138	15 30	32·885	0·97	20	15·64	0·38	0·897	0·5077196	57	11	766	513	38	0·5075811
	139	16 27	34·359	0·97	19	16·03	0·38	0·896	0·5073835	57	10	785	543	38	0·5072402
	137	17 25	33·911	0·97	18	16·37	0·38	0·893	0·5074825	57	9	802	530	38	0·5073389
													Mean	...	0·5073325
													Mean of Day and Night	...	**0·5073326**
22nd Dec. Night	137	2 36	33·879	+ 0·98	18	17·72	+0·01	0·890	0·5074898	− 58	− 9	− 868	−529	−38	0·5073396
	139	3 31	34·321	0·98	19	17·73	0·01	0·890	0·5073917	58	10	869	539	38	0·5072403
	138	4 29	32·845	0·98	20	17·73	0·01	0·889	0·5077292	58	11	869	509	38	0·5075807
	140	5 23	34·646	0·98	19	17·74	0·01	0·889	0·5073215	58	10	869	539	38	0·5071701
													Mean	...	0·5073327
23rd Dec. Day	137	14 37	33·925	+ 0·98	18	15·97	+0·33	0·896	0·5074793	− 58	− 9	− 783	−532	−38	0·5073373
	139	15 32	34·357	0·98	20	16·19	0·33	0·895	0·5073842	58	11	793	542	38	0·5072400
	138	16 33	32·873	0·98	20	16·55	0·33	0·893	0·5077226	58	11	811	511	38	0·5075797
	140	17 26	34·667	0·98	19	16·85	0·33	0·891	0·5073170	58	10	826	540	38	0·5071698
													Mean	...	0·5073317
													Mean of Day and Night	...	**0·5073322**
							Pendra.								
		h m	s	s	′	°	°		s						s
30th Dec. 1909 Night	137	2 46	33·874	− 3·61	19	17·94	+0·11	0·873	0·5074909	+ 212	−10	− 879	−519	−52	0·5073661
	139	3 40	34·309	3·61	21	18·10	0·11	0·872	0·5073946	212	12	887	528	52	0·5072679
	138	4 38	32·824	3·61	21	18·16	0·11	0·872	0·5077342	212	12	890	499	52	0·5076101
	140	5 31	34·633	3·61	20	18·27	0·11	0·872	0·5073242	212	11	895	528	52	0·5071968
													Mean	...	0·5073602
31st Dec. Day	137	14 38	33·892	− 3·61	19	17·30	+0·18	0·874	0·5074871	+ 212	−10	− 848	−519	−52	0·5073654
	139	15 35	34·332	3·61	20	17·41	0·18	0·874	0·5073895	212	11	853	530	52	0·5072661
	138	16 34	32·842	3·61	21	17·61	0·18	0·873	0·5077300	212	12	863	499	52	0·5076086
	140	17 27	34·646	3·61	20	17·79	0·18	0·873	0·5073215	212	11	872	529	52	0·5071963
													Mean	...	0·5073591
													Mean of Day and Night	...	**0·5073597**
31st Dec. Night	140	2 51	34·627	− 3·39	20	18·66	+0·12	0·868	0·5073256	+ 199	−11	− 914	−526	−52	0·5071952
	138	3 47	32·816	3·39	21	18·76	0·12	0·867	0·5077361	199	12	919	496	52	0·5076081
	139	4 44	34·287	3·39	21	18·93	0·12	0·867	0·5073992	199	12	928	525	52	0·5072674
	137	5 39	33·841	3·39	19	18·95	0·12	0·867	0·5074982	199	10	929	515	52	0·5073675
													Mean	...	0·5073595
1st Jan. 1910 Day	140	15 0	34·646	− 3·39	20	17·76	+0·20	0·873	0·5073215	+ 199	−11	− 870	−529	−52	0·5071952
	138	15 55	32·839	3·39	21	17·94	0·20	0·872	0·5077306	199	12	879	499	52	0·5076063
	139	16 51	34·307	3·39	21	18·15	0·20	0·872	0·5073950	199	12	889	528	52	0·5072668
	137	17 47	33·858	3·39	19	18·32	0·20	0·869	0·5074945	199	10	898	516	52	0·5073668
													Mean	...	0·5073588
													Mean of Day and Night	...	**0·5073591**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Correction on account of: Arc	Correction on account of: Temperature	Correction on account of: Density of Air	Correction on account of: Flexure	Reduced Time of Vibration
						Pendra—(contd.)									
		h m	s	s	′	°	°		s						s
1st Jan. Night	137	3 2	33·850	− 3·20	19	18·98	+0·10	0·866	0·5074962	+ 188	−10	− 930	−514	−52	0·5073644
	139	3 59	34·289	3·20	21	19·12	0·10	0·865	0·5073988	188	12	937	524	52	0·5072651
	138	5 1	32·809	3·20	21	19·23	0·10	0·865	0·5077377	188	12	942	495	52	0·5076064
	140	5 57	34·606	3·20	20	19·27	0·10	0·865	0·5073302	188	11	944	524	52	0·5071959
													Mean	...	0·5073580
2nd Jan. Day	137	15 10	33·857	− 3·20	19	18·41	+0·25	0·868	0·5074947	+ 188	−10	− 902	−516	−52	0·5073655
	139	16 7	34·299	3·20	21	18·61	0·25	0·867	0·5073967	188	12	912	525	52	0·5072654
	138	17 6	32·812	3·20	21	18·87	0·25	0·866	0·5077372	188	12	925	495	52	0·5076076
	140	18 1	34·608	3·20	20	19·09	0·25	0·865	0·5073297	188	11	935	524	52	0·5071963
													Mean	...	0·5073587
										Mean of Day and Night				...	**0·5073583**
2nd Jan. Night	140	2 43	34·598	− 3·20	20	19·51	+0·10	0·865	0·5073317	+ 188	−11	− 956	−524	−52	0·5071962
	138	3 38	32·801	3·20	21	19·55	0·10	0·865	0·5077398	188	12	958	495	52	0·5076069
	139	4 34	34·270	3·20	21	19·69	0·10	0·865	0·5074031	188	12	965	524	52	0·5072666
	137	5 28	33·824	3·20	19	19·72	0·10	0·864	0·5075021	188	10	966	513	52	0·5073668
													Mean	...	0·5073591
3rd Jan. Day	140	14 53	34·612	− 3·20	20	18·82	+0·10	0·868	0·5073288	+ 188	−11	− 922	−526	−52	0·5071965
	138	15 50	32·810	3·20	21	18·93	0·10	0·868	0·5077377	188	12	928	496	52	0·5076077
	139	16 46	34·280	3·20	19	19·02	0·10	0·867	0·5074008	188	10	932	525	52	0·5072677
	137	17 43	33·835	3·20	19	19·12	0·10	0·867	0·5074995	188	10	937	515	52	0·5073669
													Mean	...	0·5073597
										Mean of Day and Night				...	**0·5073594**
3rd Jan. Night	137	3 14	33·835	− 3·20	19	19·32		0·867	0·5074997	+ 188	−10	− 947	−515	−52	0·5073661
	139	4 10	34·274	3·20	20	19·35		0·867	0·5074021	188	11	948	525	52	0·5072673
4th Jan. Day	138	15 14	32·816	− 3·20	21	18·36		0·872	0·5077360	+ 188	−12	− 900	−499	−52	0·5076085
	140	16 10	34·614	3·20	20	18·57		0·872	0·5073285	188	11	910	528	52	0·5071972
										Mean of Day and Night				...	**0·5073598**
						Bilaspur.									
		h m	s	s	′	°	°		s						s
10th Jan. 1910 Night	137	3 51	33·687	− 0·02	17	24·49	+0·05	0·877	0·5075331	+ 1	− 8	−1200	−521	−47	0·5073556
	139	4 46	34·123	0·02	20	24·52	0·05	0·876	0·5074353	1	11	1201	531	47	0·5072564
	138	5 47	32·656	0·02	20	24·59	0·05	0·876	0·5077747	1	11	1205	501	47	0·5075984
	140	6 41	34·442	0·02	19	24·65	0·05	0·875	0·5073656	1	10	1208	530	47	0·5071862
													Mean	...	0·5073492
11th Jan. Day	137	15 40	33·715	− 0·02	18	23·73	+0·09	0·880	0·5075267	+ 1	− 9	−1163	−523	−47	0·5073526
	139	16 35	34·147	0·02	19	23·75	0·09	0·879	0·5074302	1	10	1164	533	47	0·5072549
	138	17 36	32·678	0·02	20	23·87	0·09	0·871	0·5077693	1	11	1170	498	47	0·5075968
	140	18 28	34·466	0·02	19	23·93	0·09	0·871	0·5073603	1	10	1173	528	47	0·5071846
													Mean	...	0·5073472
										Mean of Day and Night				...	**0·5073482**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Bilaspur—(contd.)							
		h m	s	s	′	°	°		s						s
11th Jan. Night	140	3 40	34·460	− 0·16	19	24·11	+0·09	0·878	0·5073616	+ 9	− 10	− 1181	− 532	−47	0·5071855
	138	4 37	32·674	0·16	20	24·20	0·09	0·877	0·5077702	9	11	1186	502	47	0·5075965
	139	5 35	34·131	0·16	19	24·32	0·09	0·877	0·5074336	9	10	1192	531	47	0·5072565
	137	6 30	33·689	0·16	18	24·36	0·09	0·877	0·5075327	9	9	1194	521	47	0·5073565
													Mean	...	0·5073487
12th Jan. Day	140	15 43	34·476	− 0·16	19	23·49	+0·16	0·881	0·5073582	+ 9	− 10	− 1151	− 534	−47	0·5071849
	138	16 46	32·692	0·16	20	23·58	0·16	0·881	0·5077658	9	11	1155	504	47	0·5075950
	139	17 50	34·149	0·16	19	23·79	0·16	0·880	0·5074297	9	10	1166	533	47	0·5072550
	137	18 47	33·703	0·16	18	23·93	0·16	0·880	0·5075295	9	9	1173	523	47	0·5073552
													Mean	...	0·5073475
											Mean of Day and Night			...	**0·5073481**
12th Jan. Night	137	3 44	33·703	− 0·46	18	24·09	+0·10	0·879	0·5075295	+ 27	− 9	− 1180	− 522	−47	0·5073564
	139	4 39	34·148	0·46	19	24·14	0·10	0·878	0·5074298	27	10	1183	532	47	0·5072553
	138	5 48	32·681	0·46	20	24·31	0·10	0·878	0·5077687	27	11	1191	502	47	0·5075963
	140	6 40	34·464	0·46	19	24·33	0·10	0·878	0·5073607	27	10	1192	532	47	0·5071853
													Mean	...	0·5073483
13th Jan. Day	137	15 40	33·722	− 0·46	17	23·58	+0·17	0·883	0·5075250	+ 27	− 8	− 1155	− 525	−47	0·5073542
	139	16 42	34·161	0·46	19	23·70	0·17	0·881	0·5074269	27	10	1161	534	47	0·5072544
	138	17 55	32·690	0·46	20	23·92	0·17	0·881	0·5077665	27	11	1172	504	47	0·5075958
	140	18 49	34·473	0·46	19	24·08	0·17	0·879	0·5073587	27	10	1180	533	47	0·5071844
													Mean	...	0·5073472
											Mean of Day and Night			...	**0·5073478**
13th Jan. Night	140	3 49	34·469	− 0·52	19	24·32	+0·11	0·877	0·5073596	+ 31	− 10	− 1192	− 531	−47	0·5071847
	138	4 44	32·681	0·52	20	24·42	0·11	0·877	0·5077685	31	11	1197	502	47	0·5075959
	139	5 54	34·140	0·52	18	24·54	0·11	0·876	0·5074317	31	9	1202	531	47	0·5072559
	137	6 49	33·695	0·52	18	24·66	0·11	0·876	0·5075311	31	9	1208	520	47	0·5073558
													Mean	...	0·5073481
14th Jan. Day	140	15 42	34·478	− 0·52	20	23·92	+0·14	0·880	0·5073576	+ 31	− 11	− 1172	− 533	−47	0·5071844
	138	16 36	32·684	0·52	20	24·03	0·14	0·880	0·5077680	31	11	1177	503	47	0·5075973
	139	17 33	34·147	0·52	19	24·15	0·14	0·879	0·5074302	31	10	1183	533	47	0·5072560
	137	18 27	33·704	0·52	18	24·31	0·14	0·879	0·5075292	31	9	1191	522	47	0·5073554
													Mean	...	0·5073483
											Mean of Day and Night			...	**0·5073482**
								Raipur.							
		h m	s	s	′	°	°		s						s
20th Jan. 1910 Night	137	4 2	33·807	− 4·96	19	21·62	+0·11	0·871	0·5075059	+ 291	− 10	− 1059	− 517	−39	0·5073725
	139	5 1	34·245	4·96	21	21·74	0·11	0·871	0·5074085	291	12	1065	528	39	0·5072732
	138	6 0	32·768	4·96	21	21·86	0·11	0·871	0·5077476	291	12	1071	498	39	0·5076147
	140	6 54	34·558	4·96	20	21·92	0·11	0·871	0·5073406	291	11	1074	528	39	0·5072045
													Mean	...	0·5073662
21st Jan Day	137	16 4	33·800	− 4·96	19	21·55	0·00	0·873	0·5075075	+ 291	− 10	− 1056	− 519	−39	0·5073742
	139	17 0	34·246	4·96	20	21·53	0·00	0·874	0·5074083	291	11	1055	530	39	0·5072739
	138	18 0	32·778	4·96	21	21·54	0·00	0·874	0·5077453	291	12	1055	500	39	0·5076138
	140	18 54	34·569	4·96	20	21·55	0·00	0·873	0·5073382	291	11	1056	529	39	0·5072038
													Mean	...	0·5073664
											Mean of Day and Night			...	**0·5073663**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
		Raipur—(contd.)													
		h m	s	s	′	°	°		s						s
21st Jan. Night	140	4 6	34·552	− 4·45	20	21·87	+0·11	0·870	0·5073417	+ 261	− 11	− 1072	− 527	− 39	0·5072029
	138	6 3	32·755	4·45	21	21·98	0·11	0·870	0·5077509	261	12	1077	498	39	0·5076144
	139	7 0	34·223	4·45	21	22·12	0·11	0·870	0·5074136	261	12	1084	527	39	0·5072735
	137	7 58	33·777	4·45	19	22·17	0·11	0·870	0·5075128	261	10	1086	517	39	0·5073737
													Mean	..	0·5073661
22nd Jan. Day	140	16 6	34·554	− 4·45	20	21·86	0·00	0·871	0·5073413	+ 261	− 11	− 1071	− 528	− 39	0·5072025
	138	16 59	32·758	4·45	21	21·85	0·00	0·872	0·5077500	261	12	1071	499	39	0·5076140
	139	17 56	34·229	4·45	21	21·85	0·00	0·872	0·5074120	261	12	1071	528	39	0·5072731
	137	18 50	33·787	4·45	19	21·88	0·00	0·872	0·5075103	261	10	1072	518	39	0·5073725
													Mean	...	0·5073655
											Mean of Day and Night			...	**0·5073658**
22nd Jan. Night	137	4 11	33·774	− 4·22	19	22·07	+0·11	0·869	0·5075133	+ 248	− 10	− 1081	− 516	− 39	0·5073735
	139	5 4	34·213	4·22	21	22·18	0·11	0·870	0·5074155	248	12	1087	527	39	0·5072738
	138	6 2	32·748	4·22	21	22·31	0·11	0·868	0·5077526	248	12	1093	496	39	0·5076134
	140	6 57	34·537	4·22	20	22·37	0·11	0·868	0·5073450	248	11	1096	526	39	0·5072026
													Mean	...	0·5073658
23rd Jan. Day	137	16 8	33·776	− 4·22	19	22·12	+0·01	0·871	0·5075128	+ 248	− 10	− 1084	− 517	− 39	0·5073726
	139	17 4	34·217	4·22	21	22·12	0·01	0·871	0·5074146	248	12	1084	528	39	0·5072731
	138	18 4	32·752	4·22	20	22·13	0·01	0·871	0·5077515	248	11	1084	498	39	0·5076131
	140	18 58	34·541	4·22	21	22·15	0·01	0·870	0·5073442	248	12	1085	527	39	0·5072027
													Mean	...	0·5073654
											Mean of Day and Night			...	**0·5073656**
23rd Jan. Night	140	4 12	34·534	− 4·31	21	22·34	+0·10	0·869	0·5073457	+ 253	− 12	− 1095	− 527	− 39	0·5072037
	138	5 7	32·739	4·31	20	22·49	0·10	0·869	0·5077546	253	11	1102	497	39	0·5076150
	139	6 5	34·209	4·31	18	22·56	0·10	0·869	0·5074163	253	9	1105	527	39	0·5072736
	137	7 2	33·771	4·31	19	22·64	0·10	0·869	0·5075140	253	10	1109	516	39	0·5073719
													Mean	...	0·5073661
24th Jan. Day	140	16 14	34·546	− 4·31	20	22·12	0·00	0·873	0·5073429	+ 253	− 11	− 1084	− 529	− 39	0·5072019
	138	17 10	32·750	4·31	21	22·12	0·00	0·875	0·5077520	253	12	1084	501	39	0·5076137
	139	18 3	34·219	4·31	21	22·12	0·00	0·873	0·5074143	253	12	1084	529	39	0·5072732
	137	18 57	33·780	4·31	19	22·12	0·00	0·872	0·5075121	253	10	1084	518	39	0·5073723
													Mean	...	0·5073653
											Mean of Day and Night			...	**0·5073657**
		Amgaon.													
		h m	s	s	′	°	°		s						s
31st Jan. 1910 Night	137	4 47	33·887	− 7·05	18	20·14	+0·20	0·892	0·5074879	+ 414	− 9	− 987	− 530	− 45	0·5073722
	139	5 46	34·324	7·05	19	20·36	0·20	0·891	0·5073912	414	10	998	540	45	0·5072733
	138	6 48	32·841	7·05	20	20·57	0·20	0·891	0·5077302	414	11	1008	510	45	0·5076142
	140	7 42	34·657	7·05	19	20·71	0·20	0·891	0·5073191	414	10	1015	540	45	0·5071995
													Mean	...	0·5073648
1st Feb. Day	137	16 49	33·894	− 7·05	18	19·93	+0·10	0·897	0·5074861	+ 414	− 9	− 977	− 533	− 45	0·5073711
	139	17 46	34·326	7·05	20	19·93	0·10	0·896	0·5073908	414	11	977	543	45	0·5072746
	138	18 44	32·843	7·05	21	20·05	0·10	0·896	0·5077297	414	12	982	513	45	0·5076159
	140	19 38	34·652	7·05	19	20·16	0·10	0·895	0·5073203	414	10	988	542	45	0·5072032
													Mean	...	0·5073662
											Mean of Day and Night			...	**0·5073655**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Correction on account of: Arc	Correction on account of: Temperature	Correction on account of: Density of Air	Correction on account of: Flexure	Reduced Time of Vibration
									Amgaon—(contd.)						
		h m	s	s	′	°	°		s						s
1st	140	4 44	34·645	− 7·14	19	20·79	+0·21	0·891	0·5073216	+ 419	− 10	− 1019	− 540	− 45	0·5072021
Feb.	138	5 40	32·830	7·14	20	21·01	0·21	0·890	0·5077328	419	11	1029	509	45	0·5076153
Night	139	6 34	34·300	7·14	19	21·21	0·21	0·890	0·5073963	419	10	1039	539	45	0·5072749
	137	7 29	33·687	7·14	18	21·35	0·21	0·890	0·5074926	419	9	1046	529	45	0·5073716
													Mean	...	0·5073660
2nd	140	16 47	34·646	− 7·14	19	20·47	+0·08	0·896	0·5073215	+ 419	− 10	− 1003	− 543	− 45	0·5072033
Feb.	138	17 43	32·838	7·14	21	20·49	0·08	0·897	0·5077310	419	12	1004	513	45	0·5076155
Day	139	18 38	34·309	7·14	19	20·55	0·08	0·896	0·5073946	419	10	1007	543	45	0·5072760
	137	19 33	33·873	7·14	19	20·70	0·08	0·895	0·5074911	419	10	1014	532	45	0·5073729
													Mean	...	0·5073669
													Mean of Day and Night	...	**0·5073665**
2nd	137	4 48	33·866	− 6·94	19	21·29	+0·15	0·891	0·5074927	+ 407	− 10	− 1043	− 529	− 45	0·5073707
Feb.	139	5 43	34·293	6·94	19	21·46	0·15	0·890	0·5073980	407	10	1052	539	45	0·5072741
Night	138	6 41	32·811	6·94	20	21·60	0·15	0·890	0·5077372	407	11	1058	509	45	0·5076156
	140	7 37	34·616	6·94	19	21·72	0·15	0·890	0·5073278	407	10	1064	539	45	0·5072027
													Mean	...	0·5073658
3rd	137	16 57	33·880	− 6·94	17	20·77	+0·04	0·897	0·5074897	+ 407	− 8	− 1018	− 533	− 45	0·5073700
Feb.	139	17 59	34·320	6·94	20	20·67	0·04	0·897	0·5073922	407	11	1013	544	45	0·5072714
Day	138	19 0	32·833	6·94	20	20·72	0·04	0·896	0·5077321	407	11	1015	513	45	0·5076144
	140	19 53	34·639	6·94	19	20·85	0·04	0·895	0·5073228	407	10	1022	542	45	0·5072016
													Mean	...	0·5073644
													Mean of Day and Night	...	**0·5073651**
3rd	140	4 49	34·625	− 6·82	19	21·52	+0·20	0·890	0·5073260	+ 400	− 10	− 1054	− 539	− 45	0·5072012
Feb.	138	5 47	32·816	6·82	20	21·72	0·20	0·890	0·5077360	400	11	1064	509	45	0·5076131
Night	139	6 49	34·276	6·82	19	21·91	0·20	0·889	0·5074016	400	10	1074	539	45	0·5072748
	137	7 47	33·849	6·82	18	22·10	0·20	0·889	0·5074963	400	9	1083	528	45	0·5073698
													Mean	...	0·5073647
4th	140	16 55	34·638	− 6·82	19	21·02	+0·03	0·895	0·5073230	+ 400	− 10	− 1030	− 542	− 45	0·5072003
Feb.	138	17 50	32·826	6·82	20	20·92	0·03	0·896	0·5077337	400	11	1025	513	45	0·5076143
Day	139	18 46	34·301	6·82	20	20·95	0·03	0·894	0·5073961	400	11	1027	542	45	0·5072736
	137	19 39	33·866	6·82	18	21·10	0·03	0·893	0·5074927	400	9	1034	530	45	0·5073709
													Mean	...	0·5073648
													Mean of Day and Night	...	**0·5073648**
									Seoni.						
		h m	s	s	′	°	°		s						s
13th	137	5 40	33·595	+ 2·29	20	23·06	−0·07	0·851	0·5075541	− 134	− 11	− 1130	− 505	− 45	0·5073716
Feb	139	6 47	34·029	2·29	20	23·02	0·07	0·851	0·5074562	134	11	1128	516	45	0·5072728
1910	138	7 45	32·579	2·29	20	22·95	0·07	0·851	0·5077933	134	11	1125	487	45	0·5076131
Night	140	8 38	34·364	2·29	19	22·91	0·07	0·851	0·5073826	134	10	1123	516	45	0·5071998
													Mean	...	0·5073643
14th	137	17 31	33·656	+ 2·29	18	20·25	+0·41	0·859	0·5075400	− 134	− 9	− 992	− 510	− 45	0·5073710
Feb	139	18 28	34·083	2·29	20	20·51	0·41	0·858	0·5074442	134	11	1005	520	45	0·5072727
Day	138	19 28	32·621	2·29	21	20·91	0·41	0·856	0·5077831	134	12	1025	490	45	0·5076125
	140	20 20	34·401	2·29	20	21·36	0·41	0·854	0·5073743	134	11	1047	518	45	0·5071988
													Mean	...	0·5073638
													Mean of Day and Night	...	**0·5073640**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Seoni—(contd.)							
		h m	s	s	′	°	°		s						s
14th Feb. Night	140	7 55	34·364	+ 2·23	19	22·64		0·854	0·5073826	− 131	− 10	− 1109	− 518	− 45	0·5072013
	138	8 52	32·594	2·23	20	22·54		0·853	0·5077896	131	11	1104	488	45	0·5076117
15th Feb. Day	139	19 58	34·111	+ 2·23	20	19·70		0·860	0·5074382	− 131	− 11	− 965	− 521	− 45	0·5072709
	137	20 53	33·660	2·23	19	20·30		0·857	0·5075393	131	10	995	509	45	0·5073703
										Mean of Day and Night ...					**0·5073636**
15th Feb. Night	137	5 50	33·597	+ 2·25	19	23·41	− 0·24	0·851	0·5075536	− 132	− 10	− 1147	− 505	− 45	0·5073697
	139	6 45	34·027	2·25	21	23·20	0·24	0·852	0·5074567	132	12	1137	516	45	0·5072725
	138	7 44	32·573	2·25	21	22·95	0·24	0·853	0·5077949	132	12	1125	488	45	0·5076147
	140	8 36	34·353	2·25	20	22·78	0·24	0·852	0·5073849	132	11	1116	516	45	0·5072029
													Mean	...	0·5073650
16th Feb. Day	137	17 46	33·692	+ 2·25	19	19·29	+ 0·35	0·865	0·5075318	− 132	− 10	− 945	− 514	− 45	0·5073672
	139	18 41	34·126	2·25	20	19·31	0·35	0·864	0·5074347	132	11	946	524	45	0·5072689
	138	19 43	32·647	2·25	21	19·70	0·35	0·860	0·5077768	132	12	965	492	45	0·5076122
	140	20 38	34·413	2·25	20	20·26	0·35	0·858	0·5073717	132	11	993	520	45	0·5072016
													Mean	...	0·5073625
										Mean of Day and Night ...					**0·5073637**
16th Feb. Night	140	5 55	34·381	+ 2·10	20	22·23	− 0·13	0·856	0·5073788	− 123	− 11	− 1089	− 519	− 45	0·5072001
	138	6 50	32·599	2·10	21	22·02	0·13	0·856	0·5077885	123	12	1079	490	45	0·5076136
	139	7 47	34·049	2·10	19	21·92	0·13	0·856	0·5074518	123	10	1074	519	45	0·5072747
	137	8 42	33·626	2·10	19	21·87	0·13	0·855	0·5075469	123	10	1072	508	45	0·5073711
													Mean	...	0·5073649
17th Feb. Day	140	17 55	34·503	+ 2·10	20	17·59	+ 0·10	0·869	0·5073523	− 123	− 11	− 862	− 527	− 45	0·5071955
	138	18 49	32·696	2·10	21	17·88	0·10	0·866	0·5077648	123	12	876	495	45	0·5076097
	139	19 44	34·138	2·10	21	18·49	0·10	0·864	0·5074320	123	12	906	524	45	0·5072710
	137	20 38	33·693	2·10	19	19·15	0·10	0·860	0·5075318	123	10	938	511	45	0·5073691
													Mean	...	0·5073613
										Mean of Day and Night ...					**0·5073631**
17th Feb. Night	137	6 52	33·630	+ 2·18	19	21·95		0·855	0·5075460	− 128	− 10	− 1076	− 508	− 45	0·5073693
	139	7 47	34·057	2·18	21	21·91		0·854	0·5074500	128	12	1074	518	45	0·5072723
18th Feb. Day	138	18 52	32·678	+ 2·18	21	18·77		0·862	0·5077691	− 128	− 12	− 920	− 493	− 45	0·5076093
	140	19 44	34·448	2·18	21	19·12		0·860	0·5073645	128	12	937	521	45	0·5072002
										Mean of Day and Night ...					**0·5073628**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Jubbulpore.															
		h m	s	s	′	°	°		s						s
25th Feb 1910 Night	137	6 20	33·428	+11·96	19	24·78	−0·10	0·862	0·5075922	−702	−10	−1214	−512	−42	0·5073442
	139	7 15	33·855	11·96	21	24·74	0·10	0·862	0·5074952	702	12	1212	522	42	0·5072462
	138	8 15	32·422	11·96	21	24·66	0·10	0·864	0·5078316	702	12	1208	494	42	0·5075858
	140	9 8	34·180	11·96	20	24·51	0·10	0·865	0·5074229	702	11	1201	524	42	0·5071749
													Mean	...	0·5073378
26th Feb. Day	137	18 14	33·475	+11·96	19	21·92	+0·08	0·875	0·5075812	−702	−10	−1074	−520	−42	0·5073464
	139	19 8	33·912	11·96	21	21·92	0·08	0·875	0·5074823	702	12	1074	530	42	0·5072463
	138	20 6	32·471	11·96	20	21·96	0·08	0·873	0·5078197	702	11	1076	499	42	0·5075867
	140	20 58	34·229	11·96	21	22·17	0·08	0·872	0·5074120	702	12	1086	528	42	0·5071750
													Mean	...	0·5073386
										Mean of Day and Night				...	**0·5073382**
26th Feb Night	140	6 17	34·192	+12·04	20	23·71	−0·13	0·868	0·5074202	−707	−11	−1162	−526	−42	0·5071754
	138	7 13	32·437	12·04	21	23·64	0·13	0·869	0·5078279	707	12	1158	497	42	0·5075863
	139	8 7	33·880	12·04	20	23·52	0·13	0·870	0·5074897	707	11	1152	527	42	0·5072458
	137	9 2	33·458	12·04	19	23·38	0·13	0·871	0·5075856	707	10	1146	517	42	0·5073434
													Mean	...	0·5073377
27th Feb. Day	140	18 25	34·263	+12·04	20	20·73	+0·18	0·880	0·5074047	−707	−11	−1016	−533	−42	0·5071738
	138	19 19	32·496	12·04	21	20·73	0·18	0·879	0·5078137	707	12	1016	503	42	0·5075857
	139	20 14	33·935	12·04	21	20·90	0·18	0·878	0·5074772	707	12	1024	532	42	0·5072455
	137	21 8	33·501	12·04	19	21·19	0·18	0·877	0·5075757	707	10	1038	521	42	0·5073439
													Mean	...	0·5073372
										Mean of Day and Night				...	**0·5073375**
27th Feb Night	137	6 26	33·444	+11·96	19	23·29	−0·07	0·869	0·5075886	−702	−10	−1141	−516	−42	0·5073475
	139	7 19	33·884	11·96	20	23·28	0·07	0·870	0·5074887	702	11	1141	527	42	0·5072464
	138	8 15	32·443	11·96	21	23·21	0·07	0·871	0·5078262	702	12	1137	498	42	0·5075871
	140	9 8	34·211	11·96	20	23·14	0·07	0·871	0·5074161	702	11	1134	528	42	0·5071744
													Mean	...	0·5073389
28th Feb. Day	137	18 28	33·509	+11·96	19	20·80	+0·16	0·879	0·5075736	−702	−10	−1019	−522	−42	0·5073441
	139	19 22	33·938	11·96	20	20·72	0·16	0·878	0·5074766	702	11	1015	532	42	0·5072464
	138	20 19	32·494	11·96	21	20·88	0·16	0·877	0·5078141	702	12	1023	502	42	0·5075860
	140	21 9	34·254	11·96	20	21·21	0·16	0·875	0·5074067	702	11	1039	530	42	0·5071743
													Mean	...	0·5073377
										Mean of Day and Night				...	**0·5073383**
28th Feb. Night	140	6 29	34·188	+11·96	20	23·80	−0·01	0·867	0·5074209	−702	−11	−1166	−525	−42	0·5071763
	138	7 26	32·428	11·96	13	23·85	0·01	0·867	0·5078301	702	4	1169	496	42	0·5075888
	139	8 19	33·876	11·96	20	23·84	0·01	0·867	0·5074906	702	11	1168	525	42	0·5072458
	137	9 11	33·448	11·96	19	23·76	0·01	0·867	0·5075877	702	10	1164	515	42	0·5073444
													Mean	...	0·5073388
1st Mar. Day	140	18 30	34·242	+11·96	20	21·72	+0·25	0·872	0·5074091	−702	−11	−1064	−528	−42	0·5071744
	138	19 25	32·475	11·96	20	21·80	0·25	0·872	0·5078187	702	11	1068	499	42	0·5075865
	139	20 18	33·905	11·96	21	22·02	0·25	0·871	0·5074840	702	12	1079	528	42	0·5072477
	137	21 10	33·476	11·96	20	22·35	0·25	0·869	0·5075812	702	11	1095	516	42	0·5073446
													Mean	...	0·5073383
										Mean of Day and Night				...	**0·5073385**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature		Density of Air	Observed Time of Vibration	Correction on account of					Reduced Time of Vibration
						Corrected Mean	Mean Change per hour			Clock Rate	Arc	Temperature	Density of Air	Flexure	
								Maihar.							
		h m	s	s	′	°	°		s						s
15th Mar. 1910 Night	137	7 46	33·521	+10·91	19	24·74	+0·09	0·873	0·5075710	−640	−10	−1212	−519	−46	0·5073283
	139	8 40	33·953	10·91	19	24·89	0·09	0·872	0·5074731	640	10	1220	528	46	0·5072287
	138	9 39	32·502	10·91	19	24·95	0·09	0·872	0·5078122	640	10	1223	499	46	0·5075704
	140	10 33	34·269	10·91	19	25·01	0·09	0·872	0·5074032	640	10	1225	528	46	0·5071583
													Mean	...	0·5073214
16th Mar. Day	137	19 44	33·521	+10·91	19	24·39	+0·18	0·876	0·5075711	−640	−10	−1195	−520	−46	0·5073300
	139	20 39	33·957	10·91	19	24·52	0·18	0·875	0·5074725	640	10	1201	530	46	0·5072298
	138	21 38	32·509	10·91	19	24·70	0·18	0·872	0·5078103	640	10	1210	499	46	0·5075698
	140	22 34	34·270	10·91	19	24·90	0·18	0·872	0·5074031	640	10	1220	528	46	0·5071587
													Mean	...	0·5073221
										Mean of Day and Night				...	**0·5073218**
16th Mar. Night	140	7 44	34·264	+11·12	19	25·17	+0·14	0·870	0·5074043	−653	−10	−1233	−527	−46	0·5071574
	138	8 39	32·496	11·12	19	25·33	0·14	0·870	0·5078136	653	10	1241	498	46	0·5075688
	137	9 34	33·940	11·12	19	25·48	0·14	0·870	0·5074761	653	10	1249	527	46	0·5072276
	139	10 28	33·498	11·12	18	25·53	0·14	0·869	0·5075763	653	9	1251	516	46	0·5073288
													Mean	...	0·5073206
17th Mar. Day	140	19 47	34·267	+11·12	18	24·99	+0·21	0·873	0·5074037	−653	−9	−1225	−529	−46	0·5071575
	138	20 41	32·495	11·12	19	25·12	0·21	0·872	0·5078136	653	10	1231	499	46	0·5075697
	137	21 37	33·940	11·12	19	25·34	0·21	0·870	0·5074760	653	10	1242	527	46	0·5072282
	139	22 34	33·495	11·12	14	25·56	0·21	0·870	0·5075768	653	5	1252	517	46	0·5073295
													Mean	...	0·5073212
										Mean of Day and Night				...	**0·5073209**
17th Mar. Night	137	7 43	33·492	+11·21	14	25·84		0·869	0·5075777	−658	−5	−1266	−516	−46	0·5073286
	139	8 40	33·926	11·21	18	25·95		0·867	0·5074792	658	9	1272	525	46	0·5072282
18th Mar. Day	138	19 42	32·493	+11·21	19	25·44		0·870	0·5078143	−658	−10	−1247	−498	−46	0·5075684
	140	20 38	34·248	11·21	19	25·56		0·869	0·5074078	658	10	1252	527	46	0·5071585
										Mean of Day and Night				...	**0·5073209**
18th Mar Night	140	7 58	34·220	+11·42	19	26·55		0·865	0·5074141	−670	−10	−1301	−524	−46	0·5071590
	138	8 54	32·462	11·42	19	26·71		0·863	0·5078220	670	10	1309	494	46	0·5075691
19th Mar. Day	139	19 56	33·916	+11·42	19	26·22		0·868	0·5074813	−670	−10	−1285	−526	−46	0·5072276
	137	20 50	33·474	11·42	17	26·37		0·867	0·5075817	670	8	1292	515	46	0·5073286
										Mean of Day and Night				...	**0·5073211**

Table 11.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Allahabad.															
		h m	s	s	′	°	°		s						s
25th	137	8 33	33·698	+ 7·36	17	27·25	−0·06	0·886	0·5075306	− 432	− 8	−1335	−526	−45	0·5072960
Mar.	139	9 32	34·161	7·36	16	27·18	0·06	0·886	0·5074271	432	7	1332	537	45	0·5071918
1910	138	10 31	32·697	7·36	17	27·13	0·06	0·889	0·5077646	432	8	1329	509	45	0·5075323
Night	140	11 28	34·492	7·36	16	27·09	0·06	0·889	0·5073547	432	7	1327	539	45	0·5071197
													Mean	...	0·5072850
26th	137	20 33	33·763	+ 7·36	15	26·12	+0·05	0·893	0·5075159	− 432	− 6	−1280	−530	−45	0·5072866
Mar.	139	21 29	34·220	7·36	16	26·12	0·05	0·893	0·5074141	432	7	1280	541	45	0·5071836
Day	138	22 28	32·753	7·36	16	26·17	0·05	0·893	0·5077512	432	7	1282	511	45	0·5075235
	140	23 20	34·536	7·36	16	26·24	0·05	0·892	0·5073452	432	7	1286	541	45	0·5071141
													Mean	...	0·5072769
													Mean of Day and Night	...	**0·5072810**
28th	140	8 34	34·506	+ 7·78	16	26·88	+0·02	0·883	0·5073516	− 457	− 7	−1317	−535	−45	0·5071155
Mar.	138	9 29	32·721	7·78	17	26·93	0·02	0·884	0·5077590	457	8	1320	506	45	0·5075254
Night	139	10 25	34·174	7·78	16	26·94	0·02	0·884	0·5074242	457	7	1320	536	45	0·5071877
	137	11 19	33·726	7·78	15	26·97	0·02	0·884	0·5075242	457	6	1322	525	45	0·5072887
													Mean	...	0·5072793
29th	140	20 39	34·503	+ 7·78	16	26·72	+0·04	0·886	0·5073522	− 457	− 7	−1309	−537	−45	0·5071167
Mar.	138	21 40	32·723	7·78	17	26·73	0·04	0·885	0·5077585	457	8	1309	506	45	0·5075260
Day	139	22 35	34·176	7·78	16	26·77	0·04	0·885	0·5074238	457	7	1312	536	45	0·5071881
	137	23 29	33·728	7·78	15	26·84	0·04	0·885	0·5075237	457	6	1315	526	45	0·5072888
													Mean	...	0·5072799
													Mean of Day and Night	...	**0·507279 6**
29th	137	8 41	33·726	+ 7·84	15	26·93	+0·07	0·884	0·5075243	− 460	− 6	−1320	−525	−45	0·5072887
Mar.	139	9 37	34·176	7·84	16	27·02	0·07	0·885	0·5074237	460	7	1324	536	45	0·5071865
Night	138	10 38	32·712	7·84	16	27·12	0·07	0 885	0·5077609	460	7	1329	506	45	0·5075262
	140	11 33	34·489	7·84	16	27·13	0·07	0·885	0·5073555	460	7	1329	536	45	0·5071178
													Mean	...	0·5072798
30th	137	20 49	33·724	+ 7·84	15	26·80	+0·04	0·889	0·5075247	− 460	− 6	−1313	−528	−45	0·5072895
Mar	139	21 44	34·171	7·84	17	26·81	0·04	0·889	0·5074247	460	8	1314	539	45	0·5071881
Day	138	22 41	32·712	7 84	17	26·87	0·04	0·889	0·5077610	460	8	1317	509	45	0·5075271
	140	23 35	34·489	7·84	16	26·92	0·04	0·887	0·5073551	460	7	1319	538	45	0·5071182
													Mean	...	0·5072807
													Mean of Day and Night	...	**0·5072803**
30th	140	8 38	34·498	+ 8·08	16	26·74	+0·08	0·886	0·5073533	− 474	− 7	−1310	−537	−45	0·5071160
Mar.	138	9 33	32·710	8·08	17	26·80	0·08	0·886	0·5077613	474	8	1313	507	45	0·5075266
Night	139	10 28	34·176	8·08	17	26·88	0·08	0·886	0·5074238	474	8	1317	537	45	0·5071857
	137	11 22	33·711	8·08	16	26·93	0·08	0·884	0·5075278	474	7	1320	525	45	0·5072907
													Mean	...	0·5072798
31st	140	20 56	34·498	+ 8·08	17	26·53	+0·08	0·887	0·5073535	− 474	− 8	−1300	−538	−45	0·5071170
Mar.	138	21 50	32·709	8·08	18	26·54	0·08	0·887	0·5077618	474	9	1300	507	45	0·5075283
Day	139	22 44	34·174	8·08	17	26·64	0·08	0·886	0·5074242	474	8	1305	537	45	0·5071873
	137	23 39	33·727	8·08	16	26·73	0·08	0·886	0·5075240	474	7	1310	526	45	0·5072878
													Mean	...	0·5072801
													Mean of Day and Night	...	**0·5072799**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
		Sultanpur.													
		h m	s	s	′	°	°		s						s
7th Apr. 1910 Night	137	9 36	33·675	+ 8·20	18	30·16	−0·02	0·879	0·5075359	− 481	− 9	− 1478	− 522	− 44	0·5072825
	139	10 38	34·110	8·20	19	30·15	0·02	0·879	0·5074383	481	10	1477	533	44	0·5071838
	138	11 38	32·662	8·20	19	30·14	0·02	0·879	0·5077732	481	10	1477	503	44	0·5075217
	140	12 33	34·437	8·20	19	30·13	0·02	0·879	0·5073665	481	10	1476	533	44	0·5071121
													Mean	...	0·5072750
8th Apr. Day	137	21 43	33·719	+ 8·20	17	27·88	+0·33	0·885	0·5075258	− 481	− 8	− 1366	− 526	− 44	0·5072833
	139	22 40	34·152	8·20	19	28·11	0·33	0·884	0·5074290	481	10	1377	536	44	0·5071842
	138	23 38	32·690	8·20	18	28·42	0·33	0·882	0·5077666	481	9	1393	506	44	0·5075233
	140	0 31	34·461	8·20	19	28·80	0·33	0·881	0·5073613	481	10	1411	534	44	0·5071133
													Mean	...	0·5072760
											Mean of Day and Night			...	**0·5072755**
8th Apr. Night	140	9 34	34·404	+ 8·73	18	31·04	−0·07	0·875	0·5073737	− 512	− 9	− 1521	− 530	− 44	0·5071121
	138	10 29	32·625	8·73	19	30·97	0·07	0·875	0·5077822	512	10	1518	501	44	0·5075237
	139	11 24	34·078	8·73	18	30·94	0·07	0·876	0·5074453	512	9	1516	531	44	0·5071841
	137	12 19	33·643	8·73	17	30·83	0·07	0·876	0·5075432	512	8	1511	520	44	0·5072837
													Mean	...	0·5072759
9th Apr. Day	140	21 39	34·453	+ 8·73	18	28·64	+0·29	0·882	0·5073630	− 512	− 9	− 1403	− 534	− 44	0·5071128
	138	22 35	32·666	8·73	19	28·85	0·29	0·882	0·5077722	512	10	1414	505	44	0·5075237
	139	23 30	34·111	8·73	19	29·12	0·29	0·880	0·5074380	512	10	1427	533	44	0·5071854
	137	0 25	33·668	8·73	17	29·45	0·29	0·878	0·5075375	512	8	1443	522	44	0·5072846
													Mean	...	0·5072766
											Mean of Day and Night			...	**0·5072763**
9th Apr. Night	137	9 35	33·617	+ 9·28	17	31·40	−0·12	0·872	0·5075490	− 545	− 8	− 1539	− 518	− 44	0·5072836
	139	10 31	34·065	9·28	19	31·35	0·12	0·872	0·5074480	545	10	1536	528	44	0·5071817
	138	11 31	32·614	9·28	19	31·22	0·12	0·874	0·5077848	545	10	1530	500	44	0·5075219
	140	12 25	34·395	9·28	19	31·10	0·12	0·874	0·5073758	545	10	1524	530	44	0·5071105
													Mean	...	0·5072744
10th Apr. Day	137	21 39	33·658	+ 9·28	17	29·23	+0·22	0·879	0·5075398	− 545	− 8	− 1432	− 522	− 44	0·5072847
	139	22 36	34·102	9·28	18	29·39	0·22	0·878	0·5074401	545	9	1440	532	44	0·5071831
	138	23 36	32·638	9·28	19	29·60	0·22	0·878	0·5077791	545	10	1450	502	44	0·5075240
	140	0 30	34·412	9·28	18	29·85	0·22	0·876	0·5073720	545	9	1463	531	44	0·5071128
													Mean	...	0·5072762
											Mean of Day and Night			...	**0·5072753**
10th Apr. Night	140	10 0	34·365	+ 9·28	18	31·56		0·870	0·5073823	− 545	− 9	− 1546	− 527	− 44	0·5071152
	138	10 54	32·597	9·28	19	31·65		0·868	0·5077890	545	10	1551	496	44	0·5075244
11th Apr. Day	139	12 0	34·090	+ 9·28	18	29·40		0·879	0·5074428	− 545	− 9	− 1441	− 533	− 44	0·5071856
	137	12 54	34·214	9·28	17	29·58		0·879	0·5075408	545	8	1449	522	44	0·5072840
											Mean of Day and Night			...	**0·5072773**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Dehra Dun.						
		h m	s	s	′	°	°		s						s
20th	137	11 0	33·686	+13·38	18	28·54	0·00	0·826	0·5075333	−785	−9	−1398	−491	−37	0·5072613
Apr.	139	12 0	34·137	13·38	19	28·53	0·00	0·825	0·5074323	785	10	1398	500	37	0·5071593
1910	138	13 2	32·680	13·38	20	28·54	0·00	0·825	0·5077689	785	11	1398	472	37	0·5074986
Night	140	13 56	34·478	13·38	21	28·54	0·00	0·826	0·5073576	785	12	1398	501	37	0·5070843
													Mean	...	0·5072509
21st	137	23 0	33·721	+13·38	17	27·98	+0·15	0·828	0·5075253	−785	−8	−1371	−492	−37	0·5072560
Apr.	139	23 55	34·158	13·38	20	28·12	0·15	0·827	0·5074276	785	11	1378	501	37	0·5071564
Day	138	0 53	32·696	13·38	20	28·25	0·15	0·827	0·5077648	785	11	1384	473	37	0·5074958
	140	2 3	34·481	13·38	19	28·49	0·15	0·825	0·5073571	785	10	1396	500	37	0·5070843
													Mean	...	0·5072481
													Mean of Day and Night	...	**0·5072495**
21st	140	11 31	34·478	+13·40	19	28·07	+0·04	0·828	0·5073576	−787	−10	−1375	−502	−37	0·5070865
Apr.	138	12 25	32·696	13·40	20	28·13	0·04	0·827	0·5077649	787	11	1378	473	37	0·5074963
Night	139	13 23	34·150	13·40	19	28·16	0·04	0·827	0·5074296	787	10	1380	501	37	0·5071581
	137	14 16	33·712	13·40	18	28·19	0·04	0·826	0·5075275	787	9	1381	491	37	0·5072570
													Mean	...	0·5072495
22nd	140	23 27	34·491	+13·40	19	27·50	+0·03	0·829	0·5073548	−787	−10	−1348	−502	−37	0·5070864
Apr.	138	0 36	32·703	13·40	21	27·55	0·03	0·830	0·5077632	787	12	1350	475	37	0·5074971
Day	139	1 39	34·156	13·40	20	27·58	0·03	0·829	0·5074282	787	11	1351	502	37	0·5071594
	137	2 36	33·720	13·40	19	27·59	0·03	0·829	0·5075256	787	10	1352	492	37	0·5072578
													Mean	...	0·5072502
													Mean of Day and Night	...	**0·5072498**
22nd	137	11 15	33·746	+13·38	19	26·47	+0·09	0·832	0·5075198	−785	−10	−1297	−494	−37	0·5072575
Apr.	139	12 16	34·181	13·38	20	26·62	0·09	0·831	0·5074227	785	11	1304	504	37	0·5071586
Night	138	13 22	32·715	13·38	21	26·73	0·09	0·830	0·5077605	785	12	1310	475	37	0·5074986
	140	14 17	34·508	13·38	20	26·74	0·09	0·830	0·5073513	785	11	1310	503	37	0·5070867
													Mean	...	0·5072504
23rd	137	23 14	33·777	+13·38	18	25·50	+0·13	0·834	0·5075127	−785	−9	−1250	−495	−37	0·5072551
Apr.	139	0 8	34·210	13·38	20	25·62	0·13	0·833	0·5074161	785	11	1255	505	37	0·5071568
Day	138	1 2	32·745	13·38	21	25·74	0·13	0·832	0·5077532	785	12	1261	476	37	0·5074961
	140	2 3	34·532	13·38	20	25·89	0·13	0·832	0·5073460	785	11	1269	504	37	0·5070854
													Mean	...	0·5072484
													Mean of Day and Night	...	**0·5072494**

In Table III are shown the times of vibration at Dehra Dūn at the beginning and end of the season.

Table III.—Times of vibration at Dehra Dūn.

Date	137	138	139	140	Mean
1909-10	s	s	s	s	s
November, 8-9	0·5072545	0·5074953	0·5071559	0·5070847	0·5072476
„ 9-10	2546	4965	1575	0858	2486
„ 10-11	2545	4975	1574	0869	2491
„ 11-12	2549	4980	1566	0855	2488
Mean	0·5072546	0·5074968	0·5071569	0·5070857	0·5072485
April, 20-21	0·5072587	0·5074972	0·5071578	0·5070843	0·5072495
„ 21-22	2574	4967	1588	0864	2498
„ 22-23	2563	4974	1577	0861	2494
Mean	0·5072575	0·5074971	0·5071581	0·5070856	0·5072496
General Mean	0·5072561	0·5074969	0·5071575	0·5070857	0·5072491
Difference, Apr.-Nov.	+ 29	+ 3	+ 12	− 1	+ 11

In view of the large increase in the time of vibration of pendulum 137 and in accordance with the usual custom, it is desirable to tabulate the differences between the individual and mean pendulums in order to ascertain, if possible, whether the change in No. 137 is real, and, if so, when it occurred. These differences are shown in Table IV.

Table IV.—Differences between the mean and individual pendulums.

Station	137	v	138	v	139	v	140	v
Dehra Dūn ...	− 61	+ 8	− 2483	+ 1	+ 916	− 5	+ 1628	− 4
Saugor ...	− 64	+ 5	− 2491	− 7	+ 922	+ 1	+ 1634	+ 2
Damoh ...	− 61	+ 8	− 2495	− 11	+ 917	− 4	+ 1639	+ 7
Katni ...	− 58	+ 11	− 2490	− 6	+ 919	− 2	+ 1628	− 4
Umaria ...	− 63	+ 6	− 2487	− 3	+ 922	+ 1	+ 1628	− 4
Pendra ...	− 69	0	− 2486	− 2	+ 925	+ 4	+ 1630	− 2
Bilāspur ...	− 71	− 2	− 2484	0	+ 925	+ 4	+ 1631	− 1
Raipur ...	− 70	− 1	− 2481	+ 3	+ 924	+ 3	+ 1628	− 4
Amgaon ...	− 57	+ 12	− 2493	− 9	+ 914	− 7	+ 1637	+ 5
Seoni ...	− 65	+ 4	− 2484	0	+ 915	− 6	+ 1632	0
Jubbulpur ...	− 67	+ 2	− 2485	− 1	+ 918	− 3	+ 1633	+ 1
Maihar ...	− 77	− 8	− 2480	+ 4	+ 930	+ 9	+ 1628	− 4
Allahābād ...	− 94	− 25	− 2467	+ 17	+ 928	+ 7	+ 1633	+ 1
Sultānpur ...	− 77	− 8	− 2473	+ 11	+ 919	− 2	+ 1631	− 1
Dehra Dūn ...	− 79	− 10	− 2475	+ 9	+ 915	− 6	+ 1640	+ 8
Means	− 69		− 2484		+ 921		+ 1632	
Means of 1908-09	− 71		− 2487		+ 925		+ 1634	

It will be seen that though there have been considerable changes in the differences during the season, the mean differences agree well with those of the previous year. Consequently, it is unlikely that there has been any real change in any of the pendulums and we must, as before, treat the variations as accidental errors.

Table V gives the time of vibration of each pendulum at each station and the value of g deduced.

Table V.—Mean times of vibration and deduced values of g.

Station		137	138	139	140	Mean
Dehra Dūn ...	s.	0·5072561	0·5074969	0·5071575	0·5070857	0·5072491
Saugor ...	s.	0·5073414	0·5075841	0·5072428	0·5071716	0·5073350
		+853	+872	+853	+859	+859
	g.	978·734	978·726	978·734	978·731	978·731
Damoh ...	s.	0·5073342	0·5075776	0·5072364	0·5071642	0·5073281
		+781	+807	+789	+785	+790
	g.	978·762	978·751	978·758	978·760	978·758
Katni ...	s.	0·5073341	0·5075773	0·5072364	0·5071655	0·5073283
		+780	+804	+789	+798	+792
	g.	978·762	978·753	978·758	978·755	978·757
Umaria ...	s.	0·5073390	0·5075814	0·5072405	0·5071699	0·5073327
		+829	+845	+830	+842	+836
	g.	978·743	978·737	978·743	978·738	978·740
Pendra ...	s.	0·5073662	0·5076079	0·5072668	0·5071963	0·5073593
		+1101	+1110	+1093	+1106	+1102
	g.	978·638	978·635	978·641	978·636	978·638
Bilāspur ...	s.	0·5073552	0·5075965	0·5072556	0·5071850	0·5073481
		+991	+996	+981	+993	+990
	g.	978·680	978·679	978·684	978·680	978·681
Raipur ...	s.	0·5073729	0·5076140	0·5072735	0·5072031	0·5073659
		+1168	+1171	+1160	+1164	+1168
	g.	978·612	978·611	978·615	978·614	978·612
Amgaon ...	s.	0·5073712	0·5076148	0·5072741	0·5072018	0·5073655
		+1151	+1179	+1166	+1161	+1164
	g.	978·619	978·608	978·613	978·615	978·614
Seoni ...	s.	0·5073699	0·5076118	0·5072719	0·5072002	0·5073634
		+1138	+1149	+1144	+1145	+1143
	g.	978·624	978·620	978·621	978·621	978·622
Jubbulpore ...	s.	0·5073448	0·5075866	0·5072463	0·5071748	0·5073381
		+887	+897	+888	+891	+890
	g.	978·721	978·716	978·720	978·719	978·719
Maihar ...	s.	0·5073289	0·5075692	0·5072282	0·5071584	0·5073212
		+728	+723	+707	+727	+721
	g.	978·782	978·784	978·790	978·782	978·784
Allahābād ...	s.	0·5072896	0·5075269	0·5071874	0·5071169	0·5072802
		+335	+300	+299	+312	+311
	g.	978·934	978·947	978·948	978·943	978·943
Sultānpur ...	s.	0·5072838	0·5075234	0·5071842	0·5071130	0·5072761
		+277	+265	+267	+273	+270
	g.	978·956	978·961	978·960	978·958	978·959

The Reduction to Sea Level.

During the recess season of 1909-10 Captain Cowie computed reduction tables for zones up to a distance of 100 miles from the station. These tables, slightly modified, are shown at the end of Chapter VIII. The tables, though originally intended for the Hayford or Isostatic Compensation correction, can also be used for computing the orographical correction. The corrections for surface masses or topography are shewn separately in the tables and, having estimated the height of each zone or portion of zone and thus obtaining the difference of height between station and zone, we get from these topography tables the correction due to these differences *i. e.* to the error in the Bouguer assumption that the station is on an infinite plain. This is the orographical correction. The method, of course, is not new but its application is much simplified. Formerly, the zones used were not always the same and consequently the correction had to be computed in each case but now the country round a station is always divided into the zones given in Chapter VIII and the correction derived immediately from the tables.

It must, however, be remembered that since in computing the effect of the infinite plain we have taken no account of the curvature of the earth, we must take no account of it in computing this orographical correction; that is, we must take as argument, in entering the topography tables, the actual difference of height of station and zone and not that of station *plus* curvature and zone as is done for the Hayford, or compensation correction (*vide* Chapter VIII).

The orographical correction was found to be inappreciable at all the stations occupied this season.

The abstract of the season's results is given in Table VI.

Table VI.—Abstract of results.

Station	Height	γ_0	Corrections		γ_B	g	$g-\gamma_B$
			for height	for mass (Bouguer)			
	feet	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*
Raipur ...	996	978·707	−0·093	+0·033	978·647	978·612	−0·035
Amgaon ...	1032	978·715	−0·097	+0·035	978·653	978·614	−0·039
Bilāspur ...	878	978·758	−0·082	+0·030	978·706	978·681	−0·025
Seoni ...	2032	978·760	−0·190	+0·068	978·638	978·622	−0·016
Pendra ...	1996	978·804	−0·187	+0·067	978·684	978·638	−0·046
Jubbulpore ...	1467	978·828	−0·137	+0·049	978·740	978·719	−0·021
Umaria ...	1499	978·853	−0·140	+0·050	978·763	978·740	−0·023
Katni ...	1254	978·873	−0·117	+0·042	978·798	978·757	−0·041
Damoh ...	1213	978·873	−0·114	+0·041	978·800	978·758	−0·042
Saugor ...	1757	978·875	−0·165	+0·059	978·769	978·731	−0·038
Maihar ...	1161	978·902	−0·109	+0·039	978·832	978·784	−0·048
Allahābād ...	288	978·982	−0·027	+0·010	978·965	978·943	−0·022
Sultānpur ...	314	979·041	−0·029	+0·011	979·023	978·959	−0·064

Dealing with the results of this and the previous season together we note first that, with one exception, all are negative. This does not necessarily mean that gravity is in defect over the whole area, but more probably that our fundamental formula for deducing γ_0 does not suit the Bouguer residuals. However, we are mainly concerned, not with actual values of $g-\gamma_B$, but with the variations of these values or with the *relative* excesses or defects of gravity. The mean residual for the two seasons is about −·030, so, for the purpose of this discussion, to each value of $g-\gamma_B$ we shall apply a correction of +·030.

We see then that we have three small areas of *negative* residuals: the first, north of Mortakka (0), comprising the stations at Ujjain (−26), Mhow (−25) and Mukhtiara (−29); the second, between Saugor (−8) and Maihar (−18), which includes Damoh (−12) and Katni (−11); and the third, indicated by the values at Amgaon (−9), Raipur (−5) and Pendra (−16), the value at Bilāspur being slightly anomalous.

Over the whole of the rest of the area the values are *positive*, the maximum being at Khandwa (+40).

It has been mentioned that latitude observations had indicated two areas of low density, the first between Ahmedābād and Mhow and the second between Saugor and Umaria and the pendulums have now shown that these areas are of relatively low density. It was also predicted that the southern limit of the belt of high density would be found to pass through Amgaon and between Bilāspur and Pendra; the pendulums, however, seem to show that the southern limit is somewhat north of this but that its direction is more or less parallel to that predicted. The northern edge of the belt has not yet been located with precision, we can only say that it lies between Allahābād (+8) and Sultānpur (−34).

It may be said, therefore, that in this area the pendulums have confirmed the evidence of the plumb-line.

CHAPTER V.

The Pendulum Operations in 1910-11.

During this season an entirely new *locale* of operations was selected, observations being made at 11 stations in Burma, forming a preliminary examination of the geodetic conditions in that country. Practical considerations, such as the absence of roads and railways, prevented the examination of the mountains; and the stations, with two or three exceptions, were confined to the Irrawaddy valley and low ground generally.

Some of them were on and near the coast and the results, it was hoped, would throw light on the question of ocean compensation. It has long been noticed from the results of latitude and longitude operations that the plumb-line is deflected towards the ocean, thus suggesting the presence of dense subaqueous material; but up to the present no pendulum observations had been made at coast stations, except at Colaba, Madras and Cuttack the evidence from which is conflicting. The values of $g - \gamma_B$ at these stations vary from $+\cdot062$ to $-\cdot014$ and though even this last value indicates a greater density than the average Bouguer residual yet it cannot be said that a pronounced excess of density under the ocean had been found.

Of the stations visited, Maymyo and Mogok are in the hills east of the Irrawaddy valley, the rest being in and near that valley. Four stations Rangoon, Prome, Henzada and Bassein are within 60 miles of the coast.

The observations throughout the season were made by Captain H. M. Cowie, R.E.

The descriptions of the stations are given below:—

Rangoon.

Latitude	...	16° 47′ 55″
Longitude	...	96° 9′ 8″
Height	...	164 feet.

The pendulums were swung in the most northerly room of the most northerly of three buildings (standing condemned in 1910) on the lower platform of the Shwedagon *pagoda* and on the western side of the latter. The three buildings are on a higher level than, and lie N.E. of, the Arsenal gateway. The house in which the pendulums were swung is immediately below the Guard House at the N.W. corner of the *pagoda* platform. The level of the pendulum room was determined by spirit levelling from G.T.S. $\frac{\text{BM.32}}{\text{94 D}}$ of Line No. 87 (Elephant Point to Myitkyina).

Prome.

Latitude ... 18° 49′ 40″
Longitude ... 95° 13′ 40″
Height ... 101 feet.

The pendulums were swung in the most westerly of two small rooms under the upper landing of the central external staircase on the front of the Government College situated on the *maidān*. The floor of the room was connected by spirit levelling with the marble slab marking Prome Longitude station and with rail level at the railway station.

Henzada.

Latitude ... 17° 39′ 17″
Longitude ... 95° 27′ 18″
Height ... 46 feet.

The pendulums were swung in the more north-westerly of the two rooms on the ground floor of the P.W.D. inspection bungalow. The floor of the pendulum room was connected by spirit levelling with (i) rail level at the railway station and (ii) a P.W.D. bench-mark on the *band* stretching N.W. and S.E. on the south side of the bungalow.

Bassein.

Latitude ... 16° 47′ 11″
Longitude ... 94° 44′ 6″
Height ... 23 feet.

The pendulums were swung in the western room on the ground floor of the circuit house. This room had formerly served as a court house. Immediately to the south, on the other side of the road, lies the Club house. On the west of the circuit house, in the same compound, are the Club tennis courts.

Toungoo.

Latitude ... 18° 55′ 50″
Longitude ... 96° 27′ 3″
Height ... 159 feet.

The pendulums were swung in the small room at the east end of an abandoned building, which formerly served as Cadets Mess and Reading room, situated to the north of a block of buildings forming part of the Military Police Lines at the S.E. corner of the *maidān*. The pendulum station is 853 feet to the S.E. of the G.T.S. $\frac{\text{BM.90}}{\text{94 B}}$ of Line No. 87 (Elephant Point to Myitkyina) and 794 feet to the N.E. of the N.E. corner of the Magnetic observatory (Magnetograph house).

Pyinmana.

Latitude ... 19° 44′ 25″
Longitude ... 96° 11′ 56″
Height ... 409 feet.

The pendulums were swung in a small room at the N.W. corner of the ground floor of the bungalow about 150 yards S.W. of Pyinmana G.T.S. Intersected point, Latitude 19° 44′ 27″, Longitude 96° 11′ 58″, of the Mandalay Meridional series. The floor of the pendulum room was connected by spirit levelling with G.T.S. $\frac{\text{BM.71}}{\text{94 A}}$ of Line No. 87 (Elephant Point to Myitkyina).

Meiktila.

Latitude	...	20° 51′ 26″
Longitude	...	95° 51′ 58″
Height	...	799 feet.

The pendulums were swung in the large room in the western portion of the ground floor of a bungalow standing on high ground on the eastern shore of the Meiktila lake, the most southerly building in Cantonments (1910). The floor of the pendulum room was connected by spirit levelling with the G.T.S. $\frac{\text{BM.11}}{\text{84 P}}$ of Line No. 88 (Thazi to Prome and Rangoon).

Mandalay.

Latitude	...	21° 59′ 44″
Longitude	...	96° 6′ 28″
Height	...	244 feet.

The pendulums were swung in the old Magazine in the N.E. portion of the fort. It is about 15 yards from the south bank of the canal which, running E.W., enters the fort at the most northerly gate on the east front and about 704 yards from this gate. It is now (1910) about to be dismantled. The floor of the pendulum room was connected by spirit levelling with G.T.S. $\frac{\text{BM.55}}{\text{93 C}}$ of Line No. 87 (Elephant Point to Myitkyina).

Maymyo.

Latitude	...	22° 1′ 13″
Longitude	...	96° 28′ 24″
Height	...	3495 feet.

The pendulums were swung in one of the central rooms on the ground floor of the building occupied (in 1911) as office by No. 10 Party, Survey of India and which is opposite to the Forest offices. The floor of the pendulum room was connected by spirit levelling with rail level opposite the Booking office at Maymyo Railway station.

Mogok.

Latitude	...	22° 54′ 51″
Longitude	...	96° 29′ 51″
Height	...	3685 feet.

The pendulums were swung in one of the central rooms of the ground floor of a stone built house, belonging to Maung Sah Galay, in the new *bāzār*. This house stands on the right bank of the small stream, which flows through the *bāzār*, and close to the wooden bridge. The height was taken from the 4-inch Forest map.

Myingyan.

Latitude	...	21° 28′ 56″
Longitude	...	95° 23′ 50″
Height	...	248 feet.

The pendulums were swung in the old Magazine situated about 1 mile N.N.E. of the *kachahri* and rather less than ¾ mile N.E. of the Land Records office. The floor of the pendulum room was connected by spirit levelling with rail level opposite the Station Master's office, Myingyan Railway station.

With four exceptions good observing rooms were available at all the stations. The exceptions were Bassein, Toungoo, Prome and Meiktila where the control of the temperature was difficult.

Table I gives the results of the determinations of flexure at each station, the means before and after work, and the value adopted in reducing the time of vibration being shown.

Table I.—Flexure correction.

Station	Date	Means before and after work 10^{-7} secs.	Adopted Correction 10^{-7} secs.	Station	Date	Means before and after work 10^{-7} secs.	Adopted Correction 10^{-7} secs.
	1910				1911		
Dehra Dūn	October 17th	−37·7		Pyinmana	January 14th	−34·7	
	„ 23rd	37·4	−38		„ 18th	33·5	−34
Rangoon ...	Nov. 18th	−53·1		Meiktila ...	January 23rd	−34·9	
	„ 23rd	51·4	−52		„ 27th	35·1	−35
				Mandalay	Feb. 2nd	−33·3	
Prome ...	Nov. 28th	−41·5			„ 6th	35·6	−34
	Dec. 3rd	40·5	−41	Maymyo ...	Feb 11th	−34·9	
Henzada ...	Dec. 10th	−38·3			„ 15th	33·9	−34
	„ 14th	37·6	−38	Mogok ...	March 1st	−42·2	
Bassein ...	Dec. 17th	−50·5			„ 5th	41·7	−42
	„ 21st	49·4	−50	Myingyan	March 19th	−33·6	
	1911				„ 23rd	33·5	−34
Toungoo ...	January 2nd	−42·7		Dehra Dūn	April 16th	−35·9	
	„ 7th	42·9	−43		„ 22nd	36·3	−36

The time observations were made throughout by Mr. Hanumān Prasād. The p. e. of the mean value of a clock rate was ±0·012 sec. and that of single value ±0·048 sec.

The details of the observations are given in Table II.

Table II.—Details of the Observations.

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Dehra Dun.															
		h m	s	s	′	°	°		s						s
17th	137	23 0	33·667	+ 18·13	19	24·13	+ 0·05	0·840	0·5075377	− 1064	− 10	− 1182	− 499	− 38	0·5072584
Oct.	139	23 58	34·103	18·13	19	24·16	0·05	0·840	0·5074400	1064	10	1184	509	38	0·5071595
1910	138	0 56	32·659	18·13	19	24·20	0·05	0·840	0·5077740	1064	10	1186	480	38	0·5074962
Night	140	1 50	34·430	18·13	18	24·26	0·05	0·840	0·5073682	1064	9	1189	509	38	0·5070873
													Mean	...	0·5072504
18th	137	10 58	33·685	+ 18·13	17	23·39	+ 0·15	0·844	0·5075336	− 1064	− 8	− 1146	− 501	− 38	0·5072579
Oct.	139	11 52	34·119	18·13	19	23·54	0·15	0·844	0·5074363	1064	10	1153	511	38	0·5071587
Day	138	12 52	32·660	18·13	19	23·69	0·15	0·844	0·5077738	1064	10	1161	483	38	0·5074982
	140	13 43	34·440	18·13	19	23·79	0·15	0·842	0·5073659	1064	10	1166	510	38	0·5070871
													Mean	...	0·5072505
													Mean of Day and Night	...	**0·5072504**
18th	140	22 59	34·434	+ 18·22	19	24·11		0·840	0·5073673	− 1070	− 10	− 1181	− 509	− 38	0·5070865
Oct.	138	23 56	32·650	18·22	19	24·20		0·839	0·5077761	1070	10	1186	480	38	0·5074977
Night															
19th	139	11 1	34·125	+ 18·22	18	23·48		0·844	0·5074351	− 1070	− 9	− 1151	− 511	− 38	0·5071572
Oct.	137	11 55	33·685	18·22	17	23·61		0·844	0·5075336	1070	8	1157	501	38	0·5072562
Day															
													Mean of Day and Night	...	**0·5072494**
19th	140	23 15	34·440	+ 18·39	18	23·92	+ 0·09	0·840	0·5073659	− 1079	− 9	− 1172	− 509	− 38	0·5070852
Oct.	138	0 13	32·660	18·39	19	24·03	0·09	0·840	0·5077736	1079	10	1177	480	38	0·5074952
Night	139	1 11	34·102	18·39	19	24·12	0·09	0·840	0·5074401	1079	10	1182	509	38	0·5071583
	137	2 6	33·670	18·39	18	24·17	0·09	0·840	0·5075371	1079	9	1184	499	38	0·5072562
													Mean	...	0·5072487
20th	140	11 12	34·441	+ 18·39	19	23·49	+ 0·10	0·845	0·5073657	− 1079	− 10	− 1151	− 512	− 38	0·5070867
Oct.	138	12 12	32·663	18·39	21	23·54	0·10	0·844	0·5077731	1079	12	1153	483	38	0·5074966
Day	139	13 8	34·108	18·39	20	23·66	0·10	0·844	0·5074388	1079	11	1159	511	38	0·5071590
	137	14 1	33·672	18·39	19	23·74	0·10	0·842	0·5075363	1079	10	1163	500	38	0·5072573
													Mean	...	0·5072499
													Mean of Day and Night	...	**0·5072493**
21st	137	23 26	33·657	+ 18·82	19	23·54	+ 0·07	0·843	0·5075399	− 1105	− 10	− 1153	− 501	− 38	0·5072592
Oct.	139	0 20	34·091	18·82	19	23·64	0·07	0·843	0·5074426	1105	10	1158	511	38	0·5071604
Night	138	1 25	32·643	18·82	20	23·71	0·07	0·843	0·5077778	1105	11	1162	482	38	0·5074980
	140	2 16	34·417	18·82	19	23·74	0·07	0·843	0·5073710	1105	10	1163	511	38	0·5070883
													Mean	...	0·5072515
22nd	137	11 29	33·683	+ 18·82	18	22·87	+ 0·17	0·847	0·5075341	− 1105	− 9	− 1121	− 503	− 38	0·5072565
Oct.	139	12 27	34·108	18·82	19	23·03	0·17	0·845	0·5074387	1105	10	1128	512	38	0·5071594
Day	138	13 22	32·656	18·82	20	23·19	0·17	0·845	0·5077746	1105	11	1136	483	38	0·5074973
	140	14 16	34·433	18·82	19	23·34	0·17	0·843	0·5073673	1105	10	1144	511	38	0·5070865
													Mean	...	0·5072499
													Mean of Day and Night	...	**0·5072507**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Rangoon															
		h m	s	s	′	°	°		s						s
18th Nov. 1910 Night	137	23 17	33·713	−12·34	18	25·87	+0·01	0·900	0·5075271	+724	−9	−1268	−535	−52	0·5074131
	139	0 10	34·144	12·34	20	25·90	0·01	0·899	0·5074309	724	11	1269	545	52	0·5073156
	138	1 9	32·699	12·34	19	25·91	0·01	0·899	0·5077643	724	10	1270	514	52	0·5076521
	140	2 2	34·480	12·34	18	25·89	0·01	0·899	0·5073572	724	9	1269	545	52	0·5072421
													Mean	...	0·5074057
19th Nov. Day	137	11 19	33·744	−12·34	17	25·12	+0·04	0·904	0·5075200	+724	−8	−1231	−537	−52	0·5074096
	139	12 13	34·170	12·34	18	25·13	0·04	0·904	0·5074250	724	9	1231	548	52	0·5073134
	138	13 10	32·719	12·34	19	25·15	0·04	0·904	0·5077593	724	10	1232	517	52	0·5076506
	140	14 3	34·496	12·34	18	25·25	0·04	0·901	0·5073538	724	9	1237	546	52	0·5072418
													Mean	...	0·5074039
												Mean of Day and Night		...	**0·5074048**
19th Nov. Night	140	23 20	34·476	−12·13	18	25·74	−0·01	0·899	0·5073580	+712	−9	−1261	−545	−52	0·5072425
	138	0 14	32·698	12·13	19	25·75	0·01	0·899	0·5077646	712	10	1262	514	52	0·5076520
	139	1 10	34·142	12·13	18	25·74	0·01	0·899	0·5074313	712	9	1261	545	52	0·5073158
	137	2 5	33·717	12·13	18	25·73	0·01	0·899	0·5075262	712	9	1261	534	52	0·5074118
													Mean	...	0·5074055
20th Nov. Day	140	11 24	34·494	−12·13	18	25·21	+0·13	0·900	0·5073543	+712	−9	−1235	−545	−52	0·5072414
	138	12 20	32·712	12·13	19	25·31	0·13	0·900	0·5077611	712	10	1240	515	52	0·5076506
	139	13 15	34·153	12·13	18	25·44	0·13	0·900	0·5074287	712	9	1247	545	52	0·5073146
	137	14 9	33·719	12·13	18	25·55	0·13	0·899	0·5075256	712	9	1252	534	52	0·5074121
													Mean	...	0·5074047
												Mean of Day and Night		...	**0·5074051**
20th Nov. Night	137	23 27	33·707	−12·18	17	26·03	+0·06	0·897	0·5075286	+715	−8	−1275	−533	−52	0·5074133
	139	0 20	34·136	12·18	18	26·12	0·06	0·897	0·5074328	715	9	1280	544	52	0·5073158
	138	1 18	32·691	12·18	19	26·18	0·06	0·897	0·5077661	715	10	1283	513	52	0·5076518
	140	2 9	34·471	12·18	18	26·19	0·06	0·897	0·5073592	715	9	1283	544	52	0·5072419
													Mean	...	0·5074057
21st Nov. Day	137	11 29	33·728	−12·18	17	25·48	+0·09	0·900	0·5075237	+715	−8	−1249	−535	−52	0·5074108
	139	12 22	34·159	12·18	18	25·50	0·09	0·900	0·5074275	715	9	1250	545	52	0·5073134
	138	13 19	32·706	12·18	19	25·58	0·09	0·899	0·5077625	715	10	1253	514	52	0·5076511
	140	14 12	34·488	12·18	18	25·74	0·09	0·897	0·5073656	715	9	1261	544	52	0·5072405
													Mean	...	0·5074040
												Mean of Day and Night		...	**0·5074048**
21st Nov. Night	140	23 31	34·471	−11·95	18	25·98	+0·06	0·898	0·5073592	+701	−9	−1273	−544	−52	0·5072415
	138	0 27	32·690	11·95	19	26·06	0·06	0·898	0·5077663	701	10	1277	514	52	0·5076511
	139	1 21	34·138	11·95	18	26·12	0·06	0·898	0·5074323	701	9	1280	544	52	0·5073139
	137	2 15	33·711	11·95	17	26·13	0·06	0·897	0·5075276	701	8	1280	533	52	0·5074104
													Mean	...	0·5074042
22nd Nov. Day	140	11 33	34·493	−11·95	18	25·15	+0·11	0·902	0·5073545	+701	−9	−1232	−547	−52	0·5072406
	138	12 29	32·708	11·95	19	25·19	0·11	0·901	0·5077620	701	10	1234	515	52	0·5076510
	139	13 23	34·151	11·95	18	25·32	0·11	0·901	0·5074293	701	9	1241	546	52	0·5073146
	137	14 17	33·717	11·95	17	25·41	0·11	0·901	0·5075263	701	8	1245	535	52	0·5074124
													Mean	...	0·5074047
												Mean of Day and Night		...	**0·5074044**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Prome.						
		h m	s	s	′	°	°		s						s
28th Nov. 1910 Night	137	0 55	33·672	− 7·39	18	26·62	−0·05	0·899	0·5075366	+ 434	− 9	− 1304	− 534	−41	0·5073912
	139	1 48	34·095	7·39	19	26·58	0·05	0·899	0·5074419	434	10	1302	545	41	0·5072955
	138	2 56	32·653	7·39	17	26·54	0·05	0·898	0·5077755	434	8	1300	514	41	0·5076326
	140	3 50	34·434	7·39	19	26·46	0·05	0·899	0·5073672	434	10	1297	545	41	0·5072213
													Mean	...	0·5073851
29th Nov. Day	137	13 0	33·753	− 7·39	18	22·77	+0·21	0·911	0·5075182	+ 434	− 9	− 1116	− 541	−41	0·5073909
	139	13 55	34·178	7·39	20	22·91	0·21	0·911	0·5074232	434	11	1123	552	41	0·5072939
	138	14 54	32·723	7·39	20	23·10	0·21	0·910	0·5077583	434	11	1132	521	41	0·5076312
	140	15 48	34·498	7·39	19	23·36	0·21	0·908	0·5073535	434	10	1145	550	41	0·5072223
													Mean	...	0·5073846
										Mean of Day and Night				...	**0·5073849**
29th Nov. Night	140	1 3	34·434	− 7·15	19	26·11	−0·01	0·899	0·5073672	+ 420	− 10	− 1279	− 545	−41	0·5072217
	138	1 57	32·650	7·15	20	26·12	0·01	0·899	0·5077759	420	11	1280	514	41	0·5076333
	139	2 53	34·100	7·15	20	26·13	0·01	0·900	0·5074406	420	11	1280	545	41	0·5072949
	137	3 48	33·673	7·15	18	26·07	0·01	0·901	0·5075365	420	9	1277	535	41	0·5073923
													Mean	...	0·5073855
30th Nov. Day	140	13 0	34·533	− 7·15	19	22·13	+0·22	0·915	0·5073458	+ 420	− 10	− 1084	− 554	−41	0·5072189
	138	13 55	32·730	7·15	20	22·29	0·22	0·913	0·5077568	420	11	1092	522	41	0·5076322
	139	14 52	34·185	7·15	20	22·50	0·22	0·911	0·5074217	420	11	1103	552	41	0·5072930
	137	15 47	33·748	7·15	19	22·75	0·22	0·910	0·5075193	420	10	1115	541	41	0·5073906
													Mean	...	0·5073837
										Mean of Day and Night				...	**0·5073846**
1st Dec. Night	137	1 6	33·726	− 9·70	18	26·20	+0·03	0·898	0·5075242	+ 569	− 9	− 1284	− 533	−41	0·5073944
	139	2 3	34·157	9·70	20	26·30	0·03	0·897	0·5074278	569	11	1289	544	41	0·5072962
	138	3 3	32·705	9·70	21	26·32	0·03	0·899	0·5077627	569	12	1290	514	41	0·5076339
	140	3 56	34·499	9·70	19	26·28	0·03	0·899	0·5073530	569	10	1288	545	41	0·5072215
													Mean	...	0·5073865
2nd Dec. Day	137	13 4	33·811	− 9·70	19	23·01	+0·20	0·913	0·5075052	+ 569	− 10	− 1127	− 542	−41	0·5073901
	139	14 0	34·232	9·70	20	23·15	0·20	0·912	0·5074112	569	11	1134	553	41	0·5072942
	138	14 59	32·771	9·70	21	23·34	0·20	0·909	0·5077470	569	12	1144	520	41	0·5076322
	140	15 53	34·561	9·70	19	23·57	0·20	0·908	0·5073397	569	10	1155	550	41	0·5072210
													Mean	...	0·5073844
										Mean of Day and Night				...	**0·5073854**
2nd Dec. Night	140	1 19	34·491	− 9·33	19	26·36	+0·05	0·906	0·5073549	+ 548	− 10	− 1292	− 549	−41	0·5072205
	138	2 12	32·696	9·33	20	26·50	0·05	0·898	0·5077649	548	11	1299	514	41	0·5076332
	139	3 7	34·143	9·33	19	26·53	0·05	0·898	0·5074311	548	10	1300	544	41	0·5072964
	137	4 1	33·719	9·33	19	26·52	0·05	0·899	0·5075258	548	10	1299	534	41	0·5073922
													Mean	...	0·5073856
3rd Dec. Day	140	13 0	34·564	− 9·33	19	23·32	+0·17	0·912	0·5073392	+ 548	− 10	− 1143	− 553	−41	0·5072193
	138	13 53	32·763	9·33	20	23·43	0·17	0·910	0·5077489	548	11	1148	521	41	0·5076316
	139	14 48	34·212	9·33	20	23·58	0·17	0·909	0·5074157	548	11	1155	551	41	0·5072947
	137	15 42	33·779	9·33	18	23·80	0·17	0·907	0·5075122	548	9	1166	539	41	0·5073915
													Mean	...	0·5073843
										Mean of Day and Night				...	**0·5073849**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Henzada.															
		h m	s	s	′	°	°		s						s
10th Dec. 1910 Night	137	2 13	33·678	−10·24	19	26·76		0·893	0·5075351	+ 601	−10	−1311	−530	−38	0·5074063
	139	3 9	34·103	10·24	19	26·73		0·893	0·5074398	601	10	1310	541	38	0·5073100
11th Dec. Day	138	14 20	32·683	−10·24	19	24·83		0·902	0·5077680	+ 601	−10	−1217	−516	−38	0·5076500
	140	15 14	34·468	10·24	19	24·88		0·900	0·5073598	601	10	1219	545	38	0·5072387
										Mean of Day and Night ...					**0·5074013**
11th Dec. Night	140	2 10	34·427	− 9·67	19	26·29	+0·02	0·894	0·5073686	+ 568	−10	−1288	−542	−38	0·5072376
	138	3 5	32·643	9·67	19	26·32	0·02	0·893	0·5077778	568	10	1290	511	38	0·5076497
	139	3 59	34·093	9·67	19	26·34	0·02	0·893	0·5074422	568	10	1291	541	38	0·5073110
	137	4 53	33·654	9·67	18	26·35	0·02	0·893	0·5075406	568	9	1291	530	38	0·5074106
													Mean	...	0·5074022
12th Dec. Day	140	14 12	34·469	− 9·67	19	24·86	+0·09	0·903	0·5073596	+ 568	−10	−1218	−547	−38	0·5072351
	138	15 6	32·680	9·67	19	24·89	0·09	0·902	0·5077688	568	10	1220	516	38	0·5076472
	139	15 59	34·123	9·67	19	24·96	0·09	0·902	0·5074356	568	10	1223	547	38	0·5073106
	137	16 52	33·690	9·67	18	25·11	0·09	0·899	0·5075327	568	9	1230	534	38	0·5074084
													Mean	...	0·5074003
										Mean of Day and Night ...					**0·5074013**
12th Dec Night	137	2 12	33·653	− 9·65	18	26·53	+0·02	0·894	0·5075408	+ 566	− 9	−1300	−531	−38	0·5074096
	139	3 4	34·082	9·65	19	26·55	0·02	0·896	0·5074445	566	10	1301	543	38	0·5073119
	138	4 0	32·638	9·65	19	26·57	0·02	0·896	0·5077790	566	10	1302	513	38	0·5076493
	140	4 52	34·421	9·65	19	26·57	0·02	0·896	0·5073700	566	10	1302	543	38	0·5072373
													Mean	...	0·5074020
13th Dec. Day	137	14 13	33·713	− 9·65	17	24·41	+0·02	0·907	0·5075272	+ 566	− 8	−1196	−539	−38	0·5074057
	139	15 9	34·131	9·65	18	24·38	0·02	0·906	0·5074337	566	9	1195	549	38	0·5073112
	138	16 8	32·685	9·65	19	24·39	0·02	0·905	0·5077676	566	10	1195	518	38	0·5076481
	140	17 2	34·477	9·65	18	24·46	0·02	0·904	0·5073580	566	9	1199	548	38	0·5072352
													Mean	...	0·5074001
										Mean of Day and Night ...					**0·5074010**
13th Dec. Night	140	2 13	34·436	− 9·69	19	25·57	−0·02	0·900	0·5073667	+ 569	−10	−1253	−545	−38	0·5072390
	138	3 7	32·649	9·69	19	25·58	0·02	0·900	0·5077763	569	10	1253	515	38	0·5076516
	139	4 1	34·102	9·69	18	25·55	0·02	0·900	0·5074400	569	9	1252	545	38	0·5073125
	137	4 55	33·683	9·69	17	25·52	0·02	0·900	0·5075340	569	8	1250	535	38	0·5074078
													Mean	...	0·5074027
14th Dec. Day	140	14 13	34·490	− 9·69	19	23·44	−0·02	0·910	0·5073550	+ 569	−10	−1149	−551	−38	0·5072371
	138	15 6	32·706	9·69	19	23·35	0·02	0·910	0·5077626	569	10	1144	521	38	0·5076482
	139	15 59	34·159	9·69	19	23·33	0·02	0·910	0·5074275	569	10	1143	551	38	0·5073102
	137	16 53	33·737	9·69	17	23·39	0·02	0·908	0·5075217	569	8	1146	539	38	0·5074055
													Mean	...	0·5074003
										Mean of Day and Night ...					**0·5074015**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Bassein.						
		h m	s	s	′	°	°		s						s
17th	137	1 49	33·709	−11·07	18	25·13	−0·11	0·906	0·5075282	+ 650	− 9	−1231	−538	−50	0·5074104
Dec.	139	2 42	34·146	11·07	19	25·09	0·11	0·907	0·5074306	650	10	1229	550	50	0·5073117
1910	138	3 41	32·691	11·07	20	24·96	0·11	0·908	0·5077662	650	11	1223	519	50	0·5076509
Night	140	4 33	34·489	11·07	19	24·83	0·11	0·908	0·5073553	650	10	1217	550	50	0·5072376
													Mean	...	0·5074027
18th	137	13 47	33·770	−11·07	17	22·51	+0·18	0·916	0·5075143	+ 650	− 8	−1103	−544	−50	0·5074088
Dec.	139	14 41	34·192	11·07	19	22·62	0·18	0·914	0·5074201	650	10	1108	554	50	0·5073129
Day	138	15 37	32·732	11·07	20	22·79	0·18	0·914	0·5077563	650	11	1117	523	50	0·5076512
	140	16 30	34·520	11·07	19	23·01	0·18	0·913	0·5073485	650	10	1127	553	50	0·5072395
													Mean	...	0·5074031
										Mean of Day and Night				..	**0·5074029**
18th	140	1 50	34·482	−11·07	19	24·68	−0·13	0·908	0·5073567	+ 650	−10	−1209	−550	−50	0·5072398
Dec.	138	2 45	32·695	11·07	19	24·51	0·13	0·909	0·5077652	650	10	1201	520	50	0·5076521
Night	139	3 38	34·154	11·07	19	24·38	0·13	0·909	0·5074286	650	10	1195	551	50	0·5073130
	137	4 34	33·721	11·07	17	24·33	0·13	0·909	0·5075253	650	8	1192	540	50	0·5074113
													Mean	...	0·5074040
19th	140	13 55	34·562	−11·07	18	21·95	+0·19	0·916	0·5073397	+ 650	− 9	−1076	−555	−50	0·5072357
Dec.	138	14 49	32·759	11·07	20	22·12	0·19	0·916	0·5077497	650	11	1084	524	50	0·5076478
Day	139	15 41	34·213	11·07	19	22·28	0·19	0·914	0·5074155	650	10	1092	554	50	0·5073099
	137	16 34	33·761	11·07	17	22·47	0·19	0·913	0·5075161	650	8	1101	542	50	0·5074110
													Mean	...	0·5074011
										Mean of Day and Night				...	**0·5074026**
19th	137	1 52	33·712	−10·79	18	24·72	−0·07	0·906	0·5075275	+ 633	− 9	−1211	−538	−50	0·5074100
Dec.	139	2 45	34·134	10·79	19	24·71	0·07	0·907	0·5074331	633	10	1211	550	50	0·5073143
Night	138	3 39	32·690	10·79	20	24·64	0·07	0·908	0·5077665	633	11	1207	519	50	0·5076511
	140	4 33	34·475	10·79	19	24·54	0·07	0·907	0·5073583	633	10	1202	550	50	0·5072404
													Mean	...	0·5074040
20th	137	13 55	33·770	−10·79	18	22·30	+0·20	0·916	0·5075142	+ 633	− 9	−1093	−544	−50	0·5074079
Dec.	139	14 51	34·191	10·79	19	22·45	0·20	0·915	0·5074205	633	10	1100	554	50	0·5073124
Day	138	15 47	32·736	10·79	20	22·63	0·20	0·914	0·5077552	633	11	1109	523	50	0·5076492
	140	16 38	34·523	10·79	19	22·82	0·20	0·913	0·5073480	633	10	1118	553	50	0·5072382
													Mean	...	0·5074019
										Mean of Day and Night				...	**0·5074029**
20th	140	1 54	34·471	−10·67	19	24·94	−0·09	0·906	0·5073592	+ 626	−10	−1222	−549	−50	0·5072387
Dec.	138	2 50	32·676	10·67	20	24·91	0·09	0·906	0·5077697	626	11	1221	518	50	0·5076523
Night	139	3 43	34·139	10·67	19	24·82	0·09	0·906	0·5074321	626	10	1216	549	50	0·5073122
	137	4 38	33·711	10·67	17	24·71	0·09	0·907	0·5075276	626	8	1211	539	50	0·5074094
													Mean	..	0·5074031
21st	140	14 3	34·538	−10·67	19	22·03	+0·21	0·916	0·5073447	+ 626	−10	−1079	−555	−50	0·5072379
Dec.	138	14 57	32·734	10·67	20	22·21	0·21	0·915	0·5077559	626	11	1088	523	50	0·5076513
Day	139	15 52	34·199	10·67	19	22·40	0·21	0·915	0·5074187	626	10	1098	554	50	0·5073101
	137	16 52	33·760	10·67	18	22·63	0·21	0·914	0·5075163	626	9	1109	543	50	0·5074078
													Mean	...	0·5074018
										Mean of Day and Night				...	**0·5074025**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
		Toungoo.													
		h m	s	s	′	°	°		s						s
2nd Jan. 1911 Night	137	3 11	33·721	− 5·56	19	22·32		0·912	0·5075255	+ 326	− 10	− 1094	− 542	− 43	0·5073892
	139	4 10	34·151	5·56	19	22·25		0·912	0·5074292	326	10	1090	553	43	0·5072922
3rd Jan Day	138	15 10	32·779	− 5·56	19	18·86		0·925	0·5077449	+ 326	− 10	− 924	− 529	− 43	0·5076269
	140	16 7	34·561	5·56	19	19·22		0·921	0·5073399	326	10	942	558	43	0·5072172
										Mean of Day and Night ...					**0·5073814**
3rd Jan. Night	140	3 38	34·460	− 5·03	19	22·99	− 0·14	0·910	0·5073616	+ 295	− 10	− 1127	− 551	− 43	0·5072180
	138	4 35	32·664	5·03	20	22·90	0·14	0·911	0·5077728	295	11	1122	521	43	0·5076326
	139	5 28	34·131	5·03	19	22·77	0·14	0·913	0·5074337	295	10	1116	553	43	0·5072910
	137	6 23	33·710	5·03	17	22·62	0·14	0·914	0·5075278	295	8	1108	543	43	0·5073871
													Mean	...	0·5073822
4th Jan Day	140	15 38	34·556	− 5·03	19	19·41	+ 0·66	0·924	0·5073407	+ 295	− 10	− 951	− 560	− 43	0·5072138
	138	16 35	32·734	5·03	20	19·83	0·66	0·920	0·5077558	295	11	972	526	43	0·5076301
	139	17 31	34·175	5·03	19	20·50	0·66	0·916	0·5074240	295	10	1005	555	43	0·5072922
	137	18 26	33·742	5·03	17	21·19	0·66	0·912	0·5075205	295	8	1038	542	43	0·5073869
													Mean	...	0·5073807
										Mean of Day and Night ...					**0·5073815**
4th Jan. Night	137	4 4	33·686	− 5·03	17	23·33	− 0·13	0·911	0·5075334	+ 295	− 8	− 1143	− 541	− 43	0·5073894
	139	4 57	34·099	5·03	19	23·29	0·13	0·911	0·5074407	295	10	1141	552	43	0·5072956
	138	5 54	32·665	5·03	19	23·16	0·13	0·911	0·5077724	295	10	1135	521	43	0·5076310
	140	6 45	34·458	5·03	19	22·99	0·13	0·913	0·5073620	295	10	1127	553	43	0·5072182
													Mean	...	0·5073836
5th Jan. Day	137	16 3	33·772	− 5·03	18	20·16	+ 0·57	0·922	0·5075158	+ 295	− 9	− 988	− 548	− 43	0·5073845
	139	16 57	34·189	5·03	19	20·54	0·57	0·918	0·5074208	295	10	1006	556	43	0·5072888
	138	17 54	32·719	5·03	20	21·09	0·57	0·915	0·5077596	295	11	1033	523	43	0·5076281
	140	18 47	34·498	5·03	16	21·68	0·57	0·911	0·5073533	295	7	1062	552	43	0·5072164
													Mean	...	0·5073794
										Mean of Day and Night ...					**0·5073815**
5th Jan. Night	140	3 27	34·448	− 4·82	15	23·55	− 0·10	0·909	0·5073643	+ 283	− 6	− 1154	− 551	− 43	0·5072172
	138	4 25	32·661	4·82	19	23·51	0·10	0·909	0·5077734	283	10	1152	520	43	0·5076292
	139	5 20	34·111	4·82	19	23·41	0·10	0·909	0·5074381	283	10	1147	551	43	0·5072913
	137	6 14	33·690	4·82	17	23·27	0·10	0·910	0·5075325	283	8	1140	541	43	0·5073876
													Mean	...	0·5073813
6th Jan. Day	140	15 33	34·536	− 4·82	19	20·02	+ 0·56	0·920	0·5073452	+ 283	− 10	− 981	− 558	− 43	0·5072143
	138	16 29	32·731	4·82	19	20·39	0·56	0·917	0·5077565	283	10	999	525	43	0·5076271
	139	17 22	34·168	4·82	19	20·90	0·56	0·916	0·5074255	283	10	1024	555	43	0·5072906
	137	18 17	33·724	4·82	17	21·52	0·56	0·912	0·5075248	283	8	1054	542	43	0·5073884
													Mean	...	0·5073801
										Mean of Day and Night ...					**0·5073807**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Toungoo—(contd.)						
		h m	s	s	′	°	°		s						s
6th	140	4 3	34·429	− 4·71	18	23·75		0·908	0·5073681	+ 276	− 9	− 1164	− 550	− 43	0·5072191
Jan.	138	4 58	32·651	4·71	20	23 67		0·909	0·5077757	276	11	1160	520	43	0·5076299
Night															
7th	139	16 1	34·199	− 4 71	19	19·84		0·922	0·5074185	+ 276	− 10	− 972	− 559	− 43	0·5072877
Jan	137	16 57	33·756	4 71	18	20·21		0·918	0·5075173	276	9	990	545	43	0·5073862
Day															
												Mean of Day and Night		...	**0·5073807**
									Pyinmana.						
		h m	s	s	′	°	°		s						s
14th	137	3 50	33·687	− 4·00	19	23·80	+ 0·08	0·897	0·5075330	+ 235	− 10	− 1166	− 533	− 34	0·5073822
Jan.	139	4 45	34·107	4·00	19	23·92	0·08	0·897	0·5074391	235	10	1172	544	34	0·5072866
1911	138	5 46	32·660	4·00	19	24·03	0·08	0·898	0·5077736	235	10	1177	514	34	0·5076236
Night	140	6 45	34·437	4·00	19	24·02	0·08	0·898	0·5073667	235	10	1177	544	34	0·5072137
													Mean	...	0·5073765
15th	137	15 50	33·725	− 4·00	17	21·87	+ 0·21	0·906	0·5075243	+ 235	− 8	− 1072	− 538	− 34	0·5073826
Jan.	139	16 44	34·143	4·00	18	22·05	0·21	0·905	0·5074312	235	9	1080	548	34	0·5072876
Day	138	17 45	32·688	4·00	19	22·27	0·21	0·904	0·5077670	235	10	1091	517	34	0·5076253
	140	18 43	34·470	4·00	19	22·49	0·21	0·902	0·5073593	235	10	1102	547	34	0·5072135
													Mean	...	0·5073773
												Mean of Day and Night		...	**0·5073769**
15th	140	3 53	34·432	− 3·84	19	24·23	+ 0·02	0·895	0·5073678	+ 225	− 10	− 1187	− 542	− 34	0·5072130
Jan.	138	4 54	32·649	3·84	19	24·32	0·02	0·894	0·5077763	225	10	1192	511	34	0·5076241
Night	139	5 48	34·086	3·84	18	24·32	0·02	0·895	0·5074436	225	9	1192	542	34	0·5072884
	137	6 44	33·661	3·84	17	24·32	0·02	0·895	0·5075391	225	8	1192	532	34	0·5073850
													Mean	...	0·5073776
16th	140	15 54	34·466	− 3·84	19	22·93	+ 0·14	0·902	0·5073605	+ 225	− 10	− 1124	− 547	− 34	0·5072115
Jan.	138	16 52	32·683	3·84	19	23·06	0·14	0·901	0·5077681	225	10	1130	515	34	0·5076217
Day	139	17 46	34·120	3·84	19	23·17	0·14	0·901	0·5074360	225	10	1135	546	34	0·5072860
	137	18 42	33·694	3·84	18	23·34	0·14	0·898	0.5075316	225	9	1144	533	34	0·5073821
													Mean	...	0·5073753
												Mean of Day and Night		...	**0·5073765**
16th	137	3 59	33·654	− 3·79	18	24·92	+ 0·02	0·893	0·5075406	+ 222	− 9	− 1221	− 530	− 34	0·5073834
Jan.	139	4 55	34·074	3·79	19	24·94	0·02	0·893	0·5074462	222	10	1222	541	34	0·5072877
Night	138	5 53	32·637	3·79	19	24·95	0·02	0·892	0·5077791	222	10	1223	510	34	0·5076236
	140	6 45	34·409	3·79	18	24·98	0·02	0·892	0·5073726	222	9	1224	541	34	0·5072140
													Mean	..	0·5073772
17th	137	16 3	33·705	− 3·79	17	23·04	+ 0·16	0·900	0·5075291	+ 222	− 8	− 1129	− 535	− 34	0·5073807
Jan.	139	16 57	34·115	3·79	19	23·16	0·16	0·899	0·5074372	222	10	1135	545	34	0·5072868
Day	138	17 54	32·674	3·79	19	23·32	0·16	0·898	0·5077704	222	10	1143	514	34	0·5076225
	140	18 47	34·448	3·79	18	23·47	0·16	0·898	0·5073643	222	9	1150	544	34	0·5072128
													Mean	...	0·5073757
												Mean of Day and Night		...	**0·5073764**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Pyinmana—(contd.)															
		h m	s	s	′	°	°		s						s
17th Jan. Night	140	4 1	34·411	− 3·60	19	24·99	+0·03	0·892	0·5073723	+ 211	− 10	− 1225	− 541	− 34	0·5072124
	138	4 57	32·633	3·60	19	25·09	0·03	0·892	0·5077801	211	10	1229	510	34	0·5076229
	139	5 52	34·067	3·60	19	25·09	0·03	0·892	0·5074478	211	10	1229	541	34	0·5072875
	137	6 45	33·647	3·60	18	25·09	0·03	0·893	0·5075421	211	9	1229	530	34	0·5073830
													Mean	...	0·5073764
18th Jan. Day	140	16 8	34·449	− 3·60	19	23·51	+0·13	0·900	0·5073640	+ 211	− 10	− 1152	− 545	− 34	0·5072110
	138	17 4	32·668	3·60	19	23·59	0·13	0·900	0·5077718	211	10	1156	515	34	0·5076214
	139	17 57	34·105	3·60	19	23·72	0·13	0·897	0·5074396	211	10	1162	544	34	0·5072857
	137	18 51	33·674	3·60	17	23·86	0·13	0·897	0·5075359	211	8	1169	533	34	0·5073826
													Mean	...	0·5073752
												Mean of Day and Night		...	**0·5073758**
Meiktila.															
		h m	s	s	′	°	°		s						s
23rd Jan. 1911 Night	137	4 26	33·646	− 1·69	19	24·72	−0·06	0·882	0·5075423	+ 99	− 10	− 1211	− 524	− 35	0·5073742
	139	5 21	34·073	1·69	20	24·73	0·06	0·882	0·5074465	99	11	1212	534	35	0·5072772
	138	6 17	32·645	1·69	20	24·68	0·06	0·883	0·5077772	99	11	1209	505	35	0·5076111
	140	7 10	34·414	1·69	19	24·55	0·06	0·883	0·5073716	99	10	1203	535	35	0·5072032
													Mean	...	0·5073664
24th Jan. Day	137	16 26	33·725	− 1·69	18	21·20	+0·30	0·893	0·5075246	+ 99	− 9	− 1039	− 530	− 35	0·5073732
	139	17 20	34·146	1·69	19	21·43	0·30	0·892	0·5074305	99	10	1050	541	35	0·5072768
	138	18 16	32·702	1·69	19	21·69	0·30	0·891	0·5077633	99	10	1063	510	35	0·5076114
	140	19 9	34·468	1·69	19	22·03	0·30	0·889	0·5073598	99	10	1079	539	35	0·5072034
													Mean	...	0·5073662
												Mean of Day and Night		...	**0·5073663**
24th Jan. Night	140	4 36	34·397	− 1·74	19	24·02	−0·17	0·881	0·5073753	+ 102	− 10	− 1221	− 534	− 35	0·5072055
	138	5 30	32·636	1·74	20	24·89	0·17	0·881	0·5077796	102	11	1220	504	35	0·5076128
	139	6 24	34·074	1·74	19	24·71	0·17	0·882	0·5074463	102	10	1211	534	35	0·5072775
	137	7 17	33·650	1·74	18	24·48	0·17	0·883	0·5075415	102	9	1200	525	35	0·5073748
													Mean	...	0·5073677
25th Jan. Day	140	16 33	34·409	− 1·74	19	21·09	+0·31	0·894	0·5073531	+ 102	− 10	− 1033	− 542	− 35	0·5072013
	138	17 29	32·722	1·74	20	21·22	0·31	0·893	0·5077587	102	11	1040	511	35	0·5076092
	139	18 22	34·151	1·74	19	21·53	0·31	0·892	0·5074292	102	10	1055	541	35	0·5072753
	137	19 17	33·716	1·74	18	21·90	0·31	0·889	0·5075267	102	9	1073	528	35	0·5073724
													Mean	...	0·5073645
												Mean of Day and Night		...	**0·5073661**
25th Jan. Night	137	4 27	33·625	− 1·66	18	25·45	−0·06	0·880	0·5075471	+ 97	− 9	− 1247	− 523	− 35	0·5073754
	139	5 19	34·054	1·66	19	25·38	0·06	0·878	0·5074508	97	10	1244	532	35	0·5072784
	138	6 15	32·624	1·66	20	25·33	0·06	0·878	0·5077825	97	11	1241	502	35	0·5076133
	140	7 6	34·391	1·66	19	25·27	0·06	0·880	0·5073767	97	10	1238	533	35	0·5072048
													Mean	...	0·5073680
26th Jan. Day	137	16 31	33·740	− 1·66	18	20·77	+0·47	0·894	0·5075209	+ 97	− 9	− 1018	− 531	− 35	0·5073713
	139	17 25	34·161	1·66	19	21·14	0·47	0·892	0·5074271	97	10	1036	541	35	0·5072746
	138	18 21	32·709	1·66	20	21·58	0·47	0·891	0·5077618	97	11	1057	510	35	0·5076102
	140	19 14	34·471	1·66	19	22·04	0·47	0·889	0·5073592	97	10	1080	539	35	0·5072025
													Mean	...	0·5073647
												Mean of Day and Night		...	**0·5073653**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Correction on account of: Arc	Correction on account of: Temperature	Correction on account of: Density of Air	Correction on account of: Flexure	Reduced Time of Vibration
								Meiktila—(contd.)							
		h m	s	s	′	°	°		s						s
26th Jan. Night	140	4 37	34·396	− 1·91	19	25·22	−0·25	0·880	0·5073755	+ 112	−10	−1236	−533	−35	0·5072053
	138	5 32	32·638	1·91	19	25·06	0·25	0·881	0·5077788	112	10	1228	504	35	0·5076123
	139	6 25	34·080	1·91	19	24·84	0·25	0·882	0·5074450	112	10	1217	534	35	0·5072766
	137	7 19	33·669	1·91	17	24·55	0·25	0·883	0·5075373	112	8	1203	525	35	0·5073714
													Mean	...	0·5073664
27th Jan. Day	140	16 37	34·525	− 1·91	19	20·45	+0·55	0·894	0·5073475	+ 112	−10	−1002	−540	−35	0·5072000
	138	17 35	32·731	1·91	20	20·85	0·55	0·891	0·5077565	112	11	1022	510	35	0·5076099
	139	18 28	34·163	1·91	19	21·33	0·55	0·889	0·5074267	112	10	1045	539	35	0·5072750
	137	19 23	33·727	1·91	18	21·94	0·55	0·886	0·5075240	112	9	1075	526	35	0·5073707
													Mean	...	0·5073639
													Mean of Day and Night	...	**0·5073652**
								Mandalay.							
		h m	s	s	′	°	°		s						s
2nd Feb. 1911 Night	137	5 7	33·672	+ 4·04	19	22·11	+0·09	0·908	0·5075365	− 237	−10	−1083	−539	−34	0·5073462
	139	6 2	34·091	4·04	19	22·15	0·09	0·908	0·5074427	237	10	1085	550	34	0·5072511
	138	6 58	32·637	4·04	19	22·27	0·09	0·908	0·5077792	237	10	1091	519	34	0·5075901
	140	7 53	34·418	4·04	18	22·32	0·09	0·908	0·5073707	237	9	1094	550	34	0·5071783
													Mean	...	0·5073414
3rd Feb. Day	137	17 14	33·678	+ 4·04	17	22·12	+0·08	0·911	0·5075352	− 237	− 8	−1084	−541	−34	0·5073448
	139	18 7	34·091	4·04	19	22·14	0·08	0·910	0·5074427	237	10	1085	551	34	0·5072510
	138	19 4	32·639	4·04	19	22·24	0·08	0·910	0·5077786	237	10	1090	521	34	0·5075894
	140	19 57	34·424	4·04	19	22·32	0·08	0·910	0·5073696	237	10	1094	551	34	0·5071770
													Mean	...	0·5073406
													Mean of Day and Night	...	**0·5073410**
3rd Feb. Night	140	5 19	34·423	+ 3·98	19	22·48	+0·11	0·905	0·5073696	− 234	−10	−1102	−548	−34	0·5071768
	138	6 14	32·635	3·98	19	22·57	0·11	0·904	0·5077798	234	10	1106	517	34	0·5075897
	139	7 8	34·085	3·98	19	22·71	0·11	0·904	0·5074440	234	10	1113	548	34	0·5072501
	137	8 2	33·665	3·98	18	22·74	0·11	0·904	0·5075382	234	9	1114	537	34	0·5073454
													Mean	...	0·5073405
4th Feb. Day	140	17 23	34·413	+ 3·98	19	22·61	+0·06	0·910	0·5073718	− 234	−10	−1108	−551	−34	0·5071781
	138	18 19	32·631	3·98	20	22·64	0·06	0·910	0·5077807	234	11	1109	521	34	0·5075898
	139	19 11	34·078	3·98	19	22·71	0·06	0·909	0·5074453	234	10	1113	551	34	0·5072511
	137	20 5	33·654	3·98	18	22·74	0·06	0·909	0·5075406	234	9	1114	540	34	0·5073475
													Mean	...	0·5073416
													Mean of Day and Night	...	**0·5073411**
4th Feb. Night	137	5 17	33·664	+ 3·88	18	22·75	+0·04	0·907	0·5075385	− 228	− 9	−1115	−539	−34	0·5073460
	139	6 9	34·086	3·88	19	22·78	0·04	0·908	0·5074436	228	10	1116	550	34	0·5072498
	138	7 5	32·632	3·88	19	22·82	0·04	0·908	0·5077805	228	10	1118	519	34	0·5075896
	140	7 56	34·414	3·88	19	22·86	0·04	0·908	0·5073716	228	10	1120	550	34	0·5071774
													Mean	...	0·5073407
5th Feb. Day	137	17 26	33·667	+ 3·88	17	22·53	+0·05	0·912	0·5075377	− 228	− 8	−1104	−542	−34	0·5073461
	139	18 19	34·090	3·88	19	22·52	0·05	0·913	0·5074428	228	10	1103	553	34	0·5072500
	138	19 14	32·640	3·88	20	22·57	0·05	0·913	0·5077785	228	11	1106	522	34	0·5075884
	140	20 6	34·421	3·88	19	22·66	0·05	0·910	0·5073701	228	10	1110	551	34	0·5071768
													Mean	...	0·5073403
													Mean of Day and Night	...	**0·5073405**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Mandalay—(contd).															
		h m	s	s	′	°	°		s						s
5th	140	5 26	34·418	+ 4·00	19	22·71	+0·07	0·909	0·5073707	− 235	−10	−1113	− 551	−34	0·5071764
Feb.	138	6 20	32·636	4·00	20	22·74	0·07	0·908	0·5077796	235	11	1114	519	34	0·5075883
Night	139	7 12	34·086	4·00	19	22·81	0·07	0·908	0·5074436	235	10	1118	550	34	0·5072489
	137	8 5	33·667	4·00	18	22·87	0·07	0·908	0·5075378	235	9	1121	539	34	0·5073440
													Mean	...	0·5073394
6th	140	17 28	34·419	+ 4·00	19	22·53	+0·05	0·911	0·5073706	− 235	−10	−1104	− 552	−34	0·5071771
Feb.	138	18 24	32·637	4·00	20	22·52	0·05	0·911	0·5077792	235	11	1103	521	34	0·5075888
Day	139	19 16	34·088	4·00	19	22·57	0·05	0·911	0·5074431	235	10	1106	551	34	0·5072495
	137	20 9	33·655	4·00	18	22·66	0·05	0·910	0·5075401	235	9	1110	541	34	0·5073472
													Mean	...	0·5073407
												Mean of Day and Night		...	**0·5073400**
Maymyo.															
		h m	s	s	′	°	°		s						s
11th	137	6 3	33·957	− 8·59	19	13·10	+0·02	0·842	0·5074723	+ 504	−10	− 642	−500	−34	0·5074041
Feb.	139	6 58	34·382	8·59	19	13·15	0·02	0·842	0·5073787	504	10	644	510	34	0·5073093
1911	138	8 2	32·907	8·59	20	13·16	0·02	0·842	0·5077143	504	11	645	482	34	0·5076475
Night	140	8 55	34·724	8·59	19	13·16	0·02	0·843	0·5073049	504	10	645	511	34	0·5072353
													Mean	...	0·5073991
12th	137	18 4	33·978	− 8·59	18	12·09	+0·30	0·846	0·5074675	+ 504	− 9	− 592	−503	−34	0·5074041
Feb.	139	18 59	34·401	8·59	19	12·32	0·30	0·844	0·5073743	504	10	604	511	34	0·5073088
Day	138	19 59	32·917	8·59	20	12·64	0·30	0·843	0·5077121	504	11	619	482	34	0·5076479
	140	20 52	34·731	8·59	19	12·90	0·30	0·843	0·5073031	504	10	632	511	34	0·5072348
													Mean	...	0·5073989
												Mean of Day and Night		...	**0·5073990**
12th	140	6 7	34·713	− 8·46	19	13·50	+0·05	0·841	0·5073071	+ 497	−10	− 662	−510	−34	0·5072352
Feb.	138	7 9	32·896	8·46	20	13·56	0·05	0·841	0·5077168	497	11	664	481	34	0·5076475
Night	139	8 4	34·366	8·46	19	13·61	0·05	0·841	0·5073821	497	10	667	510	34	0·5073097
	137	8 59	33·942	8·46	18	13·63	0·05	0·841	0·5074755	497	9	668	500	34	0·5074041
													Mean	...	0·5073991
13th	140	18 7	34·743	− 8·46	19	12·51	+0·28	0·843	0·5073006	+ 497	−10	− 613	−511	−34	0·5072335
Feb.	138	19 1	32·920	8·46	20	12·81	0·28	0·842	0·5077112	497	11	628	482	34	0·5076454
Day	139	19 56	34·385	8·46	20	13·07	0·28	0·841	0·5073780	497	11	640	510	34	0·5073082
	137	20 51	33·948	8·46	18	13·29	0·28	0·841	0·5074743	497	9	651	500	34	0·5074046
													Mean	...	0·5073979
												Mean of Day and Night		...	**0·5073985**
13th	137	6 10	33·930	− 8·32	19	13·75	+0·07	0·841	0·5074785	+ 488	−10	− 674	−500	−34	0·5074055
Feb.	139	7 2	34·358	8·32	19	13·83	0·07	0·840	0·5073840	488	10	678	509	34	0·5073097
Night	138	8 1	32·893	8·32	20	13·91	0·07	0·840	0·5077177	488	11	682	480	34	0·5076458
	140	8 53	34·699	8·32	19	13·93	0·07	0·840	0·5073101	488	10	683	509	34	0·5072353
													Mean	...	0·5073991
14th	137	18 20	33·945	− 8·32	18	13·36	+0·22	0·842	0·5074749	+ 488	− 9	− 655	−500	−34	0·5074039
Feb.	139	19 15	34·367	8·32	19	13·59	0·22	0·841	0·5073817	488	10	666	510	34	0·5073085
Day	138	20 18	32·888	8·32	20	13·80	0·22	0·841	0·5077190	488	11	676	481	34	0·5076476
	140	21 11	34·695	8·32	19	13·99	0·22	0·839	0·5073109	488	10	686	508	34	0·5072359
													Mean	...	0·5073990
												Mean of Day and Night		...	**0·5073990**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Mogok.							
		h m	s	s	′	°	°		s						s
2nd Mar. 1911 Night	137	7 24	33·788	− 4·46	19	18·01	−0·31	0·820	0·5075102	+ 262	−10	− 882	−487	−42	0·5073943
	139	8 18	34·225	4·46	19	17·72	0·31	0·821	0·5074130	262	10	868	498	42	0·5072974
	138	9 16	32·772	4·46	20	17·43	0·31	0·822	0·5077468	262	11	854	470	42	0·5076353
	140	10 8	34·581	4·46	19	17·16	0·31	0·823	0·5073355	262	10	841	499	42	0·5072225
													Mean	...	0·5073874
3rd Mar. Day	137	19 24	33·858	− 4·46	17	15·42	+0·53	0·825	0·5074945	+ 262	− 8	− 756	−490	−42	0·5073911
	139	20 16	34·276	4·46	19	15·85	0·53	0·823	0·5074016	262	10	777	499	42	0·5072950
	138	21 11	32·798	4·46	19	16·39	0·53	0·821	0·5077406	262	10	803	470	42	0·5076343
	140	22 10	34·586	4·46	19	16·89	0·53	0·818	0·5073343	262	10	828	496	42	0·5072229
													Mean	...	0·5073858
										Mean of Day and Night				...	**0·5073866**
3rd Mar. Night	140	7 34	34·570	− 4·17	19	17·06	−0·18	0·820	0·5073378	+ 245	−10	− 836	−497	−42	0·5072238
	138	8 29	32·775	4·17	20	16·93	0·18	0·820	0·5077461	245	11	830	469	42	0·5076354
	139	9 23	34·247	4·17	19	16·76	0·18	0·820	0·5074081	245	10	821	497	42	0·5072956
	137	10 17	33·826	4·17	18	16·59	0·18	0·821	0·5075017	245	9	813	488	42	0·5073910
													Mean	...	0·5073865
4th Mar. Day	140	19 32	34·615	− 4·17	19	15·42	+0·32	0·823	0·5073282	+ 245	−10	− 756	−499	−42	0·5072220
	138	20 26	32·803	4·17	20	15·78	0·32	0·824	0·5077393	245	11	773	471	42	0·5076341
	139	21 21	34·262	4·17	19	16·07	0·32	0·823	0·5074048	245	10	787	499	42	0·5072955
	137	22 14	33·836	4·17	18	16·28	0·32	0·823	0·5074992	245	9	798	489	42	0·5073899
													Mean	...	0·5073854
										Mean of Day and Night				...	**0·5073859**
4th Mar. Night	137	9 2	33·838	− 4·17	17	16·16	−0·03	0·824	0·5074989	+ 245	− 8	− 792	−489	−42	0·5073903
	139	9 55	34·252	4·17	19	16·15	0·03	0·824	0·5074069	245	10	791	499	42	0·5072972
	138	10 51	32·790	4·17	20	16·13	0·03	0·822	0·5077425	245	11	790	470	42	0·5076357
	140	11 43	34·596	4·17	19	16·07	0·03	0·823	0·5073321	245	10	787	499	42	0·5072228
													Mean	...	0·5073865
5th Mar. Day	137	21 4	33·864	− 4·17	17	15·04	+0·55	0·825	0·5074931	+ 245	− 8	− 737	−490	−42	0·5073899
	139	21 56	34·272	4·17	19	15·58	0·55	0·823	0·5074027	245	10	763	499	42	0·5072958
	138	22 53	32·796	4·17	20	16·10	0·55	0·822	0·5077410	245	11	789	470	42	0·5076343
	140	23 45	34·587	4·17	19	16·52	0·55	0·819	0·5073343	245	10	809	496	42	0·5072231
													Mean	...	0·5073858
										Mean of Day and Night				...	**0·5073861**
								Myingyan.							
		h m	s	s	′	°	°		s						s
19th Mar. 1911 Night	137	8 25	33·563	+ 1·34	19	29·52	+0·15	0·880	0·5075611	− 79	−10	−1446	−523	−34	0·5073519
	139	9 20	33·980	1·34	21	29·66	0·15	0·880	0·5074670	79	12	1453	533	34	0·5072559
	138	10 17	32·535	1·34	18	29·80	0·15	0·879	0·5078041	79	9	1460	503	34	0·5075956
	140	11 9	34·303	1·34	18	29·94	0·15	0·879	0·5073958	79	9	1467	533	34	0·5071836
													Mean	...	0·5073468
20th Mar. Day	137	20 28	33·550	+ 1·34	17	30·05	+0·10	0·882	0·5075643	− 79	− 8	−1472	−524	−34	0·5073526
	139	21 23	33·969	1·34	18	30·13	0·10	0·882	0·5074696	79	9	1476	534	34	0·5072564
	138	22 20	32·524	1·34	19	30·22	0·10	0·880	0·5078066	79	10	1481	503	34	0·5075959
	140	23 12	34·295	1·34	18	30·31	0·10	0·879	0·5073976	79	9	1485	533	34	0·5071836
													Mean	...	0·5073471
										Mean of Day and Night				...	**0·5073469**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Myingyan—(contd.)							
		h m	s	s	′	°	°		s						s
20th	140	8 33	34·298	+ 1·43	18	30·31	+0·13	0·877	0·5073970	− 84	− 9	− 1485	− 531	− 34	0·5071827
Mar.	138	9 26	32·521	1·43	19	30·39	0·13	0·877	0·5078075	84	10	1489	502	34	0·5075956
Night	139	10 18	33·960	1·43	18	30·53	0·13	0·876	0·5074716	84	9	1496	531	34	0·5072562
	137	11 10	33·530	1·43	17	30·62	0·13	0·876	0·5075690	84	8	1500	520	34	0·5073544
													Mean	...	0·5073472
21st	140	20 33	34·289	+ 1·43	18	30·59	+0·08	0·878	0·5073987	− 84	− 9	− 1499	− 532	− 34	0·5071829
Mar.	138	21 28	32·516	1·43	19	30·69	0·08	0·878	0·5078086	84	10	1504	502	34	0·5075952
Day	139	22 21	33·952	1·43	18	30·75	0·08	0·877	0·5074732	84	9	1507	531	34	0·5072567
	137	23 14	33·526	1·43	17	30·82	0·08	0·877	0·5075697	84	8	1510	521	34	0·5073540
													Mean	...	0·5073472
												Mean of Day and Night		...	**0·5073472**
21st	137	8 41	33·523	+ 1·52	17	30·76	+0·09	0·876	0·5075707	− 89	− 8	− 1507	− 520	− 34	0·5073549
Mar.	139	9 34	33·950	1·52	18	30·86	0·09	0·875	0·5074738	89	9	1512	530	34	0·5072564
Night	138	10 30	32·508	1·52	19	30·94	0·09	0·875	0·5078107	89	10	1516	501	34	0·5075957
	140	11 23	34·274	1·52	18	30·99	0·09	0·875	0·5074021	89	9	1519	530	34	0·5071840
													Mean	...	0·5073478
22nd	137	20 42	33·528	+ 1·52	17	30·87	+0·07	0·879	0·5075692	− 89	− 8	− 1513	− 522	− 34	0·5073526
Mar.	139	21 37	33·950	1·52	18	30·94	0·07	0·878	0·5074738	89	9	1516	532	34	0·5072558
Day	138	22 30	32·508	1·52	19	30·97	0·07	0·878	0·5078107	89	10	1518	502	34	0·5075954
	140	23 22	34·275	1·52	18	31·07	0·07	0·878	0·5074018	89	9	1522	532	34	0·5071832
													Mean	...	0·5073467
												Mean of Day and Night		...	**0·5073473**
22nd Mar. Night	140	9 28	34·278	+ 1·61	18	30·87		0·877	0·5074010	− 95	− 9	− 1513	− 531	− 34	0·5071828
	138	10 22	32·507	1·61	19	30·93		0·876	0·5078109	95	10	1516	501	34	0·5075953
23rd Mar. Day	139	21 29	33·949	+ 1·61	17	30·82		0·879	0·5074741	− 95	− 8	− 1510	− 533	− 34	0·5072561
	137	22 21	33·521	1·61	17	30·87		0·879	0·5075709	95	8	1513	522	34	0·5073537
												Mean of Day and Night		...	**0·5073470**
								Dehra Dun.							
		h m	s	s	′	°	°		s						s
17th	137	10 28	33·640	+ 18·26	19	25·77	+0·05	0·831	0·5075436	− 1072	− 10	− 1263	− 494	− 36	0·5072561
Apr.	139	11 25	34·059	18·26	19	25·88	0·05	0·830	0·5074496	1072	10	1268	503	36	0·5071607
1911	138	12 32	32·611	18·26	19	25·93	0·05	0·831	0·5077855	1072	10	127[illegible]	475	36	0·5074991
Night	140	13 28	34·393	18·26	19	25·93	0·05	0·830	0·5073761	1072	10	1271	503	36	0·5070869
													Mean	...	0·5072507
18th	137	22 43	33·642	+ 18·26	18	25·53	+0·15	0·829	0·5075432	− 1072	− 9	− 1251	− 492	− 36	0·5072572
Apr.	139	23 37	34·063	18·26	19	25·69	0·15	0·829	0·5074487	1072	10	1259	502	36	0·5071608
Day	138	0 33	32·611	18·26	20	25·82	0·15	0·828	0·5077856	1072	11	1265	474	36	0·5074098
	140	1 24	34·389	18·26	19	25·95	0·15	0·828	0·5073768	1072	10	1272	502	36	0·5070876
													Mean	...	0·5072514
												Mean of Day and Night		...	**0·5072510**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Dehra Dun—(contd.)							
		h m	s	s	′	°	°		s						s
18th Apr. Night	140	10 48	34·369	+18·91	19	26·32	+0·09	0·825	0·5073813	−1110	−10	−1290	−500	−36	0·5070867
	138	11 42	32·592	18·91	20	26·47	0·09	0·826	0·5077902	1110	11	1297	472	36	0·5074976
	139	12 37	34·037	18·91	17	26·54	0·09	0·827	0·5074545	1110	8	1300	501	36	0·5071590
	137	13 31	33·611	18·91	18	26·58	0·09	0·827	0·5075506	1110	9	1302	491	36	0·5072558
													Mean	...	0·5072498
19th Apr. Day	140	22 51	34·380	+18·91	19	25·82	+0·18	0·829	0·5073790	−1110	−10	−1265	−502	−36	0·5070867
	138	23 45	32·600	18·91	20	26·00	0·18	0·829	0·5077881	1110	11	1274	474	36	0·5074976
	139	0 37	34·038	18·91	20	26·15	0·18	0·829	0·5074542	1110	11	1281	502	36	0·5071602
	137	1 30	33·616	18·91	18	26·29	0·18	0·829	0·5075492	1110	9	1288	492	36	0·5072557
													Mean	...	0·5072501
											Mean of Day and Night			...	**0·5072499**
19th Apr. Night	137	10 54	33·592	+18·91	18	26·53	+0·07	0·830	0·5075548	−1110	−9	−1300	−493	−36	0·5072600
	139	11 47	34·013	18·91	19	26·63	0·07	0·830	0·5074598	1110	10	1305	503	36	0·5071634
	138	12 42	32·570	18·91	20	26·70	0·07	0·832	0·5077956	1110	11	1308	476	36	0·5075015
	140	13 35	34·351	18·91	19	26·72	0·07	0·833	0·5073855	1110	10	1309	505	36	0·5070885
													Mean	...	0·5072534
20th Apr. Day	137	22 55	33·624	+18·91	18	25·98	+0·11	0·836	0·5075472	−1110	−9	−1273	−497	−36	0·5072547
	139	23 50	34·035	18·91	20	26·09	0·11	0·836	0·5074548	1110	11	1278	507	36	0·5071606
	138	0 46	32·586	18·91	20	26·18	0·11	0·835	0·5077916	1110	11	1283	478	36	0·5074998
	140	1 37	34·360	18·91	20	26·28	0·11	0·833	0·5073833	1110	11	1288	505	36	0·5070883
													Mean	...	0·5072508
											Mean of Day and Night			...	**0·5072521**
20th Apr. Night	140	11 18	34·370	+18·87	19	26·31	+0·12	0·832	0·5073811	−1108	−10	−1289	−504	−36	0·5070864
	138	12 12	32·587	18·87	21	26·46	0·12	0·832	0·5077915	1108	12	1297	476	36	0·5074986
	139	13 9	34·033	18·87	19	26·56	0·12	0·832	0·5074551	1108	10	1301	504	36	0·5071592
	137	14 4	33·619	18·87	18	26·65	0·12	0·831	0·5075487	1108	9	1305	494	36	0·5072535
													Mean	...	0·5072494
21st Apr. Day	140	23 22	34·376	+18·87	19	25·86	+0·15	0·836	0·5073798	−1108	−10	−1267	−507	−36	0·5070870
	138	0 19	32·594	18·87	20	25·97	0·15	0·836	0·5077896	1108	11	1273	478	36	0·5074990
	139	1 13	34·035	18·87	19	26·12	0·15	0·834	0·5074549	1108	10	1280	505	36	0·5071610
	137	2 5	33·618	18·87	17	26·25	0·15	0·833	0·5075488	1108	8	1286	495	36	0·3072555
													Mean	...	0·5072506
											Mean of Day and Night			...	**0·5072500**

In Table III are shown the times of vibration of the four pendulums at Dehra Dūn at the beginning and end of the field season.

Table III.—Times of vibration at Dehra Dūn.

Date	137	138	139	140	Mean
1910-11	s	s	s	s	s
October, 17-18	0·5072582	0·5074972	0·5071591	0·5070872	0·5072504
" 18-19	2562	4977	1572	0865	2494
" 19-20	2567	4959	1587	0859	2493
" 21-22	2579	4976	1599	0874	2507
Mean	0·5072573	0·5074971	0·5071587	0·5070867	0·5072500
April, 17-18	0·5072567	0·5074994	0·5071608	0·5070872	0·5072510
" 18-19	2557	4976	1596	0867	2499
" 19-20	2574	5007	1620	0884	2521
" 20-21	2545	4988	1601	0867	2500
Mean	0·5072561	0·5074991	0·5071606	0·5070872	0·5072508
General Mean	0·5072567	0·5074981	0·5071596	0·5070870	0·5072504
Difference, Apr.-Oct.	−12	+20	+19	+ 5	+ 8

Three of the pendulums show large changes, and we shall as usual tabulate the differences of each pendulum from the mean at each station in order to see if there is any evidence of progressive change.

Table IV.—Differences between the mean and individual pendulums.

Station	137	v	138	v	139	v	140	v
Dehra Dūn ...	−73	−11	−2471	+ 6	+913	+11	+1633	− 3
Rangoon ...	−69	− 7	−2465	+12	+902	0	+1632	− 4
Prome ...	−67	− 5	−2475	+ 2	+902	0	+1642	+ 6
Henzada ...	−62	0	−2480	− 3	+904	+ 2	+1640	+ 4
Bassein ...	−69	− 7	−2480	− 3	+906	+ 4	+1642	+ 6
Toungoo ...	−63	− 1	−2480	− 3	+903	+ 1	+1641	+ 5
Pyinmana ...	−63	− 1	−2468	+ 9	+894	− 8	+1637	+ 1
Meiktila ...	−69	− 7	−2453	+24	+896	− 6	+1627	− 9
Mandalay ...	−52	+10	−2486	− 9	+905	+ 3	+1634	− 2
Maymyo ...	−56	+ 6	−2481	− 4	+898	− 4	+1638	+ 2
Mogok ...	−49	+13	−2486	− 9	+901	− 1	+1633	− 3
Myingyan ...	−64	− 2	−2484	− 7	+909	+ 7	+1639	+ 3
Dehra Dūn ...	−53	+ 9	−2483	− 6	+902	0	+1636	0
Means	−62		−2477		+902		+1636	
Means of 1909-10	−69		−2484		+921		+1632	

There are the usual fluctuations in the differences, but no definite evidence of a sudden or gradual change in any one pendulum during the season. It appears, however, that pendulum 139 has changed since the previous season, the amount being about 21×10^{-7} secs. It is possible that some part of the change in this pendulum occurred between Dehra Dūn and Rangoon, but the evidence is not sufficiently clear to warrant any change being made in the mean time of vibration at Dehra Dūn. A change during the recess season does not, of course, affect the value of gravity deduced.

In Table V are given the times of vibration of the mean and individual pendulums at each station and the values of g deduced.

Table V.—Mean times of vibration and deduced values of g.

Station		137	138	139	140	Mean
Dehra Dūn ...	s.	0·5072567	0·5074981	0·5071596	0·5070870	0·5072504
Rangoon ...	s.	0·5074117	0·5076513	0·5073146	0·5072416	0·5074048
		+1550	+1532	+1549	+1546	+1544
	g.	978·465	978·472	978·465	978·466	978·467
Prome ...	s.	0·5073917	0·5076325	0·5072948	0·5072208	0·5073850
		+1350	+1344	+1351	+1338	+1346
	g.	978·542	978·544	978·541	978·546	978·543
Henzada ...	s.	0·5074075	0·5076493	0·5073109	0·5072373	0·5074013
		+1508	+1512	+1512	+1503	+1509
	g.	978·481	978·480	978·479	978·483	978·481
Bassein ...	s.	0·5074096	0·5076507	0·5073121	0·5072385	0·5074027
		+1529	+1526	+1524	+1515	+1523
	g.	978·473	978·474	978·475	978·478	978·475
Toungoo ...	s.	0·5073875	0·5076292	0·5072909	0·5072171	0·5073812
		+1308	+1311	+1312	+1301	+1308
	g.	978·558	978·557	978·556	978·561	978·558
Pyinmana ...	s.	0·5073827	0·5076232	0·5072870	0·5072127	0·5073764
		+1260	+1251	+1273	+1257	+1260
	g.	978·577	978·580	978·572	978·578	978·577
Meiktila ...	s.	0·5073729	0·5076113	0·5072764	0·5072033	0·5073660
		+1162	+1132	+1167	+1163	+1156
	g.	978·614	978·626	978·612	978·614	978·617
Mandalay ...	s.	0·5073459	0·5075893	0·5072502	0·5071773	0·5073407
		+892	+912	+905	+903	+903
	g.	978·719	978·711	978·714	978·714	978·714
Maymyo ...	s.	0·5074044	0·5076469	0·5073090	0·5072350	0·5073988
		+1477	+1488	+1493	+1480	+1484
	g.	978·493	978·489	978·487	978·492	978·490
Mogok ...	s.	0·5073911	0·5076348	0·5072961	0·5072229	0·5073862
		+1344	+1367	+1364	+1359	+1358
	g.	978·544	978·536	978·536	978·538	978·539
Myingyan ...	s.	0·5073535	0·5075955	0·5072562	0·5071832	0·5073471
		+968	+974	+965	+962	+967
	g.	978·689	978·687	978·690	978·692	978·690

The Reduction to Sea Level.

Orographical corrections were computed for all stations except Rangoon, Henzada and Bassein; they were, however, found to be inappreciable at all except Pyinmana, Mandalay and Mogok. The method of computation was the same as that described in Chapter IV, and the details of the three stations for which the correction was found to be appreciable are herewith shown. The actual heights of the portions of zones are given, but for entering the tables the argument is difference between height of station and height of zone.

Table VI.—Orographical corrections.

Unit of correction 0·00001 dyne .

Pyinmana — *Height, 409 feet*

Zone	*Fraction*	Height (*feet*)	*Correction*
A	1·00	409	0
B	1·00	415	8
C	1·00	415	1
D	1·00	420	0
E	0·95	400	0
	0·05	500	1
F	0·90	400	0
	0·10	500	0
G	0·95	400	0
	0·05	500	0
H	0·10	350	0
	0·85	400	0
	0·05	500	0
I	0·10	350	0
	0·70	400	0
	0·20	500	0
J	0·55	400	0
	0·45	500	0
K	0·40	400	0
	0·60	600	0
L	0·15	400	0
	0·80	600	0
	0·05	1300	1
M	0·05	400	0
	0·50	600	0
	0·05	1100	0
	0·25	2000	7
	0·15	3500	15
N	0·05	400	0
	0·55	600	0
	0·10	1300	1
	0·25	3500	14
	0·05	4000	4
Total ...		**0·00052**	
Correction		**−0·001**	

Mandalay — *Height, 244 feet*

Zone	*Fraction*	Height	*Correction*
ZONES A to J *No Correction.*			
K	0·60	240	0
	0·25	500	0
	0·15	1100	3
L	0·65	240	0
	0·20	500	0
	0·15	2100	7
M	0·65	240	0
	0·05	500	0
	0·05	2000	2
	0·25	3500	28
N	0·65	240	0
	0·05	500	0
	0·05	2500	2
	0·15	3700	11
	0·10	4400	10
Total ...		**0·00063**	
Correction		**−0·001**	

Mogok — *Height, 3685 feet*

Zone	*Fraction*	Height (*feet*)	*Correction*
A	1·00	3685	0
B	1·00	3690	7
C	1·00	3700	2
D	0·35	3700	0
	0·35	3750	2
	0·30	3850	6
E	0·20	3700	0
	0·45	3800	4
	0·35	4000	19
F	0·70	3760	1
	0·30	3840	3
G	0·15	3750	0
	0·40	3875	2
	0·20	4100	4
	0·25	4500	18
H	0·15	3700	0
	0·70	4100	8
	0·15	4700	8
I	0·30	3800	0
	0·40	4300	9
	0·10	4800	7
	0·20	5000	18
J	0·20	3200	2
	0·10	3600	0
	0·30	4500	8
	0·30	5250	29
	0·05	5900	10
	0·05	7000	23
K	0·05	3000	5
	0·30	3800	0
	0·25	4250	2
	0·20	4800	6
	0·15	5900	18
	0·05	7000	13
L	0·10	2750	1
	0·30	3000	2
	0·15	3700	0
	0·20	4000	0
	0·20	4900	4
	0·05	5800	3
M	0·20	2000	6
	0·15	3000	1
	0·10	3500	0
	0·20	3850	0
	0·25	4300	1
	0·10	5000	2
N	0·20	2500	1
	0·25	3000	1
	0·30	3500	0
	0·10	4300	0
	0·15	4800	1
Total ...		**0·00257**	
Correction		**−0·003**	

The outer radius of Zone N is 32 miles and since as a rule the investigation of the orographical correction is not continued beyond 35 miles from the station, the next zone was not taken into account. Looking at the totals, however, it is most unlikely that the third place of decimals in the correction would be altered by considering further zones.

The abstract of the season's results is given in Table VII.

Table VII.—Abstract of results.

Station	Height	γ_0	Corrections: for height	Corrections: for mass (Bouguer)	Corrections: orographical	γ_B	g	$g-\gamma_B$
	feet	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*
Bassein ...	23	978·460	−0·002	+0·001	0	978·459	978·475	+0·016
Rangoon ...	164	978·461	−0·015	+0·006	0	978·452	978·467	+0·015
Henzada ...	46	978·505	−0·004	+0·002	0	978·503	978·481	−0·022
Prome ...	101	978·568	−0·009	+0·003	0	978·562	978·543	−0·019
Toungoo ...	159	978·573	−0·015	+0·005	0	978·563	978·558	−0·005
Pyinmana ...	409	978·619	−0·038	+0·014	−0·001	978·594	978·577	−0·017
Meiktila ...	799	978·684	−0·075	+0·027	0	978·636	978·617	−0·019
Myingyan ...	248	978·722	−0·023	+0·008	0	978·707	978·690	−0·017
Mandalay ..	244	978·754	−0·023	+0·008	−0·001	978·738	978·714	−0·024
Maymyo ...	3495	978·756	−0·327	+0·117	0	978·546	978·490	−0·056
Mogok ...	3685	978·813	−0·345	+0·124	−0·003	978·589	978·539	−0·050

It will be immediately noticed that except at the two hill stations the residuals are much smaller than in other parts of India. This seems to indicate the presence of some dense subaqueous matter, the more so since the two stations which are practically on the coast show positive residuals. At the time of writing the Hayford or compensation corrections for mass have not been computed owing to lack of maps and it will be interesting to see how they will affect the residuals. It is likely that the difference between the Bouguer residuals at, say, Rangoon and Maymyo will be very largely reduced.

CHAPTER VI.

The Pendulum Operations in 1911-12.

During the winter of 1911-12 only one Imperial Officer was available for the two geodetic parties and an area had to be selected where both latitude and pendulum observations were required. Such an area was found in Bihār and Orissa where two meridional chains of triangulation are crossed by railways at many points so that long road journeys could be avoided. A southerly deflection of the plumb-line of 11″ (the largest found in India up to that time) previously observed at Hurilaong, near Daltonganj, pointed to the possibility of the "hidden chain" being found close to the south and pendulum observations were made to determine, if possible, the northern edge. The northern stations are all in the Gangetic plain and deficiencies of gravity were to be expected there, the deficiencies increasing as the Himalaya were approached.

Of the stations visited, Japla is in flat country close to the Son river, the nearest hills being about 6 miles distant. Daltonganj is on the banks of the Koel river, a tributary of the Son, in country less flat than at Japla. Rānchi is on a high level plateau with a few isolated rocky hills rising therefrom. Gaya and Sasarām are on the southern edge of the Ganges valley and the rest of the stations are in this valley, all being on absolutely level ground. Moghal Sarai, Buxar and Monghyr are close to the river, and Gorakhpur, the most northerly station, is about 60 miles from the outer Himalaya, so that its position compares roughly with that of Kaliāna, south of Dehra Dūn.

The observations throughout the season were made by Captain H. J. Couchman, R.E.

The descriptions of the stations are given below :—

Japla.

Latitude	...	24° 31′ 58″
Longitude	...	84° 0′
Height	...	474 feet.

The pendulums were swung in the south room of the Japla Inspection bungalow. The floor of the pendulum room was connected by levelling to the rail opposite the centre of the platform at Japla Railway station the height of which was given as 479 feet. Some rain and much cloud delayed the observations and as stars could only be observed on the nights of November 22nd, 27th and 28th only two independent results are obtainable. The size of the room was 16 feet × 12 feet and it had a concrete floor and tiled roof.

Daltonganj.

Latitude ... 24° 2′ 5″
Longitude ... 84° 4′
Height ... 707 feet.

The height was determined by levelling from the rail at Daltonganj Railway station. The observations were made in the south room of the dak bungalow.

Ranchi.

Latitude ... 23° 23′ 5″
Longitude ... 85° 19′
Height ... 2167 feet.

The height was determined by levelling from the roof of the *kachahri*, a G. T. S. station, and, as the ⊙ could not be found there, also from the railway station. The height given above is the mean of the two values obtained which were 2163 and 2172 feet. The observations were taken in the north-east room of the house temporarily used as the circuit house which is about 100 yards north of the Judicial Commissioner's bungalow. The size of the room was 21 feet × 15 feet and it had a good concrete floor and tiled roof with plaster underneath.

Gaya.

Latitude ... 24° 47′ 42″
Longitude ... 85° 0′
Height ... 361 feet.

The height was determined by levelling from the railway station. The observations were made in the north-east room of the opium godown. The size of the room was 24 feet × 11½ feet and it had a concrete floor, tiled roof with a broad verandah outside.

Monghyr.

Latitude ... 25° 22′ 53″
Longitude ... 86° 28′
Height ... 154 feet.

The height was determined by levelling from the railway station. The pendulums were swung in the east room of a large double-storied private house situated immediately to the north of the jail in Monghyr fort. The size of the room was 21 feet × 16 feet and it had a good concrete floor.

Arrah.

Latitude ... 25° 34′ 10″
Longitude ... 84° 39′
Height ... 188 feet.

The height was determined by levelling from the G. T. S. $\frac{\text{BM.14}}{\text{72 C}}$ of Main Line 72 (Dildarnagar to Pirpainti). The observations were made in a small room at the S.E. corner of an old bungalow, belonging to Mr. Solonos, which is about 2 miles N.N.W. of the railway station. The bungalow was temporarily being used as a circuit house. The size of the room was 20½ feet × 12½ feet, and it had a concrete floor and a tiled roof with thatch underneath.

Sasaram.

Latitude ... 24° 57′ 21″
Longitude ... 83° 59′
Height ... 340 feet.

The height was determined by levelling from the railway station. The observations were made in the N.W. room of the Bedāhih P.W.D. Inspection bungalow about 2¼ miles west of Sasarām and on the Grand Trunk Road. The room was 14 feet × 14 feet and had a *pukka* floor and tiled roof with plaster underneath and ceiling cloth.

Moghal Sarai.

Latitude ... 25° 17′ 3″
Longitude ... 83° 6′
Height ... 257 feet.

The height was determined by levelling from the Standard Bench-mark at Benares *viz.* G.T.S. $\frac{\text{BM.96}}{\text{63 K}}$ of Main Line 70 (Allahābād to Dildarnagar) to the Benares Railway station and from Moghal Sarai Railway station to the pendulum room, assuming that the difference of rail level between Benares and Moghal Sarai as given by the East Indian Railway is correct. The observations were taken in the east main room of the opium bungalow situated about 300 yards south of the Benares road and about ¾ mile west of the railway station. Concrete floor, tiled roof with plaster ceiling. Size of room 20 feet × 14 feet.

Buxar.

Latitude ... 25° 34′ 42″
Longitude ... 83° 59′
Height ... 207 feet.

The height was determined by levelling from the G.T.S. $\frac{\text{BM.72}}{\text{63 O}}$ of Main Line 72 (Dildarnagar to Pirpainti). The observations were made in the south room of a private bungalow belonging to Babu Harihar Prasād of Dumraon situated on the right bank of the Ganges and immediately to the west of the *bāzār*. The size of the room was 21½ feet × 14 feet and it had a concrete floor, tiled roof with boarded ceiling. The latter being in bad repair, the temperature conditions were not very satisfactory.

Muzaffarpur.

Latitude ... 26° 7′ 5″
Longitude ... 85° 25′
Height ... 179 feet.

The height was determined by levelling from the G.T.S. $\frac{\text{BM.12}}{\text{72 F}}$ of Main Line 71 (Gorakhpur to Purnea). The pendulums were swung in the south main room of the opium building which is situated about 2½ miles east of the railway station and on the main Samastipur road. The floor was of concrete and the roof, of tiles with cloth ceiling. The size of the room was 20 feet × 16½ feet.

Majhauli Raj.

Latitude ... 26° 17′ 46″
Longitude ... 83° 58′
Height ... 219 feet.

The height was determined by levelling from Salīmpur Railway station. The observations were made in a small building situated about 200 yards north-north-west of the Majhauli Rāj palace. The building has been used as a store-house for grain and has brick walls and floor and a brick arched roof. The size of the room was 21½ feet × 10 feet and the temperature conditions were very satisfactory.

Gorakhpur.

Latitude ... 26° 44′ 58″
Longitude ... 83° 23′
Height ... 257 feet.

The height was determined by levelling from the Standard Bench-mark at Gorakhpur, *viz.* G.T.S. $\frac{\text{BM.61}}{\text{63 N}}$ of Branch Line 69A (Gorakhpur to Bharmi). The observations were made in the north main room of the P.W.D. inspection bungalow. The size of the room was 20 feet × 18 feet and it had a concrete floor and tiled roof with cloth ceiling.

Good observing rooms were available at all the stations and the control of temperature presented no difficulties. At Japla and Arrah the floors were in bad repair, hence the large flexure corrections at these stations. These corrections are shewn in Table I and call for no particular comment.

Table I.—Flexure correction.

Station	Date	Means before and after work 10^{-7} secs.	Adopted Correction 10^{-7} secs.
Dehra Dūn ...	November 4, 1911 " 9	−37·2 38·8	−38
Japla ...	November 22 " 29	−63·2 61·3	−62
Daltonganj ...	December 6 " 11	−43·4 43·4	−43
Rānchi ...	December 29 January 3, 1912	−42·9 45·3	−44
Gaya ...	January 10 " 16	−42·6 42·6	−43
Monghyr ...	January 19 " 23	−36·6 36·0	−36
Arrah ...	January 29 February 3	−53·8 51·3	−53
Sasarām ...	February 9 " 13	−47·7 47·6	−48
Moghal Sarai ...	February 18 " 22	−41·7 40·3	−41
Buxar ...	February 27 March 2	−43·8 43·6	−44
Muzaffarpur ...	March 7 " 11	−46·5 46·3	−46
Majhauli Rāj ...	March 15 " 19	−40·5 40·6	−41
Gorakhpur ...	March 25 " 29	−41·9 42·5	−42
Dehra Dūn ...	April 8 " 12	−36·6 36·0	−36

The time observations were made by Mr. Hanumān Prasād, the mean p. e. of the mean value of a clock rate being ± 0·013 sec. while that of a single value was ± 0·056 sec.

The details of the observations are given in Table II.

Table II.—Details of the Observations.

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
		Dehra Dun.													
		h m	s	s	′	°	°		s						s
4th Nov. 1911 Night	137	0 11	33·715	+19·00	19	20·99	+0·13	0·852	0·5075266	−1115	−10	−1029	−506	−38	0·5072568
	139	1 6	34·135	19·00	21	21·13	0·13	0·853	0·5074328	1115	12	1035	517	38	0·5071611
	138	2 4	32·687	19·00	21	21·28	0·13	0·852	0·5077671	1115	12	1043	487	38	0·5074976
	140	2 57	34·464	19·00	17	21·32	0·13	0·852	0·5073607	1115	8	1045	516	38	0·5070885
													Mean	...	0·5072510
5th Nov. Day	137	12 9	33·726	+19·00	16	20·46	+0·19	0·858	0·5075245	−1115	−7	−1003	−510	−38	0·5072572
	139	13 4	34·149	19·00	18	20·59	0·19	0·857	0·5074297	1115	9	1009	519	38	0·5071607
	138	14 11	32·684	19·00	20	20·83	0·19	0·855	0·5077677	1115	11	1021	489	38	0·5075003
	140	15 4	34·469	19·00	18	20·97	0·19	0·855	0·5073596	1115	9	1028	518	38	0·5070888
													Mean	...	0·5072518
													Mean of Day and Night	...	**0·5072514**
5th Nov. Night	140	0 9	34·472	+18·97	18	21·00	+0·11	0·853	0·5073588	−1114	−9	−1029	−517	−38	0·5070881
	138	1 8	32·679	18·97	19	21·12	0·11	0·852	0·5077690	1114	10	1035	487	38	0·5075006
	139	2 4	34·125	18·97	19	21·20	0·11	0·851	0·5074350	1114	10	1039	516	38	0·5071633
	137	2 57	33·698	18·97	17	21·32	0·11	0·851	0·5075307	1114	8	1045	505	38	0·5072597
													Mean	...	0·5072529
6th Nov. Day	140	12 10	34·489	+18·97	14	20·46	+0·15	0·858	0·5073553	−1114	−5	−1003	−520	−38	0·5070873
	138	13 7	32·695	18·97	19	20·59	0·15	0·856	0·5077651	1114	10	1009	490	38	0·5074990
	139	14 6	34·148	18·97	18	20·74	0·15	0·855	0·5074300	1114	9	1016	518	38	0·5071605
	137	15 0	33·709	18·97	17	20·91	0·15	0·855	0·5075282	1114	8	1025	508	38	0·5072589
													Mean	...	0·5072514
													Mean of Day and Night	...	**0·5072522**
6th Nov. Night	137	0 20	33·709	+19·31	17	20·92	+0·15	0·855	0·5075282	−1133	−8	−1025	−508	−38	0·5072570
	139	1 21	34·122	19·31	18	21·13	0·15	0·852	0·5074358	1133	9	1035	516	38	0·5071627
	138	2 20	32·664	19·31	19	21·29	0·15	0·852	0·5077727	1133	10	1043	487	38	0·5075016
	140	3 14	34·454	19·31	18	21·35	0·15	0·852	0·5073629	1133	9	1046	516	38	0·5070887
													Mean	...	0·5072525
7th Nov. Day	137	12 25	33·720	+19·31	17	20·63	+0·17	0·857	0·5075256	−1133	−8	−1011	−509	−38	0·5072557
	139	13 22	34·136	19·31	18	20·75	0·17	0·855	0·5074328	1133	9	1017	518	38	0·5071613
	138	14 20	32 682	19·31	20	20·91	0·17	0·855	0·5077683	1133	11	1025	489	38	0·5074987
	140	15 14	34·464	19·31	18	21·09	0·17	0·853	0·5073607	1133	9	1033	517	38	0·5070877
													Mean	...	0·5072509
													Mean of Day and Night	...	**0·5072517**
7th Nov. Night	140	0 34	34·466	+19·12	18	21·10	+0·09	0·852	0·5073603	−1122	−9	−1034	−516	−38	0·5070884
	138	1 31	32·690	19·12	19	21·13	0·09	0·852	0·5077665	1122	10	1035	487	38	0·5074973
	139	2 26	34·118	19·12	19	21·27	0·09	0·852	0·5074363	1122	10	1042	516	38	0·5071635
	137	3 24	33·707	19·12	17	21·32	0·09	0·851	0·5075286	1122	8	1045	505	38	0·5072568
													Mean	...	0·5072515
8th Nov. Day	140	12 38	34·474	+19·12	19	20·55	+0·11	0·858	0·5073585	−1122	−10	−1007	−520	−38	0·5070888
	138	13 32	32·687	19·12	20	20·68	0·11	0·856	0·5077670	1122	11	1013	490	38	0·5074996
	139	14 28	34·136	19·12	19	20·76	0·11	0·855	0·5074327	1122	10	1017	518	38	0·5071622
	137	15 23	33·709	19·12	18	20·91	0·11	0·853	0·5075282	1122	9	1025	507	38	0·5072581
													Mean	...	0·5072522
													Mean of Day and Night	...	**0·5072518**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Japla.							
		h m	s	s	′	°	°		s						s
22nd	137	1 14	33·824	+ 4·82	21	21·86	+0·03	0·904	0·5075022	− 283	− 12	− 1071	− 537	− 62	0·5073057
Nov.	139	2 12	34·270	4·82	19	21·89	0·03	0·904	0·5074030	283	10	1073	548	62	0·5072054
1911	138	3 14	32·801	4·82	20	21·92	0·03	0·904	0·5077398	283	11	1074	517	62	0·5075451
Night	140	4 8	34·604	4·82	19	21·94	0·03	0·904	0·5073305	283	10	1075	548	62	0·5071327
													Mean	...	0·5072972
23rd	137	13 20	33·830	+ 4·82	19	21·11	+0·21	0·907	0·5075008	− 283	− 10	− 1034	− 539	− 62	0·5073080
Nov.	139	14 15	34·260	4·82	20	21·30	0·21	0·906	0·5074051	283	11	1044	549	62	0·5072102
Day	138	15 15	32·791	4·82	20	21·50	0·21	0·903	0·5077421	283	11	1054	517	62	0·5075494
	140	16 10	34·583	4·82	17	21·73	0·21	0·901	0·5073350	283	8	1065	546	62	0·5071386
													Mean	...	0·5073016
													Mean of Day and Night	...	**0·5072994**
23rd	140	1 23	34·583	+ 4·82	17	22·16	+0·16	0·901	0·5073350	− 283	− 8	− 1086	− 546	− 62	0·5071365
Nov.	138	2 22	32·762	4·82	21	22·34	0·16	0·900	0·5077489	283	12	1095	515	62	0·5075522
Night	139	3 17	34·216	4·82	19	22·50	0·16	0·900	0·5074149	283	10	1103	545	62	0·5072146
	137	4 14	33·780	4·82	19	22·59	0·16	0·898	0·5075120	283	10	1107	533	62	0·5073125
													Mean	...	0·5073040
24th	140	13 22	34·576	+ 4·82	20	21·90	+0·16	0·904	0·5073366	− 283	− 11	− 1073	− 548	− 62	0·5071389
Nov.	138	14 18	32·773	4·82	18	21·96	0·16	0·903	0·5077466	283	9	1076	517	62	0·5075519
Day	139	15 11	34·217	4·82	20	22·13	0·16	0·903	0·5074147	283	11	1084	547	62	0·5072160
	137	16 4	33·787	4·82	18	22·31	0·16	0·900	0·5075103	283	9	1093	535	62	0·5073121
													Mean	...	0·5073047
													Mean of Day and Night	...	**0·5073043**
24th	137	1 13	33·791	+ 4·82	19	22·11	+0·12	0·903	0·5075097	− 283	− 10	− 1083	− 536	− 62	0·5073123
Nov.	139	2 6	34·223	4·82	20	22·15	0·12	0·903	0·5074136	283	11	1085	547	62	0·5072148
Night	138	3 3	32·752	4·82	21	22·30	0·12	0·900	0·5077516	283	12	1093	515	62	0·5075551
	140	3 54	34·552	4·82	20	22·37	0·12	0·900	0·5073417	283	11	1096	545	62	0·5071420
													Mean	...	0·5073061
25th	137	13 14	33·796	+ 4·82	19	21·88	+0·16	0·904	0·5075083	− 283	− 10	− 1072	− 537	− 62	0·5073119
Nov.	139	14 9	34·225	4·82	20	21·96	0·16	0·903	0·5074129	283	11	1076	547	62	0·5072150
Day	138	15 11	32·757	4·82	21	22·15	0·16	0·903	0·5077505	283	12	1085	517	62	0·5075546
	140	16 3	34·557	4·82	20	22·30	0·16	0·900	0·5073406	283	11	1093	545	62	0·5071412
													Mean	...	0·5073057
													Mean of Day and Night	...	**0·5073059**
25th	140	1 24	34·554	+ 4·82	20	22·12		0·901	0·5073411	− 283	− 11	− 1084	− 546	− 62	0·5071425
Nov.	138	2 19	32·752	4·82	21	22·24		0·901	0·5077516	283	12	1090	515	62	0·5075554
Night															
26th	139	13 27	34·222	+ 4·82	20	21·73		0·904	0·5074136	− 283	− 11	− 1065	− 548	− 62	0·5072167
Nov.	137	14 23	33·783	4·82	18	21·89		0·903	0·5075112	283	9	1073	536	62	0·5073149
Day															
													Mean of Day and Night	...	**0·5073074**

Table 11.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Japla—(contd.)															
		h m	s	s	′	°	°		s						s
26th Nov. Night	137	1 33	33·784	+ 4·82	15	21·91		0·903	0·5075110	− 283	− 6	− 1074	− 536	− 62	0·5073149
	139	2 29	34·220	4·82	20	22·04		0·901	0·5074141	283	11	1080	546	62	0·5072159
27th Nov. Day	138	13 33	32·780	+ 4·82	20	21·34		0·908	0·5077448	− 283	− 11	− 1046	− 519	− 62	0·5075527
	140	14 28	34·580	4·82	20	21·41		0·909	0·5073357	283	11	1049	551	62	0·5071401
													Mean of Day and Night	...	**0·5073059**
													Mean of 22nd to 27th November	...	**0·5073046**
27th Nov. Night	140	1 29	34·577	+ 4·50	20	21·50	+ 0·10	0·906	0·5073363	− 264	− 11	− 1054	− 549	− 62	0·5071423
	138	2 25	32·771	4·50	21	21·55	0·10	0·905	0·5077470	264	12	1056	518	62	0·5075558
	139	3 20	34·230	4·50	20	21·69	0·10	0·905	0·5074117	264	11	1063	548	62	0·5072169
	137	4 13	33·802	4·50	19	21·71	0·10	0·905	0·5075071	264	10	1064	538	62	0·5073133
													Mean	...	0·5073071
28th Nov. Day	140	13 26	34·615	+ 4·50	17	20·32	+ 0·17	0·912	0·5073282	− 264	− 8	− 996	− 553	− 62	0·5071399
	138	14 21	32·805	4·50	21	20·44	0·17	0·912	0·5077387	264	12	1002	522	62	0·5075525
	139	15 12	34·268	4·50	20	20·58	0·17	0·910	0·5074033	264	11	1008	551	62	0·5072137
	137	16 5	33·831	4·50	19	20·79	0·17	0·908	0·5075005	264	10	1019	539	62	0·5073111
													Mean	...	0·5073043
													Mean of Day and Night	...	**0·5073057**
Daltonganj.															
		h m	s	s	′	°	°		s						s
6th Dec. 1911 Night	137	2 0	33·822	+ 5·24	19	19·10	+ 0·10	0·908	0·5075027	− 308	− 10	− 936	− 539	− 43	0·5073191
	139	2 55	34·252	5·24	20	19·18	0·10	0·907	0·5074068	308	11	940	550	43	0·5072216
	138	3 52	32·792	5·24	15	19·31	0·10	0·907	0·5077418	308	6	946	519	43	0·5075596
	140	4 44	34·590	5·24	20	19·33	0·10	0·907	0·5073336	308	11	947	550	43	0·5071477
													Mean	...	0·5073120
7th Dec. Day	137	14 0	33·844	+ 5·24	19	18·18	+ 0·19	0·914	0·5074976	− 308	− 10	− 891	− 543	− 43	0·5073181
	139	14 55	34·268	5·24	21	18·31	0·19	0·911	0·5074032	308	12	897	552	43	0·5072220
	138	15 52	32·800	5·24	21	18·50	0·19	0·910	0·5077399	308	12	907	521	43	0·5075608
	140	16 45	34·596	5·24	20	18·71	0·19	0·909	0·5073325	308	11	917	551	43	0·5071495
													Mean	...	0·5073126
													Mean of Day and Night	...	**0·5073123**
7th Dec. Night	140	2 9	34·590	+ 5·42	20	19·09	+ 0·10	0·909	0·5073336	− 318	− 11	− 935	− 551	− 43	0·5071478
	138	3 15	32·778	5·42	22	19·17	0·10	0·908	0·5077452	318	13	939	519	43	0·5075620
	139	4 9	34·241	5·42	21	19·30	0·10	0·908	0·5074093	318	12	946	550	43	0·5072224
	137	5 3	33·801	5·42	21	19·33	0·10	0·908	0·5075073	318	12	947	539	43	0·5073214
													Mean	...	0·5073134
8th Dec. Day	140	14 13	34·607	+ 5·42	20	18·45	+ 0·19	0·914	0·5073298	− 318	− 11	− 904	− 554	− 43	0·5071468
	138	15 10	32·801	5·42	20	18·53	0·19	0·913	0·5077398	318	11	908	522	43	0·5075596
	139	16 3	34·258	5·42	21	18·72	0·19	0·910	0·5074055	318	12	917	551	43	0·5072214
	137	16 56	33·811	5·42	20	18·93	0·19	0·909	0·5075050	318	11	928	540	43	0·5073210
													Mean	...	0·5073122
													Mean of Day and Night	...	**0·5073128**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Daltonganj—(contd.)															
		h m	s	s	′	°	°		s						s
8th Dec. Night	137	2 19	33·806	+ 5·61	19	19·10	+0·09	0·910	0·5075061	− 329	− 10	− 936	− 541	− 43	0·5073202
	139	3 12	34·234	5·61	21	19·16	0·09	0·909	0·5074110	329	12	939	551	43	0·5072236
	138	4 9	32·765	5·61	22	19·29	0·09	0·909	0·5077482	329	13	945	520	43	0·5075632
	140	5 1	34·572	5·61	21	19·32	0·09	0·909	0·5073375	329	12	947	551	43	0·5071493
													Mean	...	0·5073141
9th Dec. Day	137	14 25	33·834	+ 5·61	19	18·16	+0·20	0·915	0·5074998	− 329	− 10	− 890	− 544	− 43	0·5073182
	139	15 18	34·263	5·61	21	18·31	0·20	0·913	0·5074046	329	12	897	553	43	0·5072212
	138	16 12	32·791	5·61	21	18·49	0·20	0·913	0·5077420	329	12	906	522	43	0·5075608
	140	17 3	34·588	5·61	21	18·70	0·20	0·910	0·5073341	329	12	916	551	43	0·5071490
													Mean	...	0·5073123
													Mean of Day and Night	...	**0·5073132**
9th Dec. Night	140	1 47	34·589	+ 5·48	21	18·93	+0·14	0·909	0·5073338	− 322	− 12	− 928	− 551	− 43	0·5071482
	138	2 42	32·782	5·48	21	19·07	0·14	0·908	0·5077443	322	12	934	519	43	0·5075613
	139	3 35	34·237	5·48	21	19·19	0·14	0·908	0·5074103	322	12	940	550	43	0·5072236
	137	4 26	33·802	5·48	19	19·29	0·14	0·908	0·5075071	322	10	945	539	43	0·5073212
													Mean	...	0·5073136
10th Dec. Day	140	13 49	34·614	+ 5·48	21	18·23	+0·22	0·912	0·5073283	− 322	− 12	− 893	− 553	− 43	0·5071460
	138	14 44	32·806	5·48	22	18·34	0·22	0·911	0·5077385	322	13	899	521	43	0·5075587
	139	15 38	34·263	5·48	21	18·56	0·22	0·909	0·5074046	322	12	909	551	43	0·5072209
	137	16 29	33·818	5·48	19	18·78	0·22	0·908	0·5075036	322	10	920	539	43	0·5073202
													Mean	...	0·5073114
													Mean of Day and Night	...	**0·5073125**
Ranchi.															
		h m	s	s	′	°	°		s						s
30th Dec. 1911 Night	139	3 42	34·314	+ 0·26	21	15·51	+0·12	0·873	0·5073932	− 15	− 12	− 760	− 529	− 44	0·5072572
	137	4 48	33·865	0·26	19	15·63	0·12	0·873	0·5074928	15	10	766	519	44	0·5073574
	140	5 48	34·646	0·26	21	15·74	0·12	0·873	0·5073215	15	12	771	529	44	0·5071844
	138	6 44	32·839	0·26	20	15·88	0·12	0·872	0·5077307	15	11	778	499	44	0·5075960
													Mean	...	0·5073488
31st Dec. Day	139	15 46	34·321	+ 0·26	18	15·50	+0·07	0·877	0·5073917	− 15	− 9	− 760	− 531	− 44	0·5072558
	137	16 40	33·873	0·26	18	15·52	0·07	0·876	0·5074910	15	9	760	520	44	0·5073562
	140	17 40	34·660	0·26	18	15·57	0·07	0·874	0·5073185	15	9	763	530	44	0·5071824
	138	18 34	32·846	0·26	20	15·71	0·07	0·873	0·5077290	15	11	770	499	44	0·5075951
													Mean	...	0·5073474
													Mean of Day and Night	...	**0·5073481**
31st Dec. Night	138	3 40	32·841	+ 0·37	20	15·93	+0·09	0·873	0·5077301	− 22	− 11	− 781	− 499	− 44	0·5075944
	140	4 35	34·643	0·37	19	16·01	0·09	0·873	0·5073221	22	10	784	529	44	0·5071832
	137	5 30	33·866	0·37	18	16·11	0·09	0·873	0·5074926	22	9	789	519	44	0·5073543
	139	6 22	34·299	0·37	19	16·14	0·09	0·873	0·5073967	22	10	791	529	44	0·5072571
													Mean	...	0·5073473
1st Jan. 1912 Day	138	15 46	32·836	+ 0·37	20	15·66	+0·04	0·876	0·5077313	− 22	− 11	− 767	− 501	− 44	0·5075968
	140	16 38	34·652	0·37	19	15·68	0·04	0·876	0·5073202	22	10	768	531	44	0·5071827
	137	17 33	33·867	0·37	18	15·72	0·04	0·874	0·5074925	22	9	770	519	44	0·5073561
	139	18 25	34·310	0·37	20	15·75	0·04	0·873	0·5073943	22	11	772	529	44	0·5072565
													Mean	...	0·5073480
													Mean of Day and Night	...	**0·5073476**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Correction on account of: Arc	Correction on account of: Temperature	Correction on account of: Density of Air	Correction on account of: Flexure	Reduced Time of Vibration
Ranchi—(contd).															
		h m	s	s	′	°	°		s						s
1st	137	3 42	33·865	+ 0·49	17	15·95	+0·08	0·873	0·5074928	− 29	− 8	− 782	−519	−44	0·5073546
Jan.	139	4 34	34·287	0·49	19	16·07	0·08	0·875	0·5073993	29	10	787	530	44	0·5072593
Night	138	5 33	32·813	0·49	20	16·13	0·08	0·873	0·5077367	29	11	790	499	44	0·5075994
	140	6 23	34·632	0·49	19	16·17	0·08	0·873	0·5073245	29	10	792	529	44	0·5071841
													Mean	...	0·5073494
2nd	137	15 47	33·876	+ 0·49	18	15·76	+0·08	0·876	0·5074903	− 29	− 9	− 772	−520	−44	0·5073529
Jan.	139	16 40	34·304	0·49	19	15·80	0·08	0·876	0·5073955	29	10	774	531	44	0·5072567
Day	138	17 34	32·824	0·49	20	15·91	0·08	0·875	0·5077343	29	11	780	501	44	0·5075978
	140	18 28	34·640	0·49	19	15·95	0·08	0·873	0·5073227	29	10	782	529	44	0·5071833
													Mean	...	0·5073477
													Mean of Day and Night	...	**0·5073485**
2nd	140	3 36	34·641	+ 0·56	19	16·10	+0·08	0·872	0·5073226	− 33	− 10	− 789	− 528	−44	0·5071822
Jan.	138	4 30	32·825	0·56	20	16·14	0·08	0·872	0·5077340	33	11	791	499	44	0·5075962
Night	139	5 24	34·291	0·56	20	16·23	0·08	0·872	0·5073983	33	11	795	528	44	0·5072572
	137	6 16	33·848	0·56	18	16·31	0·08	0·872	0·5074967	33	9	799	518	44	0·5073564
													Mean	...	0·5073480
3rd	140	15 38	34·644	+ 0·56	19	15·94	+0·07	0·876	0·5073218	− 33	− 10	− 781	− 531	−44	0·5071819
Jan.	138	16 33	32·834	0·56	20	15·97	0·07	0·873	0·5077317	33	11	783	499	44	0·5075947
Day	139	17 26	34·298	0·56	16	16·06	0·07	0·873	0·5073968	33	7	787	529	44	0·5072568
	137	18 20	33·857	0·56	18	16·13	0·07	0·872	0·5074947	33	9	790	518	44	0·5073553
													Mean	...	0·507347[illegible]
													Mean of Day and Night	...	**0·5073476**
Gaya.															
		h m	s	s	′	°	°		s						s
12th	139	4 33	34·249	+ 8·08	18	18·25	+0·11	0·924	0·5074075	− 474	− 9	− 894	−560	−43	0·5072095
Jan.	137	5 26	33·804	8·08	17	18·33	0·11	0·921	0·5075066	474	8	898	547	43	0·5073096
1912	140	6 21	34·573	8·08	19	18·45	0·11	0·921	0·5073372	474	10	904	558	43	0·5071383
Night	138	7 15	32·779	8·08	20	18·52	0·11	0·921	0·5077449	474	11	907	527	43	0·5075487
													Mean		0·5073015
13th	139	16 35	34·281	+ 8·08	19	17·86	+0·12	0·926	0·5074006	− 474	− 10	− 875	−561	−43	0·5072043
Jan.	137	17 29	33·834	8·08	18	17·93	0·12	0·926	0·5075000	474	9	879	550	43	0·5073045
Day	140	18 24	34·613	8·08	19	18·07	0·12	0·925	0·5073288	474	10	885	561	43	0·5071315
	138	19 17	32·805	8·08	20	18·15	0·12	0·924	0·5077386	474	11	889	529	43	0·5075440
													Mean	...	0·5072961
													Mean of Day and Night	...	**0·5072988**
13th	138	5 2	32·785	+ 7·82	19	18·27	+ 0·11	0·924	0·5077435	− 459	− 10	− 895	− 529	−43	0·5075499
Jan.	140	5 53	34·604	7·82	19	18·34	0·11	0·922	0·5073306	459	10	899	559	43	0·5071336
Night	137	6 47	33·824	7·82	18	18·48	0·11	0·922	0·5075022	459	9	906	548	43	0·5073057
	139	7 39	34·261	7·82	19	18·53	0·11	0·922	0·5074050	459	10	908	559	43	0·5072071
													Mean	...	0·5072991
14th	138	16 58	32·821	+ 7·82	20	17·97	+ 0·09	0·928	0·5077350	− 459	− 11	− 881	− 531	− 43	0·5075425
Jan.	140	17 48	34·622	7·82	19	18·01	0·09	0·927	0·5073266	459	10	882	562	43	0·5071310
Day	137	18 43	33·841	7·82	18	18·11	0·09	0·926	0·5074982	459	9	887	550	43	0·5073034
	139	19 37	34·261	7·82	19	18·18	0·09	0·925	0·5074050	459	10	891	561	43	0·5072086
													Mean	...	0·5072964
													Mean of Day and Night	...	**0·5072977**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
							Gaya—(contd).								
		h m	s	s	′	°	°		s						s
14th Jan. Night	137	4 36	33·829	+ 7·71	17	18·18	+0·07	0·926	0·5075011	− 453	− 8	− 891	−550	−43	0·5073066
	139	5 29	34·269	7·71	19	18·30	0·07	0·926	0·5074032	453	10	897	561	43	0·5072068
	138	6 24	32·797	7·71	20	18·33	0·07	0·926	0·5077407	453	11	898	530	43	0·5075472
	140	7 16	34·607	7·71	19	18·40	0·07	0·925	0·5073300	453	10	902	561	43	0·5071331
													Mean	...	0·5072984
15th Jan. Day	137	16 42	33·850	+ 7·71	18	17·92	+0·09	0·928	0·5074962	− 453	− 9	− 878	−551	−43	0·5073028
	139	17 34	34·286	7·71	19	17·96	0·09	0·928	0·5073995	453	10	880	562	43	0·5072047
	138	18 29	32·825	7·71	20	18·07	0·09	0·927	0·5077341	453	11	885	530	43	0·5075419
	140	19 21	34·617	7·71	19	18·14	0·09	0·926	0·5073278	453	10	889	561	43	0·5071322
													Mean	...	0·5072954
													Mean of Day and Night	...	**0·5072969**
15th Jan. Night	140	5 34	34·596	+ 8·22	19	18·17	+0·07	0·927	0·5073323	− 483	−10	− 890	−562	−43	0·5071335
	138	6 30	32·781	8·22	20	18·30	0·07	0·927	0·5077446	483	11	897	530	43	0·5075482
	139	7 25	34·248	8·22	19	18·34	0·07	0·926	0·5074077	483	10	899	561	43	0·5072081
	137	8 16	33·810	8·22	18	18·41	0·07	0·926	0·5075052	483	9	902	550	43	0·5073065
													Mean	...	0·5072991
16th Jan. Day	140	17 37	34·603	+ 8·22	19	17·83	+0·13	0·931	0·5073307	− 483	−10	− 874	−564	−43	0·5071333
	138	18 31	32·800	8·22	20	17·93	0·13	0·930	0·5077399	483	11	879	532	43	0·5075451
	139	19 24	34·257	8·22	19	18·05	0·13	0·927	0·5074058	483	10	884	562	43	0·5072076
	137	20 15	33·824	8·22	18	18·15	0·13	0·927	0·5075023	483	9	889	551	43	0·5073048
													Mean	...	0·5072977
													Mean of Day and Night	...	**0·5072984**
							Monghyr.								
		h m	s	s	′	°	°		s						s
19th Jan. 1912 Night	139	4 57	34·295	+ 8·65	18	17·08	+0·09	0·936	0·5073976	− 508	− 9	− 837	−567	−36	0·5072019
	137	5 50	33·859	8·65	21	17·14	0·09	0·936	0·5074943	508	12	840	556	36	0·5072991
	140	6 44	34·636	8·65	20	17·22	0·09	0·934	0·5073235	508	11	844	566	36	0·5071270
	138	7 38	32·829	8·65	19	17·32	0·09	0·934	0·5077330	508	11	849	534	36	0·5075392
													Mean	...	0·5072918
20th Jan. Day	139	17 0	34·306	+ 8·65	19	16·92	+0·12	0·938	0·5073952	− 508	−10	− 829	−568	−36	0·5072001
	137	17 52	33·857	8·65	18	16·97	0·12	0·937	0·5074947	508	9	832	557	36	0·5073005
	140	18 45	34·633	8·65	19	17·12	0·12	0·937	0·5073243	508	10	839	568	36	0·5071282
	138	19 39	32·823	8·65	21	17·20	0·12	0·934	0·5077343	508	12	843	534	36	0·5075410
													Mean	...	0·5072925
													Mean of Day and Night	...	**0·5072921**
20th Jan. Night	138	5 8	32·838	+ 8·60	20	17·31	+0·08	0·934	0·5077310	− 505	− 11	− 848	− 534	−36	0·5075376
	140	6 2	34·641	8·60	16	17·32	0·08	0·933	0·5073226	505	7	849	565	36	0·5071264
	137	6 57	33·861	8·60	18	17·43	0·08	0·933	0·5074937	505	9	854	554	36	0·5072979
	139	7 59	34·292	8·60	20	17·52	0·08	0·933	0·5073982	505	11	858	565	36	0·5072007
													Mean	...	0·5072907
21st Jan. Day	138	17 9	32·833	+ 8·60	20	17·39	+0·10	0·934	0·5077320	− 505	− 11	− 852	− 534	−36	0·5075382
	140	18 0	34·637	8·60	20	17·50	0·10	0·934	0·5073235	505	11	858	566	36	0·5071259
	137	18 53	33·855	8·60	18	17·57	0·10	0·933	0·5074951	505	9	861	554	36	0·5072986
	139	19 55	34·272	8·60	20	17·72	0·10	0·931	0·5074027	505	11	868	564	36	0·5072043
													Mean	...	0·5072917
													Mean of Day and Night	...	**0·5072912**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Monghyr—(contd.)															
		h m	s	s	′	°	°		s						s
21st Jan. Night	137	5 13	33·857	+ 8·56	18	17·62	+0·05	0·932	0·5074947	− 502	− 9	− 863	− 554	− 36	0·5072983
	139	6 5	34·286	8·56	20	17·70	0·05	0·931	0·5073996	502	11	867	564	36	0·5072016
	138	6 59	32·823	8·56	20	17·73	0·05	0·931	0·5077344	502	11	869	533	36	0·5075393
	140	7 50	34·623	8·56	19	17·77	0·05	0·931	0·5073263	502	10	871	564	36	0·5071280
													Mean	...	0·5072918
22nd Jan. Day	137	17 8	33·850	+ 8·56	18	17·58	+0·11	0·933	0·5074963	− 502	− 9	− 861	− 554	− 36	0·5073001
	139	18 3	34·297	8·56	20	17·70	0·11	0·932	0·5073972	502	11	867	565	36	0·5071991
	138	18 58	32·825	8·56	21	17·77	0·11	0·932	0·5077340	502	12	871	533	36	0·5075386
	140	19 49	34·624	8·56	19	17·91	0·11	0·931	0·5073262	502	10	878	564	36	0·5071272
													Mean	...	0·5072913
										Mean of Day and Night				...	**0·5072915**
22nd Jan. Night	140	5 6	34·631	+ 8·46	19	17·90	+0·08	0·928	0·5073248	− 497	− 10	− 877	− 562	− 36	0·5071266
	138	5 58	32·822	8·46	21	17·94	0·08	0·928	0·5077348	497	12	879	531	36	0·5075393
	139	6 49	34·278	8·46	20	18·00	0·08	0·928	0·5074012	497	11	882	562	36	0·5072024
	137	7 42	33·845	8·46	18	18·10	0·08	0·926	0·5074975	497	9	887	550	36	0·5072996
													Mean	...	0·5072920
23rd Jan. Day	140	17 6	34·633	+ 8·46	19	17·96	+0·12	0·928	0·5073243	− 497	− 10	− 880	− 562	− 36	0·5071258
	138	17 59	32·826	8·46	21	18·07	0·12	0·927	0·5077336	497	12	885	530	36	0·5075376
	139	18 51	34·281	8·46	20	18·15	0·12	0·926	0·5074006	497	11	889	561	36	0·5072012
	137	19 43	33·843	8·46	19	18·29	0·12	0·925	0·5074978	497	10	896	549	36	0·5072990
													Mean	...	0·5072909
										Mean of Day and Night				...	**0·5072915**
Arrah.															
		h m	s	s	′	°	°		s						s
30th Jan. 1912 Night	139	5 36	34·566	− 2·18	18	18·40	+0·08	0·924	0·5073386	+ 128	− 9	− 902	− 560	− 53	0·5071990
	137	6 32	34·134	2·18	13	18·53	0·08	0·925	0·5074331	128	4	908	549	53	0·5072945
	140	7 28	34·903	2·18	19	18·60	0·08	0·925	0·5072667	128	10	911	561	53	0·5071260
	138	8 27	33·083	2·18	19	18·66	0·08	0·924	0·5076727	128	10	914	529	53	0·5075349
													Mean	...	0·5072886
31st Jan. Day	139	17 41	34·570	− 2·18	19	18·30	+0·20	0·927	0·5073378	+ 128	− 10	− 897	− 562	− 53	0·5071984
	137	18 41	34·122	2·18	18	18·45	0·20	0·926	0·5074357	128	9	904	550	53	0·5072969
	140	19 35	34·896	2·18	19	18·65	0·20	0·925	0·5072683	128	10	914	561	53	0·5071273
	138	20 30	33·066	2·18	20	18·85	0·20	0·923	0·5076766	128	11	924	528	53	0·5075378
													Mean	..	0·5072901
										Mean of Day and Night				...	**0·5072893**
31st Jan. Night	138	6 21	33·061	− 2·14	18	19·67	+0·02	0·920	0·5076778	+ 126	− 9	− 964	− 526	− 53	0·5075352
	140	7 13	34·887	2·14	18	19·72	0·02	0·920	0·5072700	126	9	966	558	53	0·5071240
	137	8 8	34·091	2·14	17	19·74	0·02	0·920	0·5074423	126	8	967	546	53	0·5072975
	139	9 18	34·536	2·14	18	19·74	0·02	0·920	0·5073451	126	9	967	558	53	0·5071990
													Mean	...	0·5072889
1st Feb. Day	138	18 26	33·057	− 2·14	19	19·47	+0·17	0·923	0·5076788	+ 126	− 10	− 954	− 528	− 53	0·5075369
	140	19 16	34·884	2·14	18	19·58	0·17	0·921	0·5072708	126	9	959	558	53	0·5071255
	137	20 11	34·090	2·14	18	19·75	0·17	0·920	0·5074428	126	9	968	546	53	0·5072978
	139	21 7	34·536	2·14	18	19·96	0·17	0·918	0·5073451	126	9	978	556	53	0·5071981
													Mean	...	0·5072896
										Mean of Day and Night				...	**0·5072893**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Correction on account of: Arc	Correction on account of: Temperature	Correction on account of: Density of Air	Correction on account of: Flexure	Reduced Time of Vibration
Arrah—(contd.)															
		h m	s	s	′	°	°		s						s
1st Feb. Night	137	5 52	34·087	− 2·22	17	20·22	0·00	0·919	0·5074433	+ 130	− 8	− 991	− 546	− 53	0·5072965
	139	6 48	34·525	2·22	18	20·24	0·00	0·919	0·5073477	130	9	992	557	53	0·5071996
	138	7 44	33·027	2·22	20	20·24	0·00	0·920	0·5076858	130	11	992	526	53	0·5075406
	140	8 35	34·871	2·22	19	20·21	0·00	0·919	0·5072736	130	10	990	557	53	0·5071256
													Mean	...	0·5072906
2nd Feb. Day	137	17 54	34·099	− 2·22	17	19·90	+0·13	0·920	0·5074407	+ 130	− 8	− 975	− 546	− 53	0·5072955
	139	18 48	34·536	2·22	19	19·97	0·13	0·920	0·5073451	130	10	979	558	53	0·5071981
	138	19 42	33·046	2·22	20	20·11	0·13	0·919	0·5076812	130	11	985	526	53	0·5075367
	140	20 33	34·875	2·22	19	20·22	0·13	0·918	0·5072729	130	10	991	556	53	0·5071249
													Mean	...	0·5072888
													Mean of Day and Night	...	**0·5072897**
2nd Feb. Night	140	6 2	34·890	− 2·44	19	20·23	+0·01	0·920	0·5072696	+ 143	− 10	− 991	− 558	− 53	0·5071227
	138	6 57	33·042	2·44	20	20·20	0·01	0·920	0·5076822	143	11	990	526	53	0·5075385
	139	7 51	34·525	2·44	19	20·21	0·01	0·920	0·5073475	143	10	990	558	53	0·5072007
	137	8 44	34·084	2·44	17	20·25	0·01	0·920	0·5074441	143	8	992	546	53	0·5072985
													Mean	...	0·5072901
3rd Feb. Day	140	18 5	34·910	− 2·44	18	19·69	+0·15	0·924	0·5072653	+ 143	− 9	− 965	− 560	− 53	0·5071209
	138	18 58	33·084	2·44	20	19·75	0·15	0·923	0·5076725	143	11	968	528	53	0·5075308
	139	19 50	34·526	2·44	19	19·92	0·15	0·923	0·5073473	143	10	976	559	53	0·5072018
	137	20 43	34·099	2·44	18	20·06	0·15	0·920	0·5074408	143	9	983	546	53	0·5072960
													Mean	...	0·5072874
													Mean of Day and Night	...	**0·5072888**
Sasaram.															
		h m	s	s	′	°	°		s						s
9th Feb. 1912 Night	139	6 15	34·473	− 1·33	19	20·64	+0·04	0·916	0·5073588	+ 78	− 10	− 1011	− 555	− 48	0·5072042
	137	7 7	34·035	1·33	18	20·69	0·04	0·913	0·5074548	78	9	1014	542	48	0·5073013
	140	8 1	34·826	1·33	20	20·72	0·04	0·913	0·5072832	78	11	1015	553	48	0·5071283
	138	8 57	33·000	1·33	20	20·78	0·04	0·913	0·5079231	78	11	1018	522	48	0·5075402
													Mean	...	0·5072935
10th Feb. Day	139	18 15	34·486	− 1·33	19	20·32	+0·15	0·917	0·5073560	+ 78	− 10	− 996	− 556	− 48	0·5072028
	137	19 8	34·050	1·33	19	20·41	0·15	0·917	0·5074515	78	10	1000	545	48	0·5072990
	140	20 2	34·825	1·33	20	20·56	0·15	0·916	0·5072832	78	11	1007	555	48	0·5071289
	138	20 55	32·999	1·33	21	20·72	0·15	0·913	0·5076926	78	12	1015	522	48	0·5075407
													Mean	...	0·5072929
													Mean of Day and Night	...	**0·5072932**
10th Feb. Night	138	6 15	32·993	− 1·19	20	20·72	+0·08	0·912	0·5076938	+ 70	− 11	− 1015	− 522	− 48	0·5075412
	140	7 7	34·815	1·19	22	20·76	0·08	0·912	0·5072856	70	13	1017	553	48	0·5071295
	137	8 2	34·033	1·19	18	20·87	0·08	0·913	0·5074555	70	9	1023	542	48	0·5073003
	139	8 54	34·472	1·19	20	20·90	0.08	0·913	0·5073589	70	11	1024	553	48	0·5072023
													Mean	...	0·5072933
11th Feb. Day	138	18 17	33·004	− 1·19	20	20·39	+0·13	0·917	0·5076912	+ 70	− 11	− 999	− 525	− 48	0·5075399
	140	19 8	34·823	1·19	20	20·50	0·13	0·917	0·5072840	70	11	1005	556	48	0·5071290
	137	20 3	34·604	1·19	19	20·62	0·13	0·916	0·5074545	70	10	1010	544	48	0·5073003
	139	20 57	34·476	1·19	20	20·75	0·13	0·913	0·5073581	70	11	1017	553	48	0·5072022
													Mean	...	0·5072929
													Mean of Day and Night	...	**0·5072931**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature		Density of Air	Observed Time of Vibration	Correction on account of					Reduced Time of Vibration
						Corrected Mean	Mean Change per hour			Clock Rate	Arc	Temperature	Density of Air	Flexure	
									Sasaram—(contd.)						
		h m	s	s	′	°	°		s						s
11th	137	6 13	34·025	− 1·02	18	20·77	+0·06	0·913	0·5074571	+ 60	− 9	−1018	−542	−48	0·5073014
Feb.	139	7 4	34·463	1·02	20	20·86	0·06	0·913	0·5073610	60	11	1022	553	48	0·5072036
Night	138	7 58	32·984	1·02	21	20·92	0·06	0·912	0·5076962	60	12	1025	522	48	0·5075415
	140	8 48	34·808	1·02	20	20·95	0·06	0·912	0·5072871	60	11	1027	553	48	0·5071292
													Mean	...	0·5072939
12th	137	18 12	34·046	− 1·02	18	20·32	+0·13	0·916	0·5074526	+ 60	− 9	− 996	−544	−48	0·5072989
Feb.	139	19 4	34·480	1·02	20	20·37	0·13	0·916	0·5073572	60	11	998	555	48	0·5072020
Day	138	19 57	32·997	1·02	21	20·51	0·13	0·914	0·5076929	60	12	1005	523	48	0·5075401
	140	20 47	34·819	1·02	20	20·65	0·13	0·914	0·5072846	60	11	1012	554	48	0·5071281
													Mean	...	0·5072923
													Mean of Day and Night	...	**0·5072931**
12th	140	6 16	34·810	− 1·00	20	20·72	+0·09	0·913	0·5072865	+ 59	−11	−1015	−553	−48	0·5071297
Feb.	138	7 9	32·986	1·00	21	20·78	0·09	0·913	0·5076956	59	12	1018	522	48	0·5075415
Night	139	8 1	34·467	1·00	20	20·90	0·09	0·912	0·5073601	59	11	1024	553	48	0·5072024
	137	8 52	34·031	1·00	19	20·92	0·09	0·912	0·5074556	59	10	1025	542	48	0·5072990
													Mean	...	0·5072932
13th	140	18 14	34·829	− 1·00	19	20·33	+0·17	0·914	0·5072826	+ 59	−10	− 996	−554	−48	0·5071277
Feb.	138	19 7	32·997	1·00	21	20·45	0·17	0·914	0·5076930	59	12	1002	523	48	0·5075404
Day	139	20 0	34·474	1·00	20	20·60	0·17	0·913	0·5073585	59	11	1009	553	48	0·5072023
	137	20 52	34·033	1·00	19	20·76	0·17	0·911	0·5074552	59	10	1017	541	48	0·5072995
													Mean	...	0·5072925
													Mean of Day and Night	...	**0·5072928**
									Moghal Sarai.						
		h m	s	s	′	°	°		s						s
18th	139	6 34	34·462	− 2·27	19	23·37	+0·03	0·905	0·5073611	+ 133	−10	−1145	− 548	−41	0·5072000
Feb.	137	7 31	34·023	2·27	18	23·42	0·03	0·904	0·5074577	133	9	1148	537	41	0·5072975
1912	140	8 24	34·813	2·27	20	23·46	0·03	0·905	0·5072858	133	11	1150	548	41	0·5071241
Night	138	9 21	32·991	2·27	20	23·47	0·03	0·905	0·5076945	133	11	1150	518	41	0·5075358
													Mean	...	0·5072894
19th	139	18 35	34·488	− 2·27	17	22·52	+0·10	0·911	0·5073555	+ 133	− 8	−1103	− 552	−41	0·5071984
Feb.	137	19 31	34·038	2·27	18	22·55	0·10	0·910	0·5074545	133	9	1105	541	41	0·5072982
Day	140	20 25	34·824	2·27	19	22·68	0·10	0·909	0·5072835	133	10	1111	551	41	0·5071255
	138	21 18	33·001	2·27	20	22·76	0·10	0·908	0·5076922	133	11	1115	519	41	0·5075369
													Mean	...	0·5072898
													Mean of Day and Night	...	**0·5072896**
19th	138	6 40	32·996	− 2·06	20	22·88	+0·03	0·909	0·5076932	+ 121	−11	−1121	−520	−41	0·5075360
Feb.	140	7 31	34·818	2·06	19	22·88	0·03	0·909	0·5072849	121	10	1121	551	41	0·5071247
Night	137	8 32	34·027	2·06	19	22·92	0·03	0·909	0·5074567	121	10	1123	540	41	0·5072974
	139	9 25	34·467	2·06	20	22·94	0·03	0·908	0·5073601	121	11	1124	550	41	0·5071996
													Mean	...	0·5072894
20th	138	18 42	33·011	− 2·06	20	22·23	+0·11	0·912	0·5076897	+ 121	−11	−1089	−522	−41	0·5075355
Feb.	140	19 33	34·828	2·06	20	22·30	0·11	0·912	0·5072827	121	11	1093	553	41	0·5071250
Day	137	20 29	34·043	2·06	18	22·40	0·11	0·911	0·5074530	121	9	1098	541	41	0·5072962
	139	21 21	34·483	2·06	19	22·54	0·11	0·909	0·5073567	121	10	1104	551	41	0·5071982
													Mean	...	0·5072887
													Mean of Day and Night	...	**0·5072891**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Mogal Sarai—(contd.)															
		h m	s	s	′	°	°		s						s
20th Feb. Night	137	6 39	34·031	− 1·88	18	22·75	+0·08	0·909	0·5074557	+ 110	− 9	− 1115	− 540	− 41	0·5072962
	139	7 32	34·458	1·88	19	22·84	0·08	0·909	0·5073620	110	10	1119	551	41	0·5072009
	138	8 27	33·003	1·88	20	22·92	0·08	0·909	0·5076915	110	11	1123	520	41	0·5075330
	140	9 23	34·820	1·88	19	22·98	0·08	0·909	0·5072845	110	10	1126	551	41	0·5071227
													Mean	...	0·5072882
21st Feb. Day	137	18 47	34·045	− 1·88	18	22·32	+0·14	0·914	0·5074527	+ 110	− 9	− 1094	− 543	− 41	0·5072950
	139	19 40	34·465	1·88	20	22·44	0·14	0·913	0·5073605	110	11	1100	553	41	0·5072010
	138	20 33	33·001	1·88	21	22·55	0·14	0·911	0·5076922	110	12	1105	521	41	0·5075353
	140	21 25	34·818	1·88	19	22·71	0·14	0·911	0·5072849	110	10	1113	552	41	0·5071243
													Mean	...	0·5072889
										Mean of Day and Night				...	**0·5072886**
21st Feb. Night	140	6 40	34·836	− 1·67	19	22·97	+0·08	0·910	0·5072811	+ 98	− 10	− 1126	− 551	− 41	0·5071181
	138	7 36	32·999	1·67	20	23·09	0·08	0·909	0·5076927	98	11	1131	520	41	0·5075322
	139	8 29	34·460	1·67	19	23·13	0·08	0·909	0·5073616	98	10	1133	551	41	0·5071979
	137	9 21	34·013	1·67	18	23·22	0·08	0·909	0·5074597	98	9	1138	540	41	0·5072967
													Mean	...	0·5072862
22nd Feb. Day	140	18 49	34·799	− 1·67	19	22·63	+0·13	0·913	0·5072888	+ 98	− 10	− 1109	− 553	− 41	0·5071273
	138	19 41	32·984	1·67	20	22·72	0·13	0·911	0·5076959	98	11	1113	521	41	0·5075371
	139	20 35	34·456	1·67	20	22·85	0·13	0·911	0·5073625	98	11	1120	552	41	0·5071999
	137	21 28	34·011	1·67	18	23·00	0·13	0·909	0·5074601	98	9	1127	540	41	0·5072982
													Mean	...	0·5072906
										Mean of Day and Night				...	**0·5072884**
Buxar.															
		h m	s	s	′	°	°		s						s
27th Feb. 1912 Night	139	7 10	34·536	− 3·71	20	22·35	−0·02	0·910	0·5073452	+ 218	− 11	− 1095	− 551	− 44	0·5071969
	137	8 2	34·096	3·71	19	22·34	0·02	0·910	0·5074412	218	10	1095	541	44	0·5072940
	140	9 1	34·885	3·71	20	22·33	0·02	0·910	0·5072706	218	11	1094	551	44	0·5071224
	138	9 56	33·055	3·71	21	22·32	0·02	0·910	0·5076795	218	12	1094	521	44	0·5075342
													Mean	...	0·5072869
28th Feb. Day	139	19 13	34·572	− 3·71	20	21·12	+0·12	0·915	0·5073373	+ 218	− 11	− 1035	− 554	− 44	0·5071947
	137	20 6	34·129	3·71	19	21·17	0·12	0·915	0·5074341	218	10	1037	544	44	0·5072924
	140	21 0	34·918	3·71	20	21·31	0·12	0·912	0·5072637	218	11	1044	553	44	0·5071203
	138	21 53	33·077	3·71	21	21·44	0·12	0·912	0·5076741	218	12	1051	522	44	0·5075330
													Mean	...	0·5072851
										Mean of Day and Night				...	**0·5072860**
28th Feb. Night	138	7 12	33·073	− 3·99	21	22·25	+0·04	0·908	0·5076750	+ 234	− 12	− 1090	− 519	− 44	0·5075319
	140	8 6	34·900	3·99	20	22·32	0·04	0·908	0·5072675	234	11	1094	550	44	0·5071210
	137	9 1	34·106	3·99	19	22·34	0·04	0·908	0·5074391	234	10	1095	539	44	0·5072937
	139	9 53	34·548	3·99	21	22·38	0·04	0·906	0·5073426	234	12	1097	549	44	0·5071958
													Mean	...	0·5072856
29th Feb. Day	138	19 15	33·107	− 3·99	21	21·52	+0·13	0·911	0·5076672	+ 234	− 12	− 1054	− 521	− 44	0·5075275
	140	20 6	34·920	3·99	20	21·58	0·13	0·910	0·5072631	234	11	1057	551	44	0·5071202
	137	21 3	34·120	3·99	19	21·71	0·13	0·910	0·5074360	234	10	1064	541	44	0·5072935
	139	21 55	34·555	3·99	21	21·87	0·13	0·908	0·5073410	234	12	1072	550	44	0·5071966
													Mean	...	0·5072844
										Mean of Day and Night				...	**0·5072850**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Buxar—(contd.)							
		h m	s	s	′	°	°		s						s
29th	137	7 17	34·092	− 3·78	19	22·52	+0·04	0·906	0·5074422	+ 222	−10	−1103	−538	−44	0·5072949
Feb.	139	8 9	34·545	3·78	21	22·57	0·04	0·906	0·5073431	222	12	1106	549	44	0·5071942
Night	138	9 7	33·057	3·78	21	22·62	0·04	0·906	0·5076787	222	12	1108	518	44	0·5075327
	140	9 57	34·894	3·78	20	22·64	0·04	0·906	0·5072687	222	11	1109	549	44	0·5071196
													Mean	...	0·5072854
1st	137	19 2	34·135	− 3·78	18	21·46	+0·09	0·912	0·5074328	+ 222	− 9	−1052	−542	−44	0·5072903
Mar.	139	20 13	34·572	3·78	20	21·49	0·09	0·912	0·5073375	222	11	1053	553	44	0·5071936
Day	138	21 8	33·083	3·78	21	21·55	0·09	0·911	0·5076726	222	12	1056	521	44	0·5075315
	140	21 58	34·911	3·78	20	21·72	0·09	0·911	0·5072650	222	11	1064	552	44	0·5071201
													Mean	...	0·5072839
													Mean of Day and Night	...	**0·5072846**
1st	140	7 25	34·889	− 3·69	20	22·53	+0·08	0·908	0·5072698	+ 217	−11	−1104	−550	−44	0·5071206
Mar.	138	8 18	33·061	3·69	21	22·60	0·08	0·909	0·5076778	217	12	1107	520	44	0·5075312
Night	139	9 10	34·536	3·69	20	22·69	0·08	0·909	0·5073451	217	11	1112	551	44	0·5071950
	137	10 1	34·090	3·69	18	22·72	0·08	0·908	0·5074428	217	9	1113	539	44	0·5072940
													Mean	...	0·5072852
2nd	140	19 26	34·912	− 3·69	20	21·53	+0·14	0·912	0·5072648	+ 217	−11	−1055	−553	−44	0·5071202
Mar.	138	20 18	33·075	3·69	22	21·60	0·14	0·911	0·5076746	217	13	1058	521	44	0·5075327
Day	139	21 10	34·561	3·69	21	21·73	0·14	0·911	0·5073399	217	12	1065	552	44	0·5071943
	137	22 2	34·110	3·69	19	21·90	0·14	0·910	0·5074383	217	10	1073	541	44	0·5072932
													Mean	...	0·5072851
													Mean of Day and Night	...	**0·5072852**
								Muzaffarpur.							
		h m	s	s	′	°	°		s						s
8th	138	7 56	33·031	− 2·25	17	21·46	+0·10	0·916	0·5076850	+ 132	− 8	−1052	− 524	−46	0·5075352
Mar.	140	8 47	34·862	2·25	20	21·54	0·10	0·915	0·5072753	132	11	1055	554	46	0·5071219
1912	137	9 44	34·067	2·25	19	21·66	0·10	0·915	0·5074478	132	10	1061	544	46	0·5072949
Night	139	10 35	34·508	2·25	20	21·70	0·10	0·914	0·5073512	132	11	1063	554	46	0·5071970
													Mean	...	0·5072873
9th	138	19 56	33·056	− 2·25	20	20·91	+0·15	0·921	0·5076791	+ 132	−11	−1025	− 527	−46	0·5075314
Mar.	140	20 48	34·886	2·25	20	20·98	0·15	0·919	0·5072703	132	11	1028	557	46	0·5071193
Day	137	21 41	34·095	2·25	20	21·13	0·15	0·918	0·5074416	132	11	1035	545	46	0·5072911
	139	22 34	34·528	2·25	20	21·29	0·15	0·918	0·5073470	132	11	1043	556	46	0·5071946
													Mean	...	0·5072841
													Mean of Day and Night	...	**0·5072857**
9th	137	8 1	34·067	− 2·14	19	21·72	+0·09	0·915	0·5074478	+ 126	−10	−1064	−544	−46	0·5072940
Mar.	139	8 54	34·509	2·14	20	21·78	0·09	0·915	0·5073509	126	11	1067	554	46	0·5071957
Night	138	9 47	33·028	2·14	21	21·87	0·09	0·915	0·5076858	126	12	1072	523	46	0·5075331
	140	10 37	34·850	2·14	21	21·92	0·09	0·915	0·5072781	126	12	1074	554	46	0·5071221
													Mean	...	0·5072862
10th	137	20 1	34·103	− 2·14	18	21·10	+0·14	0·919	0·5074399	+ 126	− 9	−1034	−546	−46	0·5072890
Mar.	139	20 53	34·537	2·14	20	21·16	0·14	0·918	0·5073450	126	11	1037	556	46	0·5071926
Day	138	21 46	33·045	2·14	21	21·31	0·14	0·918	0·5076816	126	12	1044	525	46	0·5075315
	140	22 36	34·873	2·14	20	21·42	0·14	0·917	0·5072730	126	11	1050	556	46	0·5071193
													Mean	...	0·5072831
													Mean of Day and Night	...	**0·5072847**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Muzaffarpur—(contd.)							
		h m	s	s	′	°	°		s						s
10th	140	8 2	34·831	− 1·85	20	21·88	+0·03	0·913	0·5072821	+ 109	− 11	− 1072	− 553	− 46	0·5071248
Mar.	138	8 58	33·022	1·85	21	21·92	0·03	0·913	0·5076869	109	12	1074	522	46	0·5075324
Night	139	9 54	34·510	1·85	20	21·95	0·03	0·913	0·5073508	109	11	1076	553	46	0·5071931
	137	10 45	34·073	1·85	19	21·97	0·03	0·913	0·5074463	109	10	1077	542	46	0·5072897
													Mean	...	0·5072850
11th	140	20 6	34·875	− 1·85	19	21·32	+0·10	0·917	0·5072727	+ 109	− 10	− 1045	− 556	− 46	0·5071179
Mar.	138	21 0	33·018	1·85	21	21·34	0·10	0·916	0·5076880	109	12	1046	524	46	0·5075361
Day	139	21 52	34·513	1·85	20	21·46	0·10	0·916	0·5073501	109	11	1052	555	46	0·5071946
	137	22 44	34·081	1·85	19	21·55	0·10	0·914	0·5074446	109	10	1056	543	46	0·5072900
													Mean	...	0·5072847
													Mean of Day and Night	...	**0·5072848**
								Majhauli Raj.							
		h m	s	s	′	°	°		s						s
15th	139	8 21	34·457	− 2·46	18	24·37	−0·04	0·902	0·5073621	+ 144	− 9	− 1194	− 547	− 41	0·5071974
Mar.	137	9 17	34·015	2·46	19	24·37	0·04	0·902	0·5074592	144	10	1194	536	41	0·5072955
1912	140	10 13	34·807	2·46	19	24·32	0·04	0·902	0·5072872	144	10	1192	547	41	0·5071226
Night	138	11 7	32·986	2·46	21	24·28	0·04	0·902	0·5076956	144	12	1190	516	41	0·5075341
													Mean	...	0·5072874
16th	139	20 24	34·475	− 2·46	19	23·54	+0·12	0·907	0·5073583	+ 144	− 10	− 1153	− 550	− 41	0·5071973
Mar.	137	21 17	34·033	2·46	19	23·64	0·12	0·907	0·5074552	144	10	1158	539	41	0·5072948
Day	140	22 10	34·808	2·46	20	23·74	0·12	0·906	0·5072871	144	11	1163	549	41	0·5071251
	138	23 5	33·008	2·46	20	23·88	0·12	0·904	0·5076905	144	11	1170	517	41	0·5075310
													Mean	...	0·5072871
													Mean of Day and Night	...	**0·5072872**
16th	138	8 27	33·007	− 2·20	20	24·09	+0·01	0·903	0·5076907	+ 129	− 11	− 1180	− 517	− 41	0·5075287
Mar.	140	9 18	34·813	2·20	20	24·12	0·01	0·903	0·5072858	129	11	1182	547	41	0·5071206
Night	137	10 11	34·030	2·20	19	24·13	0·01	0·903	0·5074558	129	10	1182	536	41	0·5072918
	139	11 3	34·464	2·20	20	24·12	0·01	0·903	0·5073607	129	11	1182	547	41	0·5071955
													Mean	...	0·5072842
17th	138	20 32	33·004	− 2·20	20	23·67	+0·11	0·906	0·5076913	+ 129	− 11	− 1160	− 518	− 41	0·5075312
Mar.	140	21 22	34·810	2·20	20	23·72	0·11	0·906	0·5072865	129	11	1162	549	41	0·5071231
Day	137	22 16	34·011	2·20	18	23·85	0·11	0·904	0·5074602	129	9	1169	537	41	0·5072975
	139	23 8	34·462	2·20	20	23·96	0·11	0·904	0·5073612	129	11	1174	548	41	0·5071967
													Mean	...	0·5072871
													Mean of Day and Night	...	**0·5072856**
17th	137	8 32	34·015	− 2·17	18	24·15	+0·15	0·903	0·5074592	+ 127	− 9	− 1183	− 536	− 41	0·5072950
Mar.	139	9 23	34·455	2·17	19	24·32	0·15	0·902	0·5073628	127	10	1192	547	41	0·5071965
Night	138	10 19	32·978	2·17	20	24·48	0·15	0·901	0·5076977	127	11	1200	515	41	0·5075337
	140	11 8	34·787	2·17	16	24·53	0·15	0·901	0·5072912	127	7	1202	546	41	0·5071243
													Mean	...	0·5072874
18th	137	20 31	34·015	− 2·17	18	24·02	+0·17	0·906	0·5074592	+ 127	− 9	− 1177	− 538	− 41	0·5072954
Mar.	139	21 22	34·456	2·17	19	24·15	0·17	0·905	0·5073626	127	10	1183	548	41	0·5071971
Day	138	22 15	32·985	2·17	20	24·31	0·17	0·906	0·5076958	127	11	1191	518	41	0·5075324
	140	23 5	34·780	2·17	20	24·45	0·17	0·905	0·5072928	127	11	1198	548	41	0·5071257
													Mean	...	0·5072877
													Mean of Day and Night	...	**0·5072875**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Majhauli Raj—(contd.)															
		h m	s	s	′	°	°		s						s
18th	140	8 36	34·784	− 1·88	19	24·53	+0·03	0·902	0·5072921	+ 110	− 10	− 1202	− 547	− 41	0·5071231
Mar.	138	9 28	32·975	1·88	20	24·57	0·03	0·902	0·5076982	110	11	1204	516	41	0·5075320
Night	139	10 19	34·445	1·88	20	24·60	0·03	0·902	0·5073649	110	11	1205	547	41	0·5071955
	137	11 11	33·989	1·88	15	24·59	0·03	0·903	0·5074652	110	6	1205	536	41	0·5072974
													Mean	...	0·5072870
19th	140	20 37	34·807	− 1·88	19	24·20	+0·09	0·907	0·5072871	+ 110	− 10	− 1186	− 550	− 41	0·5071194
Mar.	138	21 29	32·986	1·88	20	24·29	0·09	0·906	0·5076957	110	11	1190	518	41	0·5075307
Day	139	22 20	34·443	1·88	19	24·35	0·09	0·906	0·5073655	110	10	1193	549	41	0·5071972
	137	23 11	34·003	1·88	19	24·48	0·09	0·905	0·5074618	110	10	1200	538	41	0·5072939
													Mean	...	0·5072853
													Mean of Day and Night	...	**0·5072862**
Gorakhpur.															
		h m	s	s	′	°	°		s						s
25th	139	9 18	34·375	− 0·78	18	26·52	+0·07	0·890	0·5073802	+ 46	− 9	− 1299	− 539	− 42	0·5071959
Mar.	137	10 11	33·943	0·78	18	26·54	0·07	0·890	0·5074752	46	9	1300	529	42	0·5072918
1912	140	11 5	34·724	0·78	19	26·62	0·07	0·890	0·5073048	46	10	1304	539	42	0·5071199
Night	138	11 59	32·910	0·78	20	26·70	0·07	0·889	0·5077137	46	11	1308	509	42	0·5075313
													Mean	...	0·5072847
26th	139	21 12	34·394	− 0·78	17	26·04	+0·11	0·891	0·5073761	+ 46	− 8	− 1276	− 540	− 42	0·5071941
Mar.	137	22 4	33·947	0·78	19	26·11	0·11	0·891	0·5074745	46	10	1279	529	42	0·5072931
Day	140	22 58	34·739	0·78	20	26·21	0·11	0·890	0·5073016	46	11	1284	539	42	0·5071186
	138	23 51	32·898	0·78	21	26·34	0·11	0·889	0·5077163	46	12	1291	509	42	0·5075355
													Mean	...	0·5072853
													Mean of Day and Night	...	**0·5072850**
26th	138	9 37	32·905	− 0·45	21	26·81	+0·12	0·885	0·5077149	+ 26	− 12	− 1314	− 506	− 42	0·5075301
Mar.	140	10 28	34·697	0·45	20	26·92	0·12	0·884	0·5073107	26	11	1319	536	42	0·5071225
Night	137	11 23	33·942	0·45	19	27·05	0·12	0·884	0·5074756	26	10	1325	525	42	0·5072880
	139	12 14	34·361	0·45	20	27·13	0·12	0·884	0·5073832	26	11	1329	536	42	0·5071940
													Mean	...	0·5072837
27th	138	21 40	32·907	− 0·45	20	26·53	+0·16	0·889	0·5077145	+ 26	− 11	− 1300	− 509	− 42	0·5075309
Mar.	140	22 30	34·716	0·45	20	26·64	0·16	0·887	0·5073065	26	11	1305	538	42	0·5071195
Day	137	23 24	33·940	0·45	19	26·78	0·16	0·886	0·5074762	26	10	1312	526	42	0·5072898
	139	0 15	34·371	0·45	21	26·95	0·16	0·885	0·5073811	26	12	1321	536	42	0·5071926
													Mean	...	0·5072832
													Mean of Day and Night	...	**0·5072834**
27th	137	9 19	33·914	− 0·60	19	27·34	+0·06	0·884	0·5074820	+ 35	− 10	− 1340	− 525	− 42	0·5072938
Mar.	139	10 10	34·355	0·60	18	27·44	0·06	0·885	0·5073846	35	9	1345	536	42	0·5071949
Night	138	11 5	32·881	0·60	21	27·50	0·06	0·885	0·5077206	35	12	1348	506	42	0·5075333
	140	11 55	34·689	0·60	20	27·50	0·06	0·886	0·5073123	35	11	1348	537	42	0·5071220
													Mean	...	0·5072860
28th	137	21 23	33·932	− 0·60	19	26·73	+0·08	0·892	0·5074778	+ 35	− 10	− 1310	− 530	− 42	0·5072921
Mar.	139	22 15	34·370	0·60	21	26·73	0·08	0·891	0·5073812	35	12	1310	540	42	0·5071943
Day	138	23 9	32·901	0·60	22	26·80	0·08	0·891	0·5077157	35	13	1313	510	42	0·5075314
	140	23 59	34·711	0·60	18	26·91	0·08	0·890	0·5073073	35	9	1319	539	42	0·5071199
													Mean	...	0·5072844
													Mean of Day and Night	...	**0·5072852**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Gorakhpur—(contd.)						
		h m	s	s	′	°	°		s						s
28th Mar. Night	140	9 39	34·711	− 0·77	17	27·07	+0·02	0·889	0·5073076	+ 45	− 8	− 1326	− 539	− 42	0·5071206
	138	10 32	32·891	0·77	20	27·10	0·02	0·889	0·5077182	45	11	1328	509	42	0·5075337
	139	11 22	34·364	0·77	19	27·13	0·02	0·889	0·5073826	45	10	1329	539	42	0·5071951
	137	12 14	33·924	0·77	17	27·13	0·02	0·889	0·5074796	45	8	1329	528	42	0·5072934
													Mean	...	0·5072857
29th Mar. Day	140	21 44	34·729	− 0·77	18	26·44	−0·04	0·896	0·5073036	+ 45	− 9	− 1296	− 543	− 42	0·5071191
	138	22 37	32·911	0·77	20	26·37	0·04	0·896	0·5077135	45	11	1292	513	42	0·5075322
	139	23 30	34·388	0·77	19	26·34	0·04	0·897	0·5073773	45	10	1291	544	42	0·5071931
	137	0 24	33·950	0·77	18	26·33	0·04	0·896	0·5074737	45	9	1290	532	42	0·5072909
													Mean	...	0·5072838
												Mean of Day and Night		...	**0·5072848**
									Dehra Dun.						
		h m	s	s	′	°	°		s						s
8th Apr. 1912 Night	139	10 21	34·478	+ 4·84	19	22·93	+0·13	0·842	0·5073577	− 284	− 10	− 1124	− 510	− 36	0·5071613
	137	11 13	34·048	4·84	18	23·05	0·13	0·841	0·5074518	284	9	1129	500	36	0·5072560
	140	12 6	34·816	4·84	19	23·16	0·13	0·841	0·5072852	284	10	1135	510	36	0·5070877
	138	13 0	32·994	4·84	20	23·29	0·13	0·841	0·5076937	284	11	1141	481	36	0·5074984
													Mean	...	0·5072509
9th Apr. Day	139	22 16	34·488	+ 4·84	19	22·73	+0·19	0·845	0·5073556	− 284	− 10	− 1114	− 512	− 36	0·5071600
	137	23 9	34·044	4·84	18	22·89	0·19	0·845	0·5074528	284	9	1122	502	36	0·5072575
	140	0 1	34·812	4·84	19	23·07	0·19	0·844	0·5072860	284	10	1130	511	36	0·5070889
	138	0 54	32·992	4·84	20	23·23	0·19	0·841	0·5076941	284	11	1138	481	36	0·5074991
													Mean	...	0·5072514
												Mean of Day and Night		...	**0·5072511**
9th Apr. Night	138	10 28	32·983	+ 4·85	20	23·51	+0·13	0·843	0·5076962	− 285	− 11	− 1152	− 482	− 36	0·5074996
	140	11 18	34·806	4·85	18	23·62	0·13	0·843	0·5072872	285	9	1157	511	36	0·5070874
	137	12 11	34·021	4·85	18	23·73	0·13	0·842	0·5074580	285	9	1163	500	36	0·5072587
	139	13 2	34·454	4·85	20	23·86	0·13	0·842	0·5073629	285	11	1169	510	36	0·5071618
													Mean	...	0·5072519
10th Apr. Day	138	22 31	32·987	+ 4·85	20	23·36	+0·20	0·845	0·5076955	− 285	− 11	− 1145	− 483	− 36	0·5074995
	140	23 21	34·812	4·85	19	23·54	0·20	0·844	0.5072861	285	10	1153	511	36	0·5070866
	137	0 16	34·015	4·85	17	23·73	0·20	0·844	0·5074591	285	8	1163	501	36	0·5072598
	139	1 7	34·459	4·85	19	23·89	0·20	0·843	0·5073618	285	10	1171	511	36	0·5071605
													Mean	...	0·5072516
												Mean of Day and Night		...	**0·5072517**
10th Apr. Night	137	10 39	34·001	+ 5·22	17	24·14	+0·13	0·843	0·5074623	− 306	− 8	− 1183	− 501	− 36	0·5072589
	139	11 32	34·440	5·22	19	24·30	0·13	0·842	0·5073660	306	10	1191	510	36	0·5071607
	138	12 25	32·962	5·22	20	24·38	0·13	0·841	0·5077011	306	11	1195	481	36	0·5074982
	140	13 15	34·781	5·22	18	24·51	0·13	0·841	0·5072927	306	9	1201	510	36	0·5070865
													Mean	...	0·5072511
11th Apr. Day	137	22 43	34·007	+ 5·22	17	24·03	+0·19	0·845	0·5074610	− 306	− 8	− 1177	− 502	− 36	0·5072581
	139	23 34	34·435	5·22	19	24·19	0·19	0·843	0·5073671	306	10	1185	511	36	0·5071623
	138	0 27	32·962	5·22	20	24·36	0·19	0·842	0·5077012	306	11	1194	482	36	0·5074983
	140	1 19	34·781	5·22	18	24·54	0·19	0·841	0·5072927	306	9	1202	510	36	0·5070864
													Mean	...	0·5072513
												Mean of Day and Night		...	**0·5072512**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature		Density of Air	Observed Time of Vibration	Correction on account of					Reduced Time of Vibration
						Corrected Mean	Mean Change per hour			Clock Rate	Arc	Temperature	Density of Air	Flexure	
Dehra Dun—(contd.)															
		h m	s	s	′	°	°		s						s
11th	140	10 44	34·751	+ 5·41	18	25·11	+0·08	0·837	0·5072991	− 318	− 9	− 1230	− 507	− 36	0·5070891
Apr.	138	11 37	32·937	5·41	21	25·17	0·08	0·838	0·5077072	318	12	1233	479	36	0·5074994
Night	139	12 28	34·407	5·41	19	25·24	0·08	0·838	0·5073729	318	10	1237	508	36	0·5071620
	137	13 21	33·970	5·41	18	25·31	0·08	0·838	0·5074695	318	9	1240	498	36	0·5072594
													Mean	...	0·5072525
12th	140	22 46	34·760	+ 5·41	21	24·88	+0·19	0·842	0·5072971	− 318	− 12	− 1219	− 510	− 36	0·5070876
Apr.	138	23 39	32·942	5·41	21	25·03	0·19	0·840	0·5077058	318	12	1226	480	36	0·5074986
Day	139	0 29	34·412	5·41	19	25·21	0·19	0·840	0·5073721	318	10	1235	509	36	0·5071613
	137	1 20	33·977	5·41	18	25·36	0·19	0·839	0·5074678	318	9	1243	498	36	0·5072574
													Mean	...	0·5072512
										Mean of Day and Night				...	**0·5072519**

In Table III are shown the times of vibration at Dehra Dūn at the beginning and end of the season.

Table III.—Times of vibration at Dehra Dūn.

Date	137	138	139	140	Mean
1911-12	s	s	s	s	s
November, 4-5	0·5072570	0·5074990	0·5071609	0·5070887	0·5072514
„ 5-6	2593	4998	1619	0877	2522
„ 6-7	2564	5001	1620	0882	2517
„ 7-8	2574	4984	1629	0886	2518
Mean	0·5072575	0·5074993	0·5071619	0·5070883	0·5072518
April, 8- 9	0·5072568	0·5074987	0·5071607	0·5070883	0·5072511
„ 9-10	2592	4996	1611	0870	2517
„ 10-11	2585	4982	1615	0865	2512
„ 11-12	2584	4990	1617	0883	2519
Mean	0·5072582	0·5074989	0·5071612	0·5070875	0·5072515
General Mean	0·5072579	0·5074991	0·5071616	0·5070879	0·5072516
Difference, Apr.-Nov.	+ 7	− 4	− 7	− 8	− 3

The agreement between the two values is satisfactory, but we shall as usual tabulate the differences between the mean and individual pendulums. These are shown in Table IV.

Table IV.—Differences between the mean and individual pendulums.

Station	137	v	138	v	139	v	140	v
Dehra Dūn ...	−57	+15	−2475	− 1	+899	− 4	+1635	− 9
Japla ...	−71	+ 1	−2483	− 9	+904	+ 1	+1648	+ 4
Daltonganj ...	−72	0	−2481	− 7	+906	+ 3	+1646	+ 2
Rānchi ...	−74	− 2	−2483	− 9	+909	+ 6	+1650	+ 6
Gaya ...	−75	− 3	−2479	− 5	+909	+ 6	+1647	+ 3
Monghyr ...	−75	− 3	−2473	+ 1	+902	− 1	+1647	+ 3
Arrah ...	−74	− 2	−2471	+ 3	+900	− 3	+1647	+ 3
Sasarām ...	−70	+ 2	−2477	− 3	+903	0	+1642	− 2
Moghal Sarai ...	−80	− 8	−2463	+11	+894	− 9	+1649	+ 5
Buxar ...	−81	− 9	−2466	+ 8	+901	− 2	+1646	+ 2
Muzaffarpur ...	−63	+ 9	−2482	− 8	+905	+ 2	+1642	− 2
Majhauli Rāj ...	−86	−14	−2451	+23	+900	− 3	+1636	− 8
Gorakhpur ...	−70	+ 2	−2477	− 3	+904	+ 1	+1643	− 1
Dehra Dūn ...	−67	+ 5	−2474	0	+903	0	+1640	− 4
Means	−72		−2474		+903		+1644	
Means of 1910-11	−62		−2477		+902		+1636	

The variations in the differences are of about the same amount as in previous years and there is no evidence of progressive change in any one pendulum. The observations at Majhauli Rāj appear to have been bad.

In Table V are shewn the times of vibration of the mean and individual pendulums at each station with the values of g deduced.

Table V.—Mean times of vibration and deduced values of g.

Station		137	138	139	140	Mean
Dehra Dûn ...	s.	0·5072579	0·5074991	0·5071616	0·5070879	0·5072516
Japla ...	s.	0·5073122	0·5075534	0·5072147	0·5071403	0·5073051
		+543	+543	+531	+524	+535
	g.	978·853	978·853	978·858	978·861	978·856
Daltonganj ...	s.	0·5073199	0·5075608	0·5072221	0·5071481	0·5073127
		+620	+617	+605	+602	+611
	g.	978·824	978·825	978·829	978·831	978·827
Rānchi ...	s.	0·5073554	0·5075963	0·5072571	0·5071830	0·5073480
		+975	+972	+955	+951	+964
	g.	978·687	978·688	978·694	978·696	978·691
Gaya ...	s.	0·5073055	0·5075459	0·5072071	0·5071333	0·5072980
		+476	+468	+455	+454	+464
	g.	978·879	978·882	978·887	978·888	978·884
Monghyr ...	s.	0·5072991	0·5075389	0·5072014	0·5071269	0·5072916
		+412	+398	+398	+390	+400
	g.	978·904	978·909	978·909	978·912	978·909
Arrah ...	s.	0·5072967	0·5075364	0·5071993	0·5071246	0·5072893
		+388	+373	+377	+367	+377
	g.	978·913	978·919	978·917	978·921	978·918
Sasarām ...	s.	0·5073000	0·5075407	0·5072027	0·5071288	0·5072930
		+421	+416	+411	+409	+414
	g.	978·900	978·902	978·904	978·905	978·903
Moghal Sarai ...	s.	0·5072969	0·5075352	0·5071995	0·5071240	0·5072889
		+390	+361	+379	+361	+373
	g.	978·912	978·924	978·917	978·924	978·919
Buxar ...	s.	0·5072933	0·5075318	0·5071951	0·5071206	0·5072852
		+354	+327	+335	+327	+336
	g.	978·926	978·937	978·934	978·937	978·933
Muzaffarpur ...	s.	0·5072914	0·5075333	0·5071946	0·5071209	0·5072851
		+335	+342	+330	+330	+335
	g.	978·934	978·931	978·936	978·936	978·934
Majhauli Rāj ...	s.	0·5072952	0·5075317	0·5071966	0·5071230	0·5072866
		+373	+326	+350	+351	+350
	g.	978·919	978·937	978·928	978·927	978·928
Gorakhpur ...	s.	0·5072916	0·5075323	0·5071942	0·5071203	0·5072846
		+337	+332	+326	+324	+330
	g.	978·933	978·935	978·938	978·938	978·936

The Reduction to Sea Level.

The orographical correction was only computed for Rānchi, this being the only station at which it was at all likely to be appreciable. It was, however, found to be only 0·0001 which is negligible.

The abstract of the season's results is given in Table VI.

Table VI.—Abstract of results.

Station	Height	γ_0	Corrections		γ_B	g	$g-\gamma_B$
			for height	for mass (Bouguer)			
	feet	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*
Rānchi ...	2167	978·843	−0·203	+0·073	978·713	978·691	−0·022
Daltonganj ...	707	978·886	−0·066	+0·024	978·844	978·827	−0·017
Japla ...	474	978·920	−0·044	+0·016	978·892	978·856	−0·036
Gaya ...	361	978·938	−0·034	+0·012	978·916	978·884	−0·032
Sasarām ...	340	978·949	−0·032	+0·011	978·928	978·903	−0·025
Moghal Sarai ...	257	978·972	−0·024	+0·009	978·957	978·919	−0·038
Monghyr ...	154	978·979	−0·014	+0·005	978·970	978·909	−0·061
Arrah ...	188	978·992	−0·018	+0·006	978·980	978·918	−0·062
Buxar ...	207	978·992	−0·019	+0·007	978·980	978·933	−0·047
Muzaffarpur ...	179	979·031	−0·017	+0·006	979·020	978·934	−0·086
Majhauli Rāj ...	219	979·043	−0·021	+0·007	979·029	978·928	−0·101
Gorakhpur ...	257	979·076	−0·024	+0·009	979·061	978·936	−0·125

At the end of Chapter IV, in the discussion of the results obtained in the Central Provinces, it was assumed that a residual of —·030 represented normal gravity. With the same assumption here, we see that gravity at Daltonganj, Rānchi and Sasarām is relatively in excess and at Gaya, Japla and Moghal Sarai it is only slightly in defect. There seems to be no doubt that Daltonganj and Rānchi are on the belt of high density and this may extend north of Sasarām on the west and nearly to Gaya on the east. In connection with this uncertainty as to the northern edge of the belt it may be noted that at Allahābād a relative excess of gravity was found, although at Maihar to the south there is a relative defect (*vide* Chapter IV).

The case of Sasarām and Japla is exactly similar and it is possible that the area of high density indicated by the residuals at Sasarām and Allahābād is separated from the "hidden chain" by a negative belt passing through Japla and Maihar and on to Saugor. We have, however, only slight evidence of this.

The large values of $g-\gamma_B$ at the three most northerly stations, Muzaffarpur to Gorakhpur, show that gravity is in greater defect than at other stations similarly situated with reference to the Himālaya. At Kaliāna, which compares with Gorakhpur, the defect is only ·081, a difference of ·024, and at Kesarbāri which is slightly nearer to the hills the defect is ·067. The whole of this season's area north of the Ganges may, therefore, be considered as a trough of unusually low density and this fact helps to account for the southerly deflections of the plumb-line which have been found as far north as Muzaffarpur, since the trough masks the northerly attraction of the Himālaya.

CHAPTER VII.

The Pendulum Operations in 1912-13.

The area selected for determinations of gravity for this year was the gap left between Major Lenox Conyngham's work south of Dehra Dūn which extended to Gesupur, near Delhi, and Captain Cowie's observations in the north-western portion of the Central Provinces.

The results obtained in the former area (*vide* Chapter I) shewed that the defects of gravity decreased in the usual manner as we recede from the hills and pointed to the probability of a relative excess of gravity being found not far south of Gesupur, while the observations from Amraoti to Hoshangābād indicated that this area formed part of the "hidden chain". The proposed observations were, therefore, intended to define the northern edge of the "hidden chain" and to determine whether the decrease in the deficiencies of gravity continued south of Gesupur.

Latitude observations had indicated the existence of an area of high density extending from Jhānsi to Sīpri, this area being, however, separated from the main "hidden chain"; it was hoped that the pendulums would define this also.

Observations were also made at Kaliānpur, the station of origin of the Indian Triangulation, at which place Captain Basevi swung his pendulums in 1867. A reference to the previous value of gravity, and also to those at the other old stations which have been occupied during the present series of determinations, will be found at the end of this chapter.

Of the stations visited, Kaliānpur is on the western edge of the high ground which runs up through Sīpri almost to Gwalior and which divides the Betwa and Chambal rivers. Bhopāl, Goona and Sīpri are in undulating country with scattered hills, the rest of the stations being on level ground.

The observations throughout the season were made by Captain H. J. Couchman, R.E.

The descriptions of the stations are given below:—

Bhopal.

Latitude	...	23° 15′ 58″
Longitude	...	77° 25′ 0″
Height	...	1630 feet.

The pendulums were swung in the second room from the south end of the Bhopāl Dak bungalow situated about 200 yards east of the railway station. The size of the room is 15½ feet × 14½ feet and it has a concrete floor, tiled roof and ceiling. The height was determined by levelling from the G.T.S. $\frac{\text{BM.29}}{\text{55 E}}$ of Main Line 34 (Nandgaon to Sironj).

Kalianpur.

Latitude ... 24° 7′ 11″
Longitude ... 77° 39′ 17″
Height ... 1763 feet.

The observations were made in the western of the two buildings at Kaliānpur, which was originally built as an office and where Captain Basevi swung the old pendulums in 1867. The size of the room was 30 feet × 12 feet and it had a stone floor, stone walls and flagged stone roof. The pendulum stand was placed 4 feet from the south wall.

Bina.

Latitude ... 24° 10′ 41″
Longitude ... 78° 11′ 46″
Height ... 1355 feet.

The height was determined by levelling from the G.T.S. $\frac{\text{BM.18}}{\text{54 L}}$ of Main Line 60 (Katni to Sironj). The pendulums were swung in the western room of a semi detached house situated at the eastern end of Bina Bāzāria and belonging to Babu Rām Chānd, Railway Permanent Way Inspector. The floor was of stone flags and the roof also, but the latter being in bad repair with many holes, the temperature conditions were somewhat unsatisfactory. The size of the room was 20 feet × 14 feet.

Goona.

Latitude ... 24° 38′ 48″
Longitude ... 77° 19′ 13″
Height ... 1569 feet.

The height was determined from a P.W.D. bench-mark in the verandah of the dak bungalow, the height of which was given as 1567·8 feet. The pendulums were swung in the second main room from the south end of the dak bungalow. The size of the room was 16 feet × 16 feet and it had a concrete floor, tiled roof with ceiling.

Lalitpur.

Latitude ... 24° 41′ 29″
Longitude ... 78° 24′ 26″
Height ... 1199 feet.

The height was determined by levelling from the railway station. The pendulums were swung in the south room of the P.W.D. inspection bungalow. The building stood on a high plinth, had a stone flagged floor, tiled roof with ceiling underneath and the size of the room was 22 feet × 12 feet.

Sipri.

Latitude ... 25° 25′ 52″
Longitude ... 77° 39′ 25″
Height ... 1533 feet.

The height was determined by levelling from the supposed position of the G.T.S. bench-mark in the old dak bungalow compound, which no longer exists, and also from the rail level at the railway station. The pendulums were swung in the Room No. 2 of the ground floor of the Sīpri Hotel. The size of the room was 24 feet × 16 feet and it had a stone floor and plaster ceiling.

Jhansi.

Latitude	...	25°	27′	2″
Longitude	...	78°	33′	43″
Height	...	858 feet.		

The height was determined by levelling from the G.T.S. $\frac{\text{BM.47}}{\text{54 K}}$ of Branch Line 63 A (Gwalior to Jhānsi). The observations were made in the south-east dressing room of the P.W.D. inspection house at Jhānsi. The size of the room was 16 feet × 12 feet and it had a stone floor, tiled roof with ceiling underneath.

Gwalior.

Latitude	...	26°	13′	57″
Longitude	...	78°	12′	49″
Height	...	658 feet.		

The height was determined by levelling from the G.T.S. $\frac{\text{BM.22}}{\text{54 J}}$ of Branch Line 63 A (Gwalior to Jhānsi). The pendulums were swung in the south room of Mr. Smith's bungalow, Morār, which was situated on the south side of the main road from Gwalior fort to Morār and about 200 yards east of the road leading to the Alijah Club. The size of the room was 16½ feet × 12 feet and it had a stone floor, flat roof with plaster ceiling underneath.

Dholpur.

Latitude	...	26°	42′	1″
Longitude	...	77°	54′	47″
Height	...	577 feet.		

The height was determined by levelling from a bench-mark at the railway station. The pendulums were swung in the east-central room of the building originally used as the Political Agent's office in Tewāri Bāgh, Dholpur. The size of the room was 15 feet × 12 feet and it had a stone flagged floor and a flat stone roof.

Agra.

Latitude	...	27°	10′	20″
Longitude	...	78°	1′	7″
Height	...	535 feet.		

The height was determined by levelling from the Standard Bench-mark at Agra *viz.* G.T.S. $\frac{\text{BM.32}}{\text{54 E}}$ of Main Line 63 (Agra to Sironj). The pendulums were swung in the north room of the north wing of the District Engineer's office situated at the junction of Metcalfe and Olia roads. The size of the room was 20½ feet × 19 feet and it had a stone floor and flat stone roof with plaster ceiling underneath.

Muttra.

Latitude	...	27°	28′	25″
Longitude	...	77°	41′	48″
Height	...	562 feet.		

The height was determined by levelling from the Standard Bench-mark at Muttra *viz.* G.T.S. $\frac{\text{BM.25}}{\text{54 E}}$ of Branch Line 62 B (Hāthras to Muttra & Delhi). The pendulums were swung in the Sessions Circuit house, the room being on the east side and second from the north-east corner. The size of the room was 16 feet × 13 feet and it had a stone floor, flat stone roof with plaster ceiling underneath.

Hathras.

Latitude	...	27° 36′ 52″
Longitude	...	78° 3′ 22″
Height	...	587 feet.

The height was deduced from the G.T.S. $\frac{\text{BM.20}}{\text{54 I}}$ of Branch Line 62 B (Hāthras to Muttra & Delhi). The observations were made in the north main room of the P.W.D. inspection bungalow at Hāthras which is on the Alīgarh road 1 mile north of the metre gauge railway station. The size of the room was 16 feet x 16 feet and it had a concrete floor, and a thatched roof with plaster ceiling underneath. The Alīgarh-Agra road was within a few feet of the bungalow, but no effect seemed to be caused by the traffic.

Aligarh.

Latitude	...	27° 53′ 32″
Longitude	...	78° 0′ 31″
Height	...	612 feet.

The height was determined by levelling from the G.T.S. $\frac{\text{BM. 6}}{\text{54 I}}$ of Main Line 62 (Meerut to Agra). The pendulums were swung in the second room from the north end of the Alīgarh Dak bungalow. The size of the room was 20 feet x 12 feet and it had a concrete floor, stone roof with plaster ceiling underneath.

Khurja.

Latitude	...	28° 14′ 19″
Longitude	...	77° 51′ 53″
Height	...	649 feet.

The height was determined by levelling from the G.T.S. $\frac{\text{BM.10}}{\text{53 H}}$ of Main Line 62 (Meerut to Agra). The observations were made in the east room of the P.W.D. inspection bungalow at Khurja, situated close to the junction of the main roads from Delhi and Meerut to Alīgarh. The size of the room was 20 feet x 12 feet and it had a concrete floor and flat roof.

Satisfactory rooms were available at all the stations, the one exception being Bina where the roof was of loose stone slabs indifferently weatherproof.

In Table I are shewn the results of the determinations of the flexure at each station. These call for no comment.

Table I.—Flexure correction.

Station	Date	Means before and after work 10^{-7} secs.	Adopted Correction 10^{-7} secs.	Station	Date	Means before and after work 10^{-7} secs.	Adopted Correction 10^{-7} secs.
Dehra Dūn	Nov. 11th, 1912 „ 15th	−39·4 40·5	−40	Gwalior ...	Jan. 28th, 1913 Feb. 1st	−46·8 47·7	−47
Bhopāl ...	Dec. 18th, 1912 „ 22nd	−51·2 50·2	−51	Dholpur ...	Feb. 18th, 1913 „ 23rd	−57·4 56·5	−57
Kaliānpur	Jan. 6th, 1913 „ 11th	−49·3 48·5	−49	Agra ...	Feb. 26th, 1913 Mar. 2nd	−44·6 43·8	−44
Bina ...	Dec. 11th, 1912 „ 15th	−51·7 49·9	−51	Muttra ...	Mar. 6th, 1913 „ 10th	−40·6 41·3	−41
Goona ...	Dec. 27th, 1912 „ 31st	−46·3 45·5	−46	Hāthras ...	Mar. 13th, 1913 „ 17th	−45·2 44·6	−45
Lalitpur ...	Dec. 4th, 1912 „ 8th	−58·1 57·2	−58	Aligarh ...	Mar. 21st, 1913 „ 25th	−47·9 48·4	−48
Sipri ...	Feb 7th, 1913 „ 13th	−40·8 41·8	−41	Khurja ...	Mar. 28th, 1913 April 1st	−44·2 45·1	−45
Jhānsi ...	Jan. 19th, 1913 „ 23rd	−46·2 45·5	−46	Dehra Dūn	April 9th, 1913 „ 17th	−42·1 43·4	−43

The time observations throughout the season were made by Mr. Hanumān Prasād. The mean p. e. of the mean value of a clock rate was $\pm 0{\cdot}016$ sec. while that of a single value was $\pm 0{\cdot}063$ sec.

The details of the observations are given in Table II.

Table II.—Details of the Observations.

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Correction on account of: Arc	Correction on account of: Temperature	Correction on account of: Density of Air	Correction on account of: Flexure	Reduced Time of Vibration
								Dehra Dun.							
		h m	s	s	′	°	°		s						s
11th	137	0 46	34·160	+ 3·37	19	18·93	+0·10	0·861	0·5074272	− 198	− 10	− 928	− 511	− 40	0·5072585
Nov.	139	1 39	34·602	3·37	17	19·03	0·10	0·860	0·5073310	198	8	932	521	40	0·5071611
1912	138	2 33	33·109	3·37	18	19·11	0·10	0·860	0·5076666	198	9	936	492	40	0·5074991
Night	140	3 24	34·944	3·37	16	19·21	0·10	0·860	0·5072583	198	7	941	521	40	0·5070876
													Mean	...	0·5072516
12th	137	12 45	34·174	+ 3·37	16	18·74	+0·08	0·865	0·5074241	− 198	− 7	− 918	− 514	− 40	0·5072564
Nov.	139	13 39	34·612	3·37	21	18·84	0·08	0·863	0·5073289	198	12	923	523	40	0·5071593
Day	138	14 32	33·118	3·37	21	18·91	0·08	0·862	0·5076647	198	12	927	493	40	0·5074977
	140	15 23	34·955	3·37	19	18·95	0·08	0·862	0·5072558	198	10	929	522	40	0·5070859
													Mean	...	0·5072498
										Mean of Day and Night				...	**0·5072507**
12th	140	0 51	34·959	+ 3·21	19	18·81	+0·10	0·862	0·5072550	− 188	− 10	− 922	− 522	− 40	0·5070868
Nov.	138	1 45	33·120	3·21	21	18·91	0·10	0·861	0·5076641	188	12	927	492	40	0·5074982
Night	139	2 37	34·598	3·21	20	18·98	0·10	0·861	0·5073317	188	11	930	522	40	0·5071626
	137	3 29	34·151	3·21	18	19·09	0·10	0·860	0·5074292	188	9	935	511	40	0·5072609
													Mean	...	0·5072521
13th	140	12 52	34·967	+ 3·21	19	18·58	+0·07	0·866	0·5072532	− 188	− 10	− 910	− 525	− 40	0·5070859
Nov.	138	13 44	33·122	3·21	21	18·62	0·07	0·866	0·5076636	188	12	912	495	40	0·5074989
Day	139	14 36	34·609	3·21	20	18·70	0·07	0·865	0·5073295	188	11	916	524	40	0·5071616
	137	15 28	34·161	3·21	18	18·73	0·07	0·865	0·5074270	188	9	918	514	40	0·5072601
													Mean	...	0·5072516
										Mean of Day and Night				...	**0·5072519**
13th	137	0 56	34·162	+ 3·51	18	18·58	+0·08	0·863	0·5074268	− 206	− 9	− 910	− 513	− 40	0·5072590
Nov.	139	1 47	34·607	3·51	20	18·69	0·08	0·863	0·5073300	206	11	916	523	40	0·5071604
Night	138	2 41	33·121	3·51	20	18·73	0·08	0·862	0·5076636	206	11	918	493	40	0·5074968
	140	3 32	34·953	3·51	20	18·83	0·08	0·861	0·5072562	206	11	923	522	40	0·5070860
													Mean	...	0·5072506
14th	137	12 55	34·170	+ 3·51	18	18·34	+0·08	0·864	0·5074249	− 206	− 9	− 899	− 513	− 40	0·5072582
Nov.	139	13 48	34·610	3·51	19	18·45	0·08	0·863	0·5073291	206	10	904	523	40	0·5071608
Day	138	14 42	33·119	3·51	21	18·52	0·08	0·862	0·5076643	206	12	907	493	40	0·5074985
	140	15 31	34·957	3·51	20	18·56	0·08	0·862	0·5072556	206	11	909	522	40	0·5070868
													Mean	...	0·5072511
										Mean of Day and Night				...	**0·5072508**
14th	140	1 4	34·959	+ 3·31	19	18·35	+0·11	0·863	0·5072550	− 194	− 10	− 899	− 523	− 40	0·5070884
Nov.	138	1 55	33·121	3·31	21	18·48	0·11	0·861	0·5076638	194	12	906	492	40	0·5074994
Night	139	2 47	34·609	3·31	20	18·55	0·11	0·861	0·5073293	194	11	909	522	40	0·5071617
	137	3 38	34·164	3·31	18	18·67	0·11	0·861	0·5074265	194	9	915	511	40	0·5072596
													Mean	...	0·5072523
15th	140	13 9	34·964	+ 3·31	19	18·18	+0·08	0·864	0·5072540	− 194	− 10	− 891	− 524	− 40	0·5070881
Nov.	138	14 1	33·125	3·31	21	18·28	0·08	0·864	0·5076628	194	12	896	494	40	0·5074992
Day	139	14 54	34·616	3·31	21	18·34	0·08	0·862	0·5073281	194	12	899	522	40	0·5071614
	137	15 45	34·173	3·31	19	18·41	0·08	0·862	0·5074242	194	10	902	512	40	0·5072584
													Mean	...	0·5072518
										Mean of Day and Night				...	**0·5072521**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Correction on account of: Arc	Correction on account of: Temperature	Correction on account of: Density of Air	Correction on account of: Flexure	Reduced Time of Vibration
Lalitpur.															
		h m	s	s	′	°	°		s						s
4th Dec. 1912 Night	137	1 8	34·215	− 8·19	19	16·31	+ 0·01	0·899	0·5074151	+ 481	− 10	− 799	− 534	− 58	0·5073231
	139	2 2	34·652	8·19	21	16·33	0·01	0·898	0·5073202	481	12	800	544	58	0·5072269
	138	2 57	33·168	8·19	19	16·33	0·01	0·898	0·5076527	481	10	800	514	58	0·5075626
	140	3 55	35·006	8·19	18	16·35	0·01	0·898	0·5072451	481	9	800	544	58	0·5071521
													Mean	...	0·5073162
5th Dec. Day	137	13 8	34·238	− 8·19	16	15·47	+ 0·16	0·903	0·5074101	+ 481	− 7	− 758	− 536	− 58	0·5073223
	139	14 0	34·678	8·19	18	15·54	0·16	0·902	0·5073148	481	9	761	547	58	0·5072254
	138	14 55	33·176	8·19	19	15·71	0·16	0·901	0·5076509	481	10	770	515	58	0·5075637
	140	15 46	35·011	8·19	18	15·88	0·16	0·899	0·5072440	481	9	778	545	58	0·5071531
													Mean	...	0·5073161
													Mean of Day and Night	...	**0·5073162**
5th Dec. Night	140	1 10	34·985	− 7·73	17	16·71	+ 0·11	0·896	0·5072496	+ 454	− 8	− 819	− 543	− 58	0·5071522
	138	2 3	33·147	7·73	19	16·77	0·11	0·896	0·5076575	454	10	822	513	58	0·5075626
	139	2 54	34·638	7·73	17	16·91	0·11	0·895	0·5073230	454	8	829	542	58	0·5072247
	137	3 45	34·193	7·73	15	16·94	0·11	0·895	0·5074199	454	6	830	532	58	0·5073227
													Mean	...	0·5073155
6th Dec. Day	140	13 9	34·984	− 7·73	17	16·85	+ 0·14	0·897	0·5072497	+ 454	− 8	− 826	− 544	− 58	0·5071515
	138	14 1	33·145	7·73	19	16·94	0·14	0·896	0·5076582	454	10	830	513	58	0·5075625
	139	14 52	34·630	7·73	18	17·07	0·14	0·895	0·5073250	454	9	836	542	58	0·5072259
	137	15 43	34·181	7·73	18	17·18	0·14	0·895	0·5074226	454	9	842	532	58	0·5073239
													Mean	...	0·5073160
													Mean of Day and Night	...	**0·5073157**
6th Dec. Night	137	1 11	34·188	− 8·09	17	17·32	+ 0·05	0·896	0·5074210	+ 475	− 8	− 849	− 532	− 58	0·5073238
	139	2 2	34·630	8·09	19	17·34	0·05	0·895	0·5073249	475	10	850	542	58	0·5072264
	138	2 55	33·129	8·09	21	17·39	0·05	0·895	0·5076620	475	12	852	512	58	0·5075661
	140	3 46	34·972	8·09	18	17·46	0·05	0·895	0·5072523	475	9	856	542	58	0·5071533
													Mean	...	0·5073174
7th Dec. Day	137	13 12	34·206	− 8·09	17	16·79	+ 0·10	0·898	0·5074172	+ 475	− 8	− 823	− 533	− 58	0·5073225
	139	14 3	34·657	8·09	19	16·87	0·10	0·898	0·5073192	475	10	827	544	58	0·5072228
	138	14 57	33·154	8·09	20	16·94	0·10	0·897	0·5076560	475	11	830	513	58	0·5075623
	140	15 47	34·988	8·09	19	17·07	0·10	0·897	0·5072487	475	10	836	544	58	0·5071514
													Mean	...	0·5073148
													Mean of Day and Night	...	**0·5073161**
7th Dec. Night	140	1 20	34·974	− 7·93	18	17·55	+ 0·12	0·895	0·5072518	+ 465	− 9	− 860	− 542	− 58	0·5071514
	138	2 11	33·132	7·93	19	17·69	0·12	0·894	0·5076612	465	10	867	511	58	0·5075631
	139	3 3	34·617	7·93	18	17·76	0·12	0·894	0·5073278	465	9	870	542	58	0·5072264
	137	3 55	34·170	7·93	17	17·90	0·12	0·894	0·5074249	465	8	877	531	58	0·5073240
													Mean	...	0·5073162
8th Dec. Day	140	13 20	34·973	− 7·93	18	17·49	+ 0·08	0·897	0·5072522	+ 465	− 9	− 857	− 544	− 58	0·5071519
	138	14 12	33·135	7·93	20	17·52	0·08	0·897	0·5076605	465	11	858	513	58	0·5075630
	139	15 3	34·617	7·93	18	17·58	0·08	0·896	0·5073277	465	9	861	543	58	0·5072271
	137	15 55	34·180	7·93	17	17·71	0·08	0·896	0·5074228	465	8	868	532	58	0·5073227
													Mean	...	0·5073162
													Mean of Day and Night	...	**0·5073162**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Bina.															
		h m	s	s	′	°	°		s						s
11th	137	1 35	34·186	− 8·26	19	16·53	−0·15	0·897	0·5074216	+ 485	−10	− 810	−533	−51	0·5073297
Dec.	139	2 27	34·637	8·26	21	16·40	0·15	0·898	0·5073233	485	12	804	544	51	0·5072307
1912	138	3 23	33·152	8·26	18	16·26	0·15	0·898	0·5076565	485	9	797	514	51	0·5075679
Night	140	4 13	34·987	8·26	21	16·13	0·15	0·898	0·5072490	485	12	790	544	51	0·5071578
													Mean	...	0·5073215
12th	137	13 43	34·240	− 8·26	20	14·34	+0·28	0·905	0·5074096	+ 485	−11	− 703	−538	−51	0·5073278
Dec.	139	14 34	34·684	8·26	19	14·48	0·28	0·904	0·5073133	485	10	710	548	51	0·5072299
Day	138	15 29	33·179	8·26	22	14·75	0·28	0·903	0·5076503	485	13	723	517	51	0·5075684
	140	16 18	35·017	8·26	19	15·03	0·28	0·900	0·5072429	485	10	736	545	51	0·5071572
													Mean	...	0·5073208
										Mean of Day and Night				...	**0·5073212**
12th	140	1 43	34·996	− 8·50	19	16·18	+0·01	0·899	0·5072472	+ 499	−10	− 793	−545	−51	0·5071572
Dec.	138	2 36	33·149	8·50	21	16·20	0·01	0·899	0·5076572	499	12	794	514	51	0·5075700
Night	139	3 27	34·650	8·50	20	16·24	0·01	0·899	0·5073206	499	11	796	545	51	0·5072302
	137	4 18	34·198	8·50	17	16·19	0·01	0·899	0·5074188	499	8	793	534	51	0·5073301
													Mean	...	0·5073218
13th	140	13 40	35·032	− 8·50	18	14·92	+0·22	0·904	0·5072398	+ 499	− 9	− 731	−548	−51	0·5071558
Dec.	138	14 33	33·188	8·50	20	15·03	0·22	0·903	0·5076481	499	11	736	517	51	0·5075665
Day	139	15 24	34·670	8·50	19	15·24	0·22	0·902	0·5073162	499	10	747	547	51	0·5072306
	137	16 16	34·216	8·50	17	15·49	0·22	0·901	0·5074148	499	8	759	535	51	0·5073294
													Mean	...	0·5073206
										Mean of Day and Night				...	**0·5073212**
13th	137	1 45	34·186	− 8·49	17	16·72	+0·01	0·897	0·5074216	+ 498	− 8	− 819	−533	−51	0·5073303
Dec.	139	2 36	34·630	8·49	19	16·75	0·01	0·897	0·5073249	498	10	821	544	51	0·5072321
Night	138	3 33	33·146	8·49	21	16·76	0·01	0·897	0·5076580	498	12	821	513	51	0·5075681
	140	4 24	34·980	8·49	18	16·74	0·01	0·897	0·5072506	498	9	820	544	51	0·5071580
													Mean	...	0·5073221
14th	137	13 47	34·232	− 8·49	17	15·29	+0·27	0·903	0·5074112	+ 498	− 8	− 749	−536	−51	0·5073266
Dec.	139	14 39	34·679	8·49	20	15·39	0·27	0·902	0·5073147	498	11	754	547	51	0·5072282
Day	138	15 32	33·176	8·49	21	15·65	0·27	0·901	0·5076508	498	12	767	515	51	0·5075661
	140	16 22	35·007	8·49	19	15·96	0·27	0·900	0·5072449	498	10	782	545	51	0·5071559
													Mean	...	0·5073192
										Mean of Day and Night				...	**0·5073207**
14th	140	1 53	34·991	− 8·64	18	16·81	+0·03	0·897	0·5072483	+ 507	− 9	− 824	−544	−51	0·5071562
Dec.	138	2 44	33·154	8·64	19	16·87	0·03	0·896	0·5076562	507	10	827	513	51	0·5075668
Night	139	3 36	34·642	8·64	19	16·89	0·03	0·896	0·5073222	507	10	828	543	51	0·5072297
	137	4 27	34·194	8·64	17	16·88	0·03	0·896	0·5074198	507	8	827	532	51	0·5073287
													Mean	...	0·5073204
15th	140	13 55	35·027	− 8·64	18	15·35	+0·26	0·902	0·5072408	+ 507	− 9	− 752	−547	−51	0·5071556
Dec.	138	14 46	33·184	8·64	20	15·50	0·26	0·900	0·5076490	507	11	760	515	51	0·5075660
Day	139	15 37	34·664	8·64	19	15·73	0·26	0·899	0·5073178	507	10	771	545	51	0·5072308
	137	16 30	34·210	8·64	17	16·02	0·26	0·897	0·5074161	507	8	785	533	51	0·5073291
													Mean	...	0·5073204
										Mean of Day and Night				...	**0·5073204**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
Bhopal.															
		h m	s	s	′	°	°		s						s
18th	137	2 8	34·080	−11·39	18	20·52	+0·04	0·870	0·5074449	+669	−9	−1005	−517	−51	0·5073536
Dec.	139	3 0	34·530	11·39	20	20·54	0·04	0·870	0·5073463	669	11	1006	527	51	0·5072537
1912	138	3 54	33·050	11·39	15	20·57	0·04	0·869	0·5076805	669	6	1008	497	51	0·5075912
Night	140	4 44	34·875	11·39	19	20·63	0·04	0·868	0·5072727	669	10	1011	526	51	0·5071798
													Mean	...	0·5073446
19th	137	14 11	34·113	−11·39	13	19·73	+0·17	0·874	0·5074376	+669	−5	−967	−519	−51	0·5073503
Dec.	139	15 5	34·555	11·39	21	19·82	0·17	0·873	0·5073409	669	12	971	529	51	0·5072515
Day	138	15 58	33·072	11·39	21	19·96	0·17	0·873	0·5076752	669	12	978	499	51	0·5075881
	140	16 48	34·890	11·39	19	20·16	0·17	0·870	0·5072697	669	10	988	527	51	0·5071719
													Mean	...	0·5073422
										Mean of Day and Night				...	**0·5073434**
19th	140	2 12	34·870	−11·40	19	20·52	−0·03	0·871	0·5072737	+669	−10	−1005	−528	−51	0·5071812
Dec.	138	3 3	33·050	11·40	21	20·52	0·03	0·871	0·5076805	669	12	1005	498	51	0·5075908
Night	139	3 55	34·541	11·40	20	20·50	0·03	0·871	0·5073442	669	11	1005	528	51	0·5072516
	137	4 46	34·096	11·40	18	20·43	0·03	0·871	0·5074413	669	9	1001	517	51	0·5073504
													Mean	...	0·5073435
20th	140	14 16	34·936	−11·40	19	18·80	+0·22	0·879	0·5072598	+669	−10	−921	−533	−51	0·5071752
Dec.	138	15 8	33·087	11·40	21	18·91	0·22	0·878	0·5076718	669	12	927	502	51	0·5075895
Day	139	15 58	34·569	11·40	20	19·08	0·22	0·877	0·5073380	669	11	935	531	51	0·5072521
	137	16 51	34·109	11·40	18	19·29	0·22	0·876	0·5074385	669	9	945	520	51	0·5073529
													Mean	...	0·5073424
										Mean of Day and Night				...	**0·5073430**
20th	137	2 37	34·106	−11·29	18	19·54	−0·01	0·877	0·5074391	+663	−9	−957	−521	−51	0·5073516
Dec.	139	3 31	34·553	11·29	19	19·52	0·01	0·877	0·5073415	663	10	956	531	51	0·5072530
Night	138	4 23	33·066	11·29	21	19·52	0·01	0·877	0·5076768	663	12	956	502	51	0·5075910
	140	5 19	34·915	11·29	18	19·51	0·01	0·876	0·5072645	663	9	956	531	51	0·5071761
													Mean	...	0·5073429
21st	137	14 28	34·147	−11·29	17	18·08	+0·22	0·883	0·5074302	+663	−8	−886	−525	−51	0·5073495
Dec.	139	15 21	34·596	11·29	19	18·21	0·22	0·881	0·5073323	663	10	882	534	51	0·5072499
Day	138	16 14	33·099	11·29	21	18·42	0·22	0·881	0·5076690	663	12	903	504	51	0·5075883
	140	17 4	34·924	11·29	20	18·62	0·22	0·879	0·5072623	663	11	912	533	51	0·5071779
													Mean	...	0·5073414
										Mean of Day and Night				...	**0·5073422**
21st	140	2 10	34·912	−11·79	19	19·09	+0·04	0·878	0·5072648	+692	−10	−935	−532	−51	0·5071812
Dec.	138	3 47	33·099	11·79	16	19·12	0·04	0·877	0·5076688	692	7	937	502	51	0·5075883
Night	139	4 21	34·580	11·79	21	19·14	0·04	0·877	0·5073358	692	12	938	531	51	0·5072518
	137	5 11	34·131	11·79	18	19·17	0·04	0·877	0·5074337	692	9	939	521	51	0·5073509
													Mean	...	0·5073431
22nd	140	14 39	34·975	−11·79	19	17·77	+0·22	0·884	0·5072516	+692	−10	−871	−536	−51	0·5071740
Dec.	138	15 31	33·116	11·79	21	17·91	0·22	0·883	0·5076651	692	12	878	505	51	0·5075897
Day	139	16 21	34·599	11·79	19	18·11	0·22	0·882	0·5073316	692	10	887	534	51	0·5072526
	137	17 12	34·146	11·79	19	18·31	0·22	0·881	0·5074303	692	10	897	523	51	0·5073514
													Mean	...	0·5073419
										Mean of Day and Night				...	**0·5073425**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Goona.						
		h m	s	s	′	°	°		s						s
27th	137	2 33	34·144	− 7·44	18	18·53	+ 0·09	0·883	0·5074309	+ 437	− 9	− 908	− 525	− 46	0·5073258
Dec.	139	3 26	34·586	7·44	21	18·58	0·09	0·883	0·5073346	437	12	910	535	46	0·5072280
1912	138	4 19	33·103	7·44	19	18·68	0·09	0·883	0·5076682	437	10	915	505	46	0·5075643
Night	140	5 7	34·929	7·44	18	18·72	0·09	0·883	0·5072615	437	9	917	535	46	0·5071545
													Mean	...	0·5073182
28th	137	14 34	34·166	− 7·44	16	17·93	+ 0·09	0·886	0·5074261	+ 437	− 7	− 879	− 526	− 46	0·5073240
Dec.	139	15 25	34·607	7·44	18	17·95	0·09	0·886	0·5073298	437	9	880	537	46	0·5072263
Day	138	16 18	33·114	7·44	20	18·04	0·09	0·886	0·5076655	437	11	884	507	46	0·5075644
	140	17 7	34·936	7·44	18	18·14	0·09	0·884	0·5072600	437	9	889	536	46	0·5071557
													Mean	...	0·5073176
													Mean of Day and Night	...	**0·5073179**
28th	140	2 36	34·917	− 6·72	18	18·67	+ 0·12	0·882	0·5072638	+ 394	− 9	− 915	− 534	− 46	0·5071528
Dec.	138	3 26	33·081	6·72	19	18·74	0·12	0·881	0·5076732	394	10	918	504	46	0·5075648
Night	139	4 17	34·562	6·72	18	18·88	0·12	0·881	0·5073396	394	9	925	534	46	0·5072276
	137	5 7	34·110	6·72	17	18·92	0·12	0·881	0·5074381	394	8	927	523	46	0·5073271
													Mean	...	0·5073181
29th	140	14 39	34·924	− 6·72	18	18·29	+ 0·05	0·884	0·5072623	+ 394	− 9	− 896	− 536	− 46	0·5071530
Dec.	138	15 30	33·098	6·72	20	18·31	0·05	0·884	0·5076692	394	11	897	506	46	0·5075626
Day	139	16 21	34·575	6·72	19	18·33	0·05	0·884	0·5073367	394	10	898	536	46	0·5072271
	137	17 12	34·125	6·72	17	18·43	0·05	0·883	0·5074349	394	8	903	525	46	0·5073261
													Mean	...	0·5073172
													Mean of Day and Night	...	**0·5073176**
29th	137	2 37	34·116	− 6·43	16	18·75	+ 0·07	0·882	0·5074371	+ 377	− 7	− 919	− 524	− 46	0·5073252
Dec.	139	3 26	34·557	6·43	18	18·87	0·07	0·881	0·5073406	377	9	925	534	46	0·5072269
Night	138	4 18	33·068	6·43	20	18·92	0·07	0·881	0·5076761	377	11	927	504	46	0·5075650
	140	5 7	34·895	6·43	18	18·95	0·07	0·881	0·5072687	377	9	929	534	46	0·5071546
													Mean	...	0·5073179
30th	137	14 37	34·133	− 6·43	16	18·06	+ 0·06	0·886	0·5074332	+ 377	− 7	− 885	− 526	− 46	0·5073245
Dec.	139	15 28	34·577	6·43	13	18·07	0·06	0·886	0·5073363	377	5	885	537	46	0·5072267
Day	138	16 19	33·085	6·43	20	18·12	0·06	0·885	0·5076722	377	11	888	506	46	0·5075648
	140	17 10	34·911	6·43	18	18·20	0·06	0·884	0·5072652	377	9	892	536	46	0·5071546
													Mean	...	0·5073177
													Mean of Day and Night	...	**0·5073178**
30th	140	2 43	34·903	− 6·26	18	18·73	+ 0·10	0·883	0·5072670	+ 367	− 9	− 918	− 535	− 46	0·5071529
Dec.	138	3 33	33·066	6·26	19	18·84	0·10	0·882	0·5076766	367	10	923	505	46	0·5075649
Night	139	4 23	34·541	6·26	14	18·93	0·10	0·882	0·5073442	367	5	928	534	46	0·5072296
	137	5 17	34·093	6·26	18	18·97	0·10	0·882	0·5074421	367	9	930	524	46	0·5073279
													Mean	...	0·5073188
31st	140	14 45	34·912	− 6·26	18	18·12	+ 0·06	0·886	0·5072649	+ 367	− 9	− 888	− 537	− 46	0·5071536
Dec.	138	15 36	33·088	6·26	21	18·13	0·06	0·886	0·5076716	367	12	888	507	46	0·5075630
Day	139	16 27	34·564	6·26	20	18·17	0·06	0·885	0·5073392	367	11	890	536	46	0·5072276
	137	17 18	34·112	6·26	18	18·30	0·06	0·884	0·5074378	367	9	897	526	46	0·5073268
													Mean	...	0·5073178
													Mean of Day and Night	...	**0·5073183**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Kalianpur.							
		h m	s	s	′	°	°		s						s
7th Jan. 1913 Night	137	3 6	34·085	− 8·87	17	21·94	+0·13	0·861	0·5074437	+ 521	− 8	−1075	−511	−49	0·5073315
	139	3 56	34·523	8·87	19	22·10	0·13	0·861	0·5073479	521	10	1083	522	49	0·5072336
	138	4 48	33·034	8·87	20	22·18	0·13	0·861	0·5076845	521	11	1087	492	49	0·5075727
	140	5 38	34·857	8·87	15	22·29	0·13	0·861	0·5072766	521	6	1092	522	49	0·5071618
													Mean	...	0·5073249
8th Jan. Day	137	15 11	34·075	− 8·87	17	21·92	+0·08	0·865	0·5074460	+ 521	− 8	−1074	−514	−49	0·5073336
	139	16 12	34·532	8·87	19	21·94	0·08	0·865	0·5073459	521	10	1075	524	49	0·5072322
	138	17 5	33·041	8·87	21	22·03	0·08	0·865	0·5076826	521	12	1079	495	49	0·5075712
	140	17 55	34·852	8·87	20	22·11	0·08	0·864	0·5072776	521	11	1083	524	49	0·5071630
													Mean	...	0·5073250
											Mean of Day and Night			...	**0·5073250**
8th Jan. Night	140	3 29	34·857	− 8·64	20	22·40	+0·06	0·861	0·5072765	+ 507	− 11	−1098	− 522	−49	0·5071592
	138	4 21	33·013	8·64	21	22·51	0·06	0·863	0·5076892	507	12	1103	494	49	0·5075741
	139	5 12	34·496	8·64	19	22·53	0·06	0·863	0·5073538	507	10	1104	523	49	0·5072359
	137	6 5	34·047	8·64	18	22·60	0·06	0·861	0·5074521	507	9	1107	511	49	0·5073352
													Mean	...	0·5073261
9th Jan. Day	140	15 29	34·845	− 8·64	19	22·40	−0·02	0·865	0·5072790	+ 507	−10	−1098	− 524	−49	0·5071616
	138	16 20	33·019	8·64	21	22·36	0·02	0·865	0·5076878	507	12	1096	495	49	0·5075733
	139	17 10	34·499	8·64	19	22·35	0·02	0·865	0·5073531	507	10	1095	524	49	0·5072360
	137	18 1	34·061	8·64	19	22·35	0·02	0·865	0·5074492	507	10	1095	514	49	0·5073331
													Mean	...	0·5073260
											Mean of Day and Night			...	**0·5073260**
9th Jan. Night	137	3 30	34·071	− 8·93	18	22·72	+0·06	0·861	0·5074470	+ 524	− 9	−1113	−511	−49	0·5073312
	139	4 21	34·503	8·93	16	22·79	0·06	0·861	0·5073523	524	7	1117	522	49	0·5072352
	138	5 13	33·022	8·93	21	22·87	0·06	0·861	0·5076869	524	12	1121	492	49	0·5075719
	140	6 4	34·875	8·93	20	22·83	0·06	0·863	0·5072727	524	11	1119	523	49	0·5071549
													Mean	...	0·5073233
10th Jan. Day	137	15 33	34·068	− 8·93	18	21·76	−0·01	0·867	0·5074476	+ 524	− 9	−1066	−515	−49	0·5073361
	139	16 24	34·515	8·93	20	21·74	0·01	0·866	0·5073497	524	11	1065	525	49	0·5072371
	138	17 17	33·032	8·93	21	21·74	0·01	0·866	0·5076848	524	12	1065	495	49	0·5075751
	140	18 8	34·867	8·93	20	21·74	0·01	0·866	0·5072743	524	11	1065	525	49	0·5071617
													Mean	...	0·5073275
											Mean of Day and Night			...	**0·5073254**
10th Jan. Night	140	3 30	34·833	− 8·53	20	22·33	+0·09	0·863	0·5072816	+ 501	−11	−1094	−523	−49	0·5071640
	138	4 24	33·011	8·53	20	22·44	0·09	0·861	0·5076897	501	11	1100	492	49	0·5075746
	139	5 14	34·482	8·53	20	22·51	0·09	0·861	0·5073569	501	11	1103	522	49	0·5072385
	137	6 5	34·039	8·53	19	22·55	0·09	0·861	0·5074540	501	10	1105	511	49	0·5073366
													Mean	...	0·5073284
11th Jan. Day	140	15 30	34·863	− 8·53	19	21·83	+0·03	0·865	0·5072752	+ 501	−10	−1070	−524	−49	0·5071600
	138	16 21	33·036	8·53	20	21·82	0·03	0·865	0·5076838	501	11	1069	495	49	0·5075715
	139	17 11	34·510	8·53	18	21·86	0·03	0·865	0·5073508	501	9	1071	524	49	0·5072356
	137	18 1	34·066	8·53	17	21·90	0·03	0·865	0·5074479	501	8	1073	514	49	0·5073336
													Mean	...	0·5073252
											Mean of Day and Night			...	**0·5073268**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of Clock Rate	Correction on account of Arc	Correction on account of Temperature	Correction on account of Density of Air	Correction on account of Flexure	Reduced Time of Vibration
									Jhansi.						
		h m	s	s	′	°	°		s						s
19th	137	4 12	34·162	− 5·38	19	20·92	+0·13	0·896	0·5074268	+ 316	− 10	− 1025	− 532	− 46	0·5072971
Jan.	139	5 3	34·606	5·38	20	21·01	0·13	0·896	0·5073301	316	11	1029	543	46	0·5071988
1913	138	5 56	33·116	5·38	21	21·13	0·13	0·896	0·5076651	316	12	1035	513	46	0·5075361
Night	140	6 45	34·947	5·38	21	21·23	0·13	0·895	0·5072576	316	12	1040	542	46	0·5071252
													Mean	...	0·5072893
20th	137	16 14	34·144	− 5·38	18	21·01	+0·06	0·897	0·5074308	+ 316	− 9	− 1029	− 533	− 46	0·5073007
Jan.	139	17 5	34·588	5·38	19	21·10	0·06	0·897	0·5073340	316	10	1034	544	46	0·5072022
Day	138	17 57	33·099	5·38	21	21·13	0·06	0·897	0·5076690	316	12	1035	513	46	0·5075400
	140	18 46	34·935	5·38	19	21·18	0·06	0·896	0·5072602	316	10	1038	543	46	0·5071281
													Mean	...	0·5072928
										Mean of Day and Night				...	**0·5072910**
20th	140	4 28	34·920	− 4·72	19	21·40	+0·18	0·893	0·5072633	+ 277	− 10	− 1049	− 541	− 46	0·5071264
Jan.	138	5 20	33·083	4·72	21	21·55	0·18	0·892	0·5076727	277	12	1056	510	46	0·5075380
Night	139	6 11	34·568	4·72	19	21·71	0·18	0·892	0·5073383	277	10	1064	541	46	0·5071999
	137	7 2	34·118	4·72	18	21·85	0·18	0·891	0·5074366	277	9	1071	529	46	0·5072988
													Mean	...	0·5072908
21st	140	16 27	34·917	− 4·72	19	21·66	+0·06	0·894	0·5072638	+ 277	− 10	− 1061	− 542	− 46	0·5071256
Jan.	138	17 18	33·070	4·72	21	21·71	0·06	0·893	0·5076759	277	12	1064	511	46	0·5075403
Day	139	18 10	34·578	4·72	19	21·74	0·06	0·893	0·5073360	277	10	1065	541	46	0·5071975
	137	19 2	34·112	4·72	17	21·83	0·06	0·893	0·5074378	277	8	1070	530	46	0·5073001
													Mean	...	0·5072909
										Mean of Day and Night				...	**0·5072908**
21st	137	4 28	34·103	− 4·68	17	21·92	+0·17	0·890	0·5074399	+ 275	− 8	− 1074	− 529	− 46	0·5073017
Jan.	139	5 19	34·538	4·68	19	22·09	0·17	0·889	0·5073448	275	10	1082	539	46	0·5072046
Night	138	6 12	33·057	4·68	20	22·24	0·17	0·889	0·5076788	275	11	1090	509	46	0·5075407
	140	7 2	34·887	4·68	18	22·34	0·17	0·888	0·5072702	275	9	1095	538	46	0·5071289
													Mean	...	0·5072940
22nd	137	16 27	34·116	− 4·68	17	22·24	+0·06	0·892	0·5074371	+ 275	− 8	− 1090	− 530	− 46	0·5072972
Jan.	139	17 17	34·557	4·68	19	22·29	0·06	0·893	0·5073406	275	10	1092	541	46	0·5071992
Day	138	18 11	33·066	4·68	20	22·33	0·06	0·893	0·5076768	275	11	1094	511	46	0·5075381
	140	19 0	34·885	4·68	18	22·42	0·06	0·891	0·5072706	275	9	1099	540	46	0·5071287
													Mean	...	0·5072908
										Mean of Day and Night				...	**0·5072924**
22nd	140	4 34	34·872	− 3·84	18	22·35	+0·13	0·892	0·5072735	+ 225	− 9	− 1095	− 541	− 46	0·5071269
Jan.	138	5 27	33·039	3·84	21	22·50	0·13	0·891	0·5076829	225	12	1103	510	46	0·5075383
Night	139	6 18	34·515	3·84	20	22·60	0·13	0·890	0·5073498	225	11	1107	539	46	0·5072020
	137	7 8	34·069	3·84	18	22·69	0·13	0·890	0·5074473	225	9	1112	529	46	0·5073002
													Mean	...	0·5072918
23rd	140	16 36	34·869	− 3·84	19	22·32	+0·02	0·894	0·5072738	+ 225	− 10	− 1094	− 542	− 46	0·5071271
Jan.	138	17 28	33·041	3·84	20	22·32	0·02	0·894	0·5076826	225	11	1094	511	46	0·5075389
Day	139	18 21	34·531	3·84	19	22·33	0·02	0·894	0·5073461	225	10	1095	542	46	0·5071993
	137	19 13	34·096	3·84	17	22·38	0·02	0·894	0·5074413	225	8	1097	531	46	0·5072956
													Mean	...	0·5072902
										Mean of Day and Night				...	**0·5072910**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
							Gwalior.								
		h m	s	s	′	°	°		s						s
28th	137	4 39	34·194	− 2·78	17	18·94	+0·16	0·911	0·5074198	+ 163	− 8	− 928	−541	−47	0·5072837
Jan.	139	5 30	34·633	2·78	19	19·11	0·16	0·910	0·5073242	163	10	936	551	47	0·5071861
1913	138	6 23	33·125	2·78	20	19·26	0·16	0·910	0·5076628	163	11	944	521	47	0·5075268
Night	140	7 13	34·967	2·78	18	19·35	0·16	0·909	0·5072532	163	9	948	551	47	0·5071140
													Mean	...	0·5072777
29th	137	16 39	34·181	− 2·78	16	19·06	+0·08	0·913	0·5074227	+ 163	− 7	− 934	−542	−47	0·5072860
Jan.	139	17 38	34·624	2·78	18	19·09	0·08	0·912	0·5073263	163	9	935	553	47	0·5071882
Day	138	18 30	33·131	2·78	16	19·14	0·08	0·913	0·5076615	163	7	938	522	47	0·5075264
	140	19 19	34·953	2·78	18	19·27	0·08	0·912	0·5072562	163	9	944	553	47	0·5071172
													Mean	...	0·5072794
													Mean of Day and Night	...	**0·5072785**
29th	140	4 58	34·951	− 2·71	19	19·54	+0·13	0·910	0·5072566	+ 159	−10	− 957	−551	−47	0·5071160
Jan.	138	5 50	33·119	2·71	21	19·68	0·13	0·909	0·5076643	159	12	964	520	47	0·5075259
Night	139	6 41	34·604	2·71	20	19·77	0·13	0·909	0·5073306	159	11	969	551	47	0·5071887
	137	7 34	34·160	2·71	18	19·91	0·13	0·909	0·5074272	159	9	976	540	47	0·5072859
													Mean	...	0·5072791
30th	140	16 58	34·975	− 2·71	19	19·10	+0·09	0·914	0·5072517	+ 159	−10	− 936	−554	−47	0·5071129
Jan.	138	17 50	33·128	2·71	20	19·12	0·09	0·913	0·5076623	159	11	937	522	47	0·5075265
Day	139	18 40	34·621	2·71	19	19·20	0·09	0·913	0·5073269	159	10	941	553	47	0·5071877
	137	19 31	34·171	2·71	18	19·33	0·09	0·913	0·5074247	159	9	947	542	47	0·5072861
													Mean	...	0·5072783
													Mean of Day and Night	...	**0·5072787**
30th	137	5 52	34·154	− 2·57	18	19·73	+0·13	0·908	0·5074286	+ 151	− 9	− 967	−539	−47	0·5072875
Jan.	139	6 35	34·599	2·57	20	19·86	0·13	0·908	0·5073316	151	11	973	550	47	0·5071886
Night	138	7 19	33·110	2·57	21	19·94	0·13	0·908	0·5076662	151	12	977	519	47	0·5075258
	140	8 0	34·947	2·57	19	20·03	0·13	0·908	0·5072577	151	10	981	550	47	0·5071140
													Mean	...	0·5072790
31st	137	17 19	34·156	− 2·57	17	19·71	+0·10	0·912	0·5074281	+ 151	− 8	− 966	−542	−47	0·5072869
Jan.	139	18 11	34·607	2·57	19	19·74	0·10	0·910	0·5073300	151	10	967	551	47	0·5071876
Day	138	19 3	33·109	2·57	21	19·84	0·10	0·909	0·5076666	151	12	972	520	47	0·5075266
	140	19 52	34·931	2·57	18	19·94	0·10	0·909	0·5072609	151	9	977	551	47	0·5071176
													Mean	...	0·5072797
													Mean of Day and Night	...	**0·5072793**
31st	140	4 57	34·931	− 2·31	19	20·24	+0·13	0·907	0·5072609	+ 136	−10	− 992	−550	−47	0·5071146
Jan.	138	5 48	33·101	2·31	20	20·34	0·13	0·907	0·5076686	136	11	997	519	47	0·5075248
Night	139	6 38	34·585	2·31	19	20·49	0·13	0·906	0·5073347	136	10	1004	549	47	0·5071873
	137	7 40	34·137	2·31	18	20·57	0·13	0·906	0·5074325	136	9	1008	538	47	0·5072859
													Mean	...	0·5072781
1st	140	16 57	34·940	− 2·31	18	20·15	+0·09	0·911	0·5072590	+ 136	− 9	− 987	−552	−47	0·5071131
Feb.	138	17 50	33·095	2·31	20	20·17	0·09	0·911	0·5076701	136	11	988	521	47	0·5075270
Day	139	18 41	34·578	2·31	18	20·28	0·09	0·909	0·5073361	136	9	994	551	47	0·5071896
	137	19 39	34·135	2·31	17	20·36	0·09	0·909	0·5074327	136	8	998	540	47	0·5072870
													Mean	...	0·5072792
													Mean of Day and Night	...	**0·5072787**

Table 11.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
						Sipri.									
		h m	s	s	′	°	°		s						s
9th	137	5 36	34·119	− 5·38	18	21·19	+0·06	0·872	0·5074361	+ 316	− 9	− 1038	− 518	− 41	0·5073071
Feb.	139	6 26	34·561	5·38	20	21·30	0·06	0·871	0·5073397	316	11	1044	528	41	0·5072089
1913	138	7 18	33·068	5·38	17	21·33	0·06	0·871	0·5076763	316	8	1045	498	41	0·5075487
Night	140	8 7	34·902	5·38	19	21·37	0·06	0·871	0·5072671	316	10	1047	528	41	0·5071361
													Mean	...	0·5073002
10th	137	17 35	34·120	− 5·38	18	21·10	+0·14	0·873	0·5074360	+ 316	− 9	− 1034	− 519	− 41	0·5073073
Feb.	139	18 25	34·565	5·38	20	21·16	0·14	0·872	0·5073390	316	11	1037	528	41	0·5072089
Day	138	19 18	33·070	5·38	21	21·31	0·14	0.872	0·5076757	316	12	1044	499	41	0·5075477
	140	20 7	34·893	5·38	19	21·44	0·14	0·871	0·5072687	316	10	1051	528	41	0·5071373
													Mean	...	0·5073003
										Mean of Day and Night				...	**0·5073002**
10th	140	5 37	34·905	− 5·38	19	21·47	+0·08	0·871	0·5072663	+ 316	− 10	− 1052	− 528	− 41	0·5071348
Feb.	138	6 28	33·070	5·38	21	21·52	0·08	0·870	0·5076757	316	12	1054	498	41	0·5075468
Night	139	7 18	34·555	5·38	20	21·58	0·08	0·870	0·5073411	316	11	1057	527	41	0·5072091
	137	8 8	34·102	5·38	18	21·69	0·08	0·870	0·5074401	316	9	1063	517	41	0·5073087
													Mean	...	0·5072998
11th	140	17 38	34·918	− 5·38	19	21·32	+0·05	0·873	0·5072636	+ 316	− 10	− 1045	− 529	− 41	0·5071327
Feb.	138	18 30	33·072	5·38	21	21·33	0·05	0·872	0·5076752	316	12	1045	499	41	0·5075471
Day	139	19 20	34·555	5·38	20	21·36	0·05	0·873	0·5073410	316	11	1047	529	41	0·5072098
	137	20 12	34·113	5·38	18	21·45	0·05	0·872	0·5074377	316	9	1051	518	41	0·5073074
													Mean	...	0·5072993
										Mean of Day and Night				...	**0·5072996**
11th	137	6 2	34·126	− 5·58	17	21·51	+0·06	0·871	0·5074347	+ 328	− 8	− 1054	− 517	− 41	0·5073055
Feb	139	6 52	34·557	5·58	20	21·53	0·06	0·871	0·5073407	328	11	1055	528	41	0·5072100
Night	138	7 46	33·070	5·58	21	21·58	0·06	0·870	0·5076757	328	12	1057	498	41	0·5075477
	140	8 35	34·903	5·58	19	21·66	0.06	0·870	0·5072670	328	10	1061	527	41	0·5071359
													Mean	...	0·5072998
12th	137	18 2	34·124	− 5·58	18	21·13	+0·12	0·873	0·5074352	+ 328	− 9	− 1035	− 519	− 41	0·5073076
Feb.	139	18 54	34·571	5·58	19	21·23	0·12	0·872	0·5073377	328	10	1040	528	41	0·5072086
Day	138	19 44	33·072	5·58	21	21·33	0·12	0·872	0·5076753	328	12	1045	499	41	0·5075484
	140	20 36	34·906	5·58	18	21·45	0·12	0·872	0·5072661	328	9	1051	528	41	0·5071360
													Mean	...	0·5073001
										Mean of Day and Night				...	**0·5073000**
12th	140	5 59	34·913	− 5·58	18	21·33	+0·02	0·870	0·5072647	+ 328	− 9	− 1045	− 527	− 41	0·5071353
Feb.	138	6 50	33·078	5·58	20	21·34	0·02	0·871	0·5076740	328	11	1046	498	41	0·5075472
Night	139	7 40	34·564	5·58	20	21·36	0·02	0·871	0·5073393	328	11	1047	528	41	0·5072094
	137	8 30	34·115	5·58	18	21·38	0·02	0·871	0·5074371	328	9	1048	517	41	0·5073084
													Mean	...	0·5073001
13th	140	18 2	34·925	− 5·58	19	20·76	+0·08	0·874	0·5072623	+ 328	− 10	− 1017	− 530	− 41	0·5071353
Feb.	138	18 52	33·084	5·58	21	20·80	0·08	0·874	0·5076725	328	12	1019	500	41	0·5075481
Day	139	19 41	34·567	5·58	21	20·89	0·08	0·873	0·5073386	328	12	1024	529	41	0·5072108
	137	20 34	34·115	5·58	19	20·94	0·08	0·873	0·5074370	328	10	1026	519	41	0·5073102
													Mean	...	0·5073011
										Mean of Day and Night				...	**0·5073006**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Dholpur.							
		h m	s	s	′	°	°		s						s
19th Feb. 1913 Night	137	6 58	34·151	+ 0·03	16	20·07	+0·20	0·905	0·5074292	− 2	− 7	− 983	−538	−57	0·5072705
	139	7 48	34·589	0·03	19	20·23	0·20	0·905	0·5073337	2	10	991	548	57	0·5071729
	138	8 41	33·093	0·03	21	20·41	0·20	0·903	0·5076705	2	12	1000	517	57	0·5075117
	140	9 30	34·981	0·03	20	20·56	0·20	0·903	0·5072630	2	11	1007	547	57	0·5071006
													Mean	...	0·5072639
20th Feb. Day	137	18 57	34·152	+ 0·03	18	20·52	+0·15	0·906	0·5074289	− 2	− 9	−1005	−538	−57	0·5072678
	139	19 49	34·582	0·03	21	20·63	0·15	0·905	0·5073353	2	12	1011	548	57	0·5071723
	138	20 40	33·073	0·03	21	20·74	0·15	0·904	0·5076750	2	12	1016	517	57	0·5075146
	140	21 29	34·902	0·03	17	20·90	0·15	0·902	0·5072671	2	8	1024	547	57	0·5071033
													Mean	...	0·5072645
													Mean of Day and Night	...	**0·5072642**
20th Feb. Night	140	6 59	34·881	+ 0·03	18	21·15	+0·19	0·899	0·5072715	− 2	− 9	−1036	−545	−57	0·5071066
	138	7 51	33·031	0·03	19	21·33	0·19	0·899	0·5076850	2	10	1045	514	57	0·5075222
	139	8 41	34·523	0·03	18	21·49	0·19	0·898	0·5073479	2	9	1053	544	57	0·5071814
	137	9 31	34·099	0·03	17	21·63	0·19	0·898	0·5074406	2	8	1060	533	57	0·5072746
													Mean	...	0·5072712
21st Feb. Day	140	18 59	34·864	+ 0·03	17	21·51	+0·14	0·901	0·5072752	− 2	− 8	−1054	−546	−57	0·5071085
	138	19 51	33·037	0·03	20	21·67	0·14	0·899	0·5076836	2	11	1062	514	57	0·5075190
	139	20 42	34·509	0·03	14	21·77	0·14	0·899	0·5073509	2	5	1067	545	57	0·5071833
	137	21 35	34·069	0·03	17	21·91	0·14	0·898	0·5074473	2	8	1074	533	57	0·5072799
													Mean	...	0·5072727
													Mean of Day and Night	...	**0·5072719**
													Mean of 19th to 21st February	...	**0·5072681**
21st Feb. Night	137	6 25	34·064	+ 0·96	16	21·95	+0·15	0·894	0·5074483	− 56	− 7	−1076	−531	−57	0·5072756
	139	7 16	34·506	0·96	18	22·11	0·15	0·894	0·5073516	56	9	1083	542	57	0·5071769
	138	8 7	33·021	0·96	20	22·25	0·15	0·893	0·5076873	56	11	1090	511	57	0·5075148
	140	9 2	34·846	0·96	17	22·33	0·15	0·893	0·5072788	56	8	1094	541	57	0·5071032
													Mean	...	0·5072676
22nd Feb. Day	137	18 28	34·069	+ 0·96	16	22·18	+0·07	0·894	0·5074473	− 56	− 7	−1087	−531	−57	0·5072735
	139	19 18	34·503	0·96	19	22·29	0·07	0·895	0·5073522	56	10	1092	542	57	0·5071765
	138	20 10	33·016	0·96	20	22·32	0·07	0·894	0·5076885	56	11	1094	511	57	0·5075156
	140	21 0	34·831	0·96	18	22·39	0·07	0·893	0·5072821	56	9	1097	541	57	0·5071061
													Mean	...	0·5072679
													Mean of Day and Night	...	**0·5072678**
22nd Feb. Night	140	6 26	34·838	+ 0·64	18	22·46	+0·14	0·892	0·5072805	− 38	− 9	−1101	−541	−57	0·5071059
	138	7 18	33·007	0·64	19	22·56	0·14	0·891	0·5076906	38	10	1105	510	57	0·5075186
	139	8 7	34·487	0·64	20	22·71	0·14	0·891	0·5073556	38	11	1113	540	57	0·5071797
	137	8 57	34·062	0·64	17	22·78	0·14	0·891	0·5074487	38	8	1116	529	57	0·5072739
													Mean	...	0·5072695
23rd Feb. Day	140	18 31	34·856	+ 0·64	17	22·45	+0·13	0·893	0·5072768	− 38	− 8	−1100	−541	−57	0·5071024
	138	19 24	33·026	0·64	20	22·53	0·13	0·892	0·5076862	38	11	1104	510	57	0·5075142
	139	20 16	34·499	0·64	19	22·69	0·13	0·893	0·5073531	38	10	1112	541	57	0·5071773
	137	21 8	34·061	0·64	16	22·75	0·13	0·893	0·5074490	38	7	1115	530	57	0·5072743
													Mean	...	0·5072671
													Mean of Day and Night	...	**0·5072683**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Agra.							
		h m	s	s	′	°	°		s						s
26th	137	6 52	34·180	+ 1·39	17	19·12	+0·13	0·913	0·5074227	− 82	− 8	− 937	− 542	− 44	0·5072614
Feb.	139	7 42	34·630	1·39	19	19·27	0·13	0·913	0·5073249	82	10	944	553	44	0·5071616
1913	138	8 37	33·126	1·39	20	19·37	0·13	0·912	0·5076626	82	11	949	522	44	0·5075018
Night	140	9 29	34·968	1·39	19	19·48	0·13	0·912	0·5072531	82	10	955	553	44	0·5070887
													Mean	...	0·5072534
27th	137	18 58	34·191	+ 1·39	17	18·72	+0·07	0·915	0·5074205	− 82	− 8	− 917	− 544	− 44	0·5072610
Feb.	139	19 50	34·635	1·39	19	18·73	0·07	0·915	0·5073238	82	10	918	554	44	0·5071630
Day	138	20 43	33·139	1·39	24	18·80	0·07	0·914	0·5076596	82	15	921	523	44	0·5075011
	140	21 33	34·977	1·39	19	18·88	0·07	0·913	0·5072512	82	10	925	553	44	0·5070898
													Mean	...	0·5072537
										Mean of Day and Night				...	**0·5072536**
27th	140	6 57	34·964	+ 1·53	19	19·32	+0·09	0·910	0·5072540	− 90	− 10	− 947	− 551	− 44	0·5070898
Feb.	138	7 50	33·124	1·53	20	19·47	0·09	0·909	0·5076632	90	11	954	520	44	0·5075013
Night	139	8 40	34·605	1·53	19	19·52	0·09	0·909	0·5073303	90	10	956	551	44	0·5071652
	137	9 32	34·164	1·53	18	19·58	0·09	0·909	0·5074265	90	9	959	540	44	0·5072623
													Mean	...	0·5072547
28th	140	19 0	34·974	+ 1·53	19	18·94	+0·10	0·913	0·5072518	− 90	− 10	− 928	− 553	− 44	0·5070893
Feb.	138	19 50	33·144	1·53	20	19·01	0·10	0·912	0·5076586	90	11	931	522	44	0·5074988
Day	139	20 40	34·631	1·53	20	19·11	0·10	0·912	0·5073248	90	11	936	553	44	0·5071614
	137	21 36	34·170	1·53	18	19·20	0·10	0·912	0·5074248	90	9	941	542	44	0·5072622
													Mean	...	0·5072529
										Mean of Day and Night				...	**0·5072538**
28th	137	7 2	34·180	+ 1·09	17	19·62	+0·11	0·908	0·5074227	− 64	− 8	− 961	− 539	− 44	0·5072611
Feb.	139	7 53	34·621	1·09	19	19·72	0·11	0·907	0·5073268	64	10	966	550	44	0·5071634
Night	138	8 45	33·124	1·09	20	19·80	0·11	0·907	0·5076630	64	11	970	519	44	0·5075022
	140	9 36	34·964	1·09	19	19·91	0·11	0·907	0·5072540	64	10	976	550	44	0·5070896
													Mean	...	0·5072541
1st	137	19 3	34·190	+ 1·09	17	19·32	+0·10	0·912	0·5074207	− 64	− 8	− 947	− 542	− 44	0·5072602
Mar.	139	19 55	34·631	1·09	21	19·38	0·10	0·912	0·5073247	64	12	950	553	44	0·5071624
Day	138	20 47	33·136	1·09	20	19·50	0·10	0·910	0·5076602	64	11	956	521	44	0·5075006
	140	21 37	34·984	1·09	19	19·55	0·10	0·910	0·5072497	64	10	958	551	44	0·5070870
													Mean	...	0·5072525
										Mean of Day and Night				...	**0·5072533**
1st	140	7 23	34·968	+ 1·35	19	19·96	+0·10	0·908	0·5072531	− 79	− 10	− 978	− 550	− 44	0·5070870
Mar.	138	8 14	33·120	1·35	21	20·10	0·10	0·908	0·5076641	79	12	985	519	44	0·5075002
Night	139	9 4	34·605	1·35	19	20·15	0·10	0·907	0·5073303	79	10	987	550	44	0·5071633
	137	9 55	34·164	1·35	18	20·23	0·10	0·906	0·5074265	79	9	991	538	44	0·5072604
													Mean	...	0·5072527
2nd	140	19 23	34·976	+ 1·35	19	19·63	+0·13	0·911	0·5072513	− 79	− 10	− 962	− 552	− 44	0·5070866
Mar.	138	20 14	33·123	1·35	21	19·73	0·13	0·909	0·5076632	79	12	967	520	44	0·5075010
Day	139	21 4	34·608	1·35	20	19·86	0·13	0·909	0·5073296	79	11	973	551	44	0·5071638
	137	21 57	34·161	1·35	18	19·95	0·13	0·908	0·5074269	79	9	978	539	44	0·5072620
													Mean	...	0·5072534
										Mean of Day and Night				...	**0·5072530**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
						Muttra.									
		h m	s	s	′	°	°		s						s
6th Mar. 1913 Night	137	7 27	34·176	+ 2·07	18	19·97	+0·11	0·903	0·5074238	− 122	− 9	− 979	− 536	− 41	0·5072551
	139	8 18	34·605	2·07	19	20·11	0·11	0·902	0·5073303	122	10	985	547	41	0·5071598
	138	9 11	33·115	2·07	15	20·17	0·11	0·902	0·5076652	122	6	988	516	41	0·5074979
	140	10 0	34·942	2·07	19	20·29	0·11	0·902	0·5072586	122	10	994	547	41	0·5070872
													Mean	...	0·5072500
7th Mar. Day	137	19 27	34·160	+ 2·07	17	19·92	+0·12	0·903	0·5074272	− 122	− 8	− 976	− 536	− 41	0·5072589
	139	20 17	34·607	2·07	19	20·02	0·12	0·903	0·5073300	122	10	981	547	41	0·5071599
	138	21 10	33·114	2·07	20	20·12	0·12	0·902	0·5076655	122	11	986	516	41	0·5074979
	140	22 0	34·942	2·07	19	20·23	0·12	0·902	0·5072587	122	10	991	547	41	0·5070876
													Mean	...	0·5072511
													Mean of Day and Night	...	**0·5072505**
7th Mar. Night	140	7 43	34·953	+ 1·97	20	20·28	+0·14	0·900	0·5072562	− 116	− 11	− 994	− 545	− 41	0·5070855
	138	8 34	33·133	1·97	17	20·36	0·14	0·900	0·5076609	116	8	998	515	41	0·5074931
	139	9 25	34·617	1·97	20	20·51	0·14	0·899	0·5073278	116	11	1005	545	41	0·5071560
	137	10 15	34·166	1·97	18	20·61	0·14	0·899	0·5074261	116	9	1010	534	41	0·5072551
													Mean	...	0·5072474
8th Mar. Day	140	19 45	34·960	+ 1·97	19	20·33	+0·13	0·901	0·5072549	− 116	− 10	− 996	− 546	− 41	0·5070840
	138	20 37	33·114	1·97	21	20·42	0·13	0·902	0·5076657	116	12	1001	516	41	0·5074971
	139	21 27	34·601	1·97	20	20·53	0·13	0·900	0·5073312	116	11	1006	545	41	0·5071593
	137	22 18	34·157	1·97	18	20·67	0·13	0·900	0·5074278	116	9	1013	535	41	0·5072564
													Mean	...	0·5072402
													Mean of Day and Night	...	**0·5072483**
8th Mar. Night	137	7 31	34·171	+ 1·93	18	20·70	+0·16	0·897	0·5074248	− 113	− 9	− 1014	− 533	− 41	0·5072538
	139	8 21	34·597	1·93	20	20·81	0·16	0·896	0·5073321	113	11	1020	543	41	0·5071593
	138	9 13	33·120	1·93	21	20·94	0·16	0·896	0·5076641	113	12	1026	513	41	0·5074936
	140	10 2	34·952	1·93	19	21·11	0·16	0·896	0·5072563	113	10	1034	543	41	0·5070822
													Mean	...	0·5072472
9th. Mar Day	137	19 30	34·153	+ 1·93	18	20·90	+0·12	0·899	0·5074288	− 113	− 9	− 1024	− 534	− 41	0·5072567
	139	20 20	34·598	1·93	20	20·94	0·12	0·897	0·5073317	113	11	1026	544	41	0·5071582
	138	21 12	33·095	1·93	21	21·09	0·12	0·897	0·5076699	113	12	1033	513	41	0·5074987
	140	22 1	34·933	1·93	20	21·15	0·12	0·897	0·5072605	113	11	1036	544	41	0·5070860
													Mean	...	0·5072499
													Mean of Day and Night	...	**0·5072486**
9th Mar. Night	140	7 55	34·949	+ 2·00	19	21·24	+0·13	0·895	0·5072569	− 117	− 10	− 1041	− 542	− 41	0·5070818
	138	8 46	33·107	2·00	16	21·35	0·13	0·894	0·5076672	117	7	1046	511	41	0·5074950
	139	9 36	34·593	2·00	19	21·51	0·13	0·893	0·5073329	117	10	1054	541	41	0·5071566
	137	10 27	34·136	2·00	19	21·53	0·13	0·893	0·5074326	117	10	1055	530	41	0·5072573
													Mean	...	0·5072477
10th Mar. Day	140	19 51	34·919	+ 2·00	19	21·48	+0·12	0·895	0·5072636	− 117	− 10	− 1053	− 542	− 41	0·5070873
	138	20 42	33·088	2·00	21	21·53	0·12	0·894	0·5076716	117	12	1055	511	41	0·5074980
	139	21 31	34·572	2·00	20	21·66	0·12	0·894	0·5073376	117	11	1061	542	41	0·5071604
	137	22 21	34·125	2·00	18	21·75	0·12	0·894	0·5074349	117	9	1066	531	41	0·5072585
													Mean	...	0·5072511
													Mean of Day and Night	...	**0·5072494**

Table 11.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
					Hathras.										
		h m	s	s	′	°	°		s						s
13th	137	7 38	34·198	+ 1·15	16	20·21	+0·13	0·898	0·5074188	− 68	− 7	− 990	− 533	− 45	0·5072545
Mar.	139	8 30	34·646	1·15	19	20·32	0·13	0·898	0·5073215	68	10	996	544	45	0·5071552
1913	138	9 23	33·132	1·15	20	20·46	0·13	0·898	0·5076612	68	11	1003	514	45	0·5074971
Night	140	10 13	34·970	1·15	18	20·53	0·13	0·897	0·5072528	68	9	1006	544	45	0·5070856
													Mean	...	0·5072481
14th	137	19 41	34·194	+ 1·15	17	19·86	+0·11	0·902	0·5074198	− 68	− 8	− 973	− 536	− 45	0·5072568
Mar.	139	20 32	34·644	1·15	20	19·92	0·11	0·902	0·5073217	68	11	976	547	45	0·5071570
Day	138	21 25	33·147	1·15	21	20·02	0·11	0·902	0·5076577	68	12	981	516	45	0·5074955
	140	22 15	34·983	1·15	19	20·13	0·21	0·901	0·5072499	68	10	986	546	45	0·5070844
													Mean	...	0·5072484
												Mean of Day and Night		...	**0·5072483**
14th	140	7 40	34·967	+ 1·37	19	20·24	+ 0·10	0·898	0·5072532	− 80	− 10	− 992	− 544	− 45	0·5070861
Mar.	138	8 32	33·137	1·37	21	20·32	0·10	0·898	0·5076602	80	12	996	514	45	0·5074955
Night	139	9 22	34·622	1·37	19	20·40	0·10	0·898	0·5073267	80	10	1000	544	45	0·5071588
	137	10 13	34·180	1·37	17	20·50	0·10	0·898	0·5074227	80	8	1005	533	45	0·5072556
													Mean	...	0·5072490
15th	140	19 46	34·990	+ 1·37	19	19·81	+0·14	0·902	0·5072486	− 80	− 10	− 971	− 547	− 45	0·5070833
Mar.	138	20 39	33·146	1·37	20	19·91	0·14	0·901	0·5076580	80	11	976	515	45	0·5074953
Day	139	21 31	34·624	1·37	19	20·05	0·14	0·901	0·5073261	80	10	982	546	45	0·5071598
	137	22 21	34·189	1·37	16	20·16	0·14	0·900	0·5074209	80	7	988	535	45	0·5072554
													Mean	...	0·5072485
												Mean of Day and Night		...	**0·5072487**
15th	137	7 50	34·171	+ 1·69	17	20·45	+0·15	0·898	0·5074249	− 99	− 8	− 1002	− 533	− 45	0·5072562
Mar.	139	8 41	34·617	1·69	19	20·55	0·15	0·899	0·5073277	99	10	1007	545	45	0·5071571
Night	138	9 33	33·112	1·69	17	20·70	0·15	0·899	0·5076659	99	8	1014	514	45	0·5074979
	140	10 21	34·952	1·69	19	20·79	0·15	0·897	0·5072563	99	10	1019	544	45	0·5070846
													Mean	...	0·5072490
16th	137	19 53	34·169	+ 1·69	17	20·29	+0·14	0·900	0·5074251	− 99	− 8	− 994	− 535	− 45	0·5072570
Mar.	139	20 43	34·625	1·69	19	20·34	0·14	0·900	0·5073260	99	10	997	545	45	0·5071564
Day	138	21 35	33·132	1·69	20	20·50	0·14	0·899	0·5076611	99	11	1005	514	45	0·5074937
	140	22 25	34·955	1·69	19	20·62	0·14	0·899	0·5072557	99	10	1010	545	45	0·5070848
													Mean	...	0·5072480
												Mean of Day and Night		..	**0·5072485**
16th	140	7 50	34·956	+ 1·49	19	20·90	+0·16	0·896	0·5072556	− 87	− 10	− 1024	− 543	− 45	0·5070847
Mar.	138	8 42	33·121	1·49	20	21·00	0·16	0·896	0·5076636	87	11	1029	513	45	0·5074951
Night	139	9 31	34·601	1·49	19	21·13	0·16	0·896	0·5073310	87	10	1035	543	45	0·5071590
	137	10 20	34·151	1·49	17	21·28	0·16	0·895	0·5074293	87	8	1043	532	45	0·5072578
													Mean	...	0·5072492
17th	140	19 54	34·958	+ 1·49	19	20·88	+0·13	0·897	0·5072552	− 87	− 10	− 1023	− 544	− 45	0·5070843
Mar.	138	20 45	33·131	1·49	20	20·94	0·13	0·896	0·5076613	87	11	1026	513	45	0·5074931
Day	139	21 37	34·617	1·49	19	21·08	0·13	0·896	0·5073276	87	10	1033	543	45	0·5071558
	137	22 30	34·169	1·49	17	21·20	0·13	0·895	0·5074252	87	8	1039	532	45	0·5072541
													Mean	...	0·5072468
												Mean of Day and Night		...	**0·5072480**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Aligarh.							
		h m	s	s	′	°	°		s						s
21st	137	8 47	34·169	+ 1·43	13	20·67	+0·09	0·905	0·5074252	− 84	− 5	− 1013	− 538	− 48	0·5072564
Mar.	139	9 38	34·614	1·43	19	20·73	0·09	0·905	0·5073285	84	10	1016	548	48	0·5071579
1913	138	10 30	33·120	1·43	20	20·82	0·09	0·904	0·5076641	84	11	1020	517	48	0·5074961
Night	140	11 20	34·951	1·43	19	20·90	0·09	0·904	0·5072567	84	10	1024	548	48	0·5070853
													Mean	...	0·5072489
22nd	137	20 46	34·177	+ 1·43	16	20·23	+0·06	0·907	0·5074236	− 84	− 7	− 991	− 539	− 48	0·5072567
Mar.	139	21 36	34·630	1·43	19	20·30	0·06	0·906	0·5073249	84	10	995	549	48	0·5071563
Day	138	22 28	33·134	1·43	20	20·33	0·06	0·906	0·5076607	84	11	996	518	48	0·5074950
	140	23 17	34·976	1·43	19	20·39	0·06	0·906	0·5072513	84	10	999	549	48	0·5070823
													Mean	...	0·5072476
													Mean of Day and Night	...	**0·5072483**
22nd	140	8 52	34·954	+ 1·87	18	20·69	+0·11	0·903	0·5072561	− 110	− 9	− 1014	− 547	− 48	0·5070833
Mar.	138	9 43	33·112	1·87	20	20·75	0·11	0·902	0·5076659	110	11	1017	516	48	0·5074957
Night	139	10 33	34·612	1·87	20	20·88	0·11	0·902	0·5073289	110	11	1023	547	48	0·5071550
	137	11 24	34·164	1·87	17	20·92	0·11	0·901	0·5074265	110	8	1025	535	48	0·5072539
													Mean		0·5072470
23rd	140	20 51	34·946	+ 1·87	18	20·30	+0·08	0·905	0·5072578	− 110	− 9	− 995	− 548	− 48	0·5070868
Mar.	138	21 42	33·119	1·87	20	20·32	0·08	0·905	0·5076643	110	11	996	518	48	0·5074960
Day	139	22 33	34·622	1·87	19	20·39	0·08	0·905	0·5073266	110	10	999	548	48	0·5071551
	137	23 24	34·173	1·87	17	20·50	0·08	0·905	0·5074243	110	8	1005	538	48	0·5072534
													Mean	...	0·5072478
													Mean of Day and Night	...	**0·5072474**
23rd	137	8 55	34·164	+ 1·08	17	20·72	+0·12	0·902	0·5074263	− 63	− 8	− 1015	− 536	− 48	0·5072593
Mar.	139	9 45	34·610	1·08	19	20·84	0·12	0·901	0·5073291	63	10	1021	546	48	0·5071603
Night	138	10 37	33·116	1·08	20	20·93	0·12	0·901	0·5076651	63	11	1026	515	48	0·5074988
	140	11 26	34·962	1·08	18	21·05	0·12	0·901	0·5072545	63	9	1031	546	48	0·5070848
													Mean	...	0·5072508
24th	137	20 55	34·161	+ 1·08	16	20·61	+0·07	0·903	0·5074270	− 63	− 7	− 1010	− 536	− 48	0·5072606
Mar.	139	21 46	34·635	1·08	19	20·69	0·07	0·902	0·5073237	63	10	1014	547	48	0·5071555
Day	138	22 37	33·131	1·08	21	20·73	0·07	0·902	0·5076615	63	12	1016	516	48	0·5074960
	140	23 26	34·966	1·08	19	20·80	0·07	0·902	0·5072335	63	10	1019	547	48	0·5070848
													Mean	...	0·5072492
													Mean of Day and Night	...	**0·5072500**
24th	140	9 6	34·978	+ 0·37	19	21·15	+0·16	0·900	0·5072509	− 22	− 10	− 1036	− 545	− 48	0·5070848
Mar.	138	9 58	33·139	0·37	20	21·32	0·16	0·899	0·5076595	22	11	1045	514	48	0·5074955
Night	139	10 48	34·615	0·37	19	21·47	0·16	0·898	0·5073282	22	10	1052	544	48	0·5071606
	137	11 39	34·181	0·37	16	21·55	0·16	0·898	0·5074227	22	7	1056	533	48	0·5072561
													Mean	...	0·5072493
25th	140	21 4	34·943	+ 0·37	18	21·31	+0·09	0·901	0·5072583	− 22	− 9	− 1044	− 546	− 48	0·5070914
Mar.	138	21 57	33·154	0·37	21	21·33	0·09	0·900	0·5076562	22	12	1045	515	48	0·5074920
Day	139	22 47	34·635	0·37	19	21·43	0·09	0·899	0·5073237	22	10	1050	545	48	0·5071562
	137	23 38	34·203	0·37	17	21·52	0·09	0·898	0·5074177	22	8	1054	533	48	0·5072512
													Mean	...	0·5072477
													Mean of Day and Night	...	**0·5072485**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
								Khurja.							
		h m	s	s	′	°	°		s						s
28th Mar. 1913 Night	137	8 57	34·062	+ 2·53	16	24·73	+0·05	0·885	0·5074487	− 149	− 7	− 1212	− 526	− 45	0·5072548
	139	9 48	34·510	2·53	19	24·86	0·05	0·886	0·5073507	149	10	1218	537	45	0·5071548
	140	11 33	34·845	2·53	18	24·94	0·05	0·886	0·5072790	149	9	1222	537	45	0·5070828
	138	12 27	33·013	2·53	24	24·94	0·05	0·886	0·5076891	149	15	1222	507	45	0·5074953
													Mean	...	0·5072469
29th Mar. Day	137	21 0	34·065	+ 2·53	19	24·57	+0·11	0·888	0·5074482	− 149	− 10	− 1204	− 527	− 45	0·5072547
	139	21 52	34·511	2·53	18	24·69	0·11	0·888	0·5073506	149	9	1210	538	45	0·5071555
	138	22 44	33·020	2·53	19	24·74	0·11	0·888	0·5076876	149	10	1212	508	45	0·5074952
	140	23 35	34·847	2·53	17	24·89	0·11	0·887	0·5072788	149	8	1220	538	45	0·5070828
													Mean	...	0·5072471
													Mean of Day and Night	...	**0·5072470**
29th Mar. Night	140	9 6	34·841	+ 2·71	17	24·92	+0·07	0·884	0·5072800	− 159	− 8	− 1221	− 536	− 45	0·5070831
	138	9 58	33·008	2·71	19	24·97	0·07	0·884	0·5076903	159	10	1224	506	45	0·5074959
	139	10 48	34·497	2·71	19	25·05	0·07	0·884	0·5073536	159	10	1227	536	45	0·5071559
	137	11 39	34·050	2·71	17	25·09	0·07	0·884	0·5074516	159	8	1229	525	45	0·5072550
													Mean	...	0·5072475
30th Mar. Day	140	21 8	34·863	+ 2·71	18	24·52	+0·11	0·886	0·5072753	− 159	− 9	− 1201	− 537	− 45	0·5070802
	138	21 59	33·025	2·71	19	24·53	0·11	0·885	0·5076863	159	10	1202	506	45	0·5074941
	139	22 50	34·509	2·71	18	24·67	0·11	0·885	0·5073509	159	9	1209	536	45	0·5071551
	137	23 41	34·061	2·71	17	24·74	0·11	0·883	0·5074490	159	8	1212	525	45	0·5072541
													Mean	...	0·5072459
													Mean of Day and Night	...	**0·5072467**
30th Mar. Night	137	8 56	34·073	+ 1·95	16	24·83	+0·03	0·883	0·5074465	− 114	− 7	− 1217	− 525	− 45	0·5072557
	139	9 46	34·513	1·95	19	24·91	0·03	0·883	0·5073502	114	10	1221	535	45	0·5071577
	138	10 39	33·032	1·95	19	24·92	0·03	0·883	0·5076847	114	10	1221	505	45	0·5074952
	140	11 29	34·855	1·95	18	24·92	0·03	0·883	0·5072770	114	9	1221	535	45	0·5070846
													Mean	...	0·5072483
31st Mar. Day	137	20 57	34·106	+ 1·95	16	24·50	+0·11	0·888	0·5074393	− 114	− 7	− 1201	− 527	− 45	0·5072499
	139	21 48	34·554	1·95	18	24·54	0·11	0·887	0·5073412	114	9	1202	538	45	0·5071504
	138	22 40	33·054	1·95	20	24·67	0·11	0·887	0·5076796	114	11	1209	507	45	0·5074910
	140	23 30	34·855	1·95	18	24·76	0·11	0·884	0·5072770	114	9	1213	536	45	0·5070853
													Mean	...	0·5072442
													Mean of Day and Night	...	**0·5072462**
31st Mar. Night	140	8 55	34·873	+ 1·76	17	24·92	+0·11	0·884	0·5072730	− 103	− 8	− 1221	− 536	− 45	0·5070817
	138	9 46	33·058	1·76	19	25·01	0·11	0·884	0·5076785	103	10	1225	506	45	0·5074896
	139	10 36	34·498	1·76	18	25·12	0·11	0·883	0·5073532	103	9	1231	535	45	0·5071609
	137	11 28	34·059	1·76	16	25·19	0·11	0·883	0·5074496	103	7	1234	525	45	0·5072582
													Mean	...	0·5072476
1st Apr. Day	140	20 58	34·868	+ 1·76	17	24·93	+0·15	0·884	0·5072742	− 103	− 8	− 1222	− 536	− 45	0·5070828
	138	21 51	33·034	1·76	19	25·06	0·15	0·884	0·5076845	103	10	1228	506	45	0·5074953
	139	22 41	34·521	1·76	18	25·17	0·15	0·883	0·5073483	103	9	1233	535	45	0·5071558
	137	23 31	34·073	1·76	17	25·32	0·15	0·882	0·5074463	103	8	1241	524	45	0·5072542
													Mean	...	0·5072470
													Mean of Day and Night	...	**0·5072473**

Table II.—Details of the Observations—(Continued).

Date	Pendulum	Sidereal Time	Coincidence Interval	Clock Rate	Mean Semi-Arc	Temperature: Corrected Mean	Temperature: Mean Change per hour	Density of Air	Observed Time of Vibration	Correction on account of: Clock Rate	Arc	Temperature	Density of Air	Flexure	Reduced Time of Vibration
									Dehra Dun.						
		h m	s	s	′	°	°		s						s
9th Apr. 1913 Night	137	10 32	34·036	+ 4·00	17	23·76	+0·13	0·838	0·5074548	− 235	− 8	− 1164	− 498	− 43	0·5072600
	139	11 22	34·477	4·00	19	23·91	0·13	0·838	0·5073578	235	10	1172	508	43	0·5071610
	138	12 14	32·992	4·00	21	24·00	0·13	0·837	0·5076943	235	12	1176	479	43	0·5074998
	140	13 5	34·807	4·00	19	24·11	0·13	0·837	0·5072871	235	10	1181	507	43	0·5070895
													Mean	...	0·5072526
10th Apr. Day	137	22 32	34·047	+ 4·00	18	23·78	+0·15	0·838	0·5074522	− 235	− 9	− 1165	− 498	− 43	0·5072572
	139	23 22	34·501	4·00	20	23·91	0·15	0·837	0·5073527	235	11	1172	507	43	0·5071559
	138	0 15	33·009	4·00	17	24·05	0·15	0·837	0·5076901	235	8	1178	479	43	0·5074958
	140	1 4	34·831	4·00	19	24·14	0·15	0·836	0·5072820	235	10	1183	507	43	0·5070842
													Mean	...	0·5072483
										Mean of Day and Night				...	**0·5072504**
10th Apr. Night	140	10 34	34·850	+ 3·34	19	24·22	+0·07	0·836	0·5072781	− 196	− 10	− 1187	− 507	− 43	0·5070838
	138	11 25	32·988	3·34	20	24·36	0·07	0·835	0·5076950	196	11	1194	478	43	0·5075028
	139	12 16	34·473	3·34	19	24·38	0·07	0·835	0·5073588	196	10	1195	506	43	0·5071638
	137	13 7	34·033	3·34	18	24·44	0·07	0·835	0·5074552	196	9	1198	496	43	0·5072610
													Mean	...	0·5072529
11th Apr. Day	140	22 37	34·816	+ 3·34	18	24·52	+0·10	8·836	0·5072852	− 196	− 9	− 1201	− 507	− 43	0·5070896
	138	23 28	32·992	3·34	20	24·55	0·10	8·835	0·5076942	196	11	1203	478	43	0·5075011
	139	0 19	34·485	3·34	16	24·68	0·10	8·835	0·5073562	196	7	1209	506	43	0·5071601
	137	1 10	34·048	3·34	18	24·73	0·10	8·835	0·5074518	196	9	1212	496	43	0·5072562
													Mean	...	0·5072517
										Mean of Day and Night				...	**0·5072523**
15th Apr. Night	137	10 56	34·071	+ 2·77	17	23·85	+0·10	0·837	0·5074468	− 163	− 8	− 1169	− 497	− 43	0·5072588
	139	11 47	34·503	2·77	20	23·93	0·10	0·837	0·5073522	163	11	1173	507	43	0·5071625
	138	12 39	33·018	2·77	21	24·00	0·10	0·837	0·5076881	163	12	1176	479	43	0·5075008
	140	13 28	34·850	2·77	19	24·10	0·10	0·837	0·5072780	163	10	1181	507	43	0·5070876
													Mean	...	0·5072524
16th Apr. Day	137	23 0	34·067	+ 2·77	18	23·85	+0·14	0·837	0·5074478	− 163	− 9	− 1169	− 497	− 43	0·5072597
	139	23 53	34·508	2·77	19	23·97	0·14	0·836	0·5073510	163	10	1175	507	43	0·5071612
	138	0 47	33·029	2·77	21	24·11	0·14	0·836	0·5076853	163	12	1181	478	43	0·5074976
	140	1 36	34·852	2·77	19	24·19	0·14	0·835	0·5072775	163	10	1185	506	43	0·5070868
													Mean	...	0·5072513
										Mean of Day and Night				...	**0·5072519**
16th Apr. Night	140	10 59	34·842	+ 2·44	19	24·25	+0·03	0·834	0·5072798	− 143	− 10	− 1188	− 505	− 43	0·5070909
	138	11 50	33·020	2·44	21	24·33	0·03	0·833	0·5076876	143	12	1192	476	43	0·5075010
	139	12 41	34·506	2·44	20	24·34	0·03	0·833	0·5073516	143	11	1193	505	43	0·5071621
	137	13 34	34·071	2·44	19	24·35	0·03	0·833	0·5074467	143	10	1193	495	43	0·5072583
													Mean	...	0·5072531
17th Apr. Day	140	23 2	34·860	+ 2·44	19	24·08	+0·12	0·836	0·5072758	− 143	− 10	− 1180	− 507	− 43	0·5070875
	138	23 53	33·031	2·44	21	24·13	0·12	0·834	0·5076849	143	12	1182	477	43	0·5074992
	139	0 43	34·499	2·44	20	24·25	0·12	0·833	0·5073530	143	11	1188	505	43	0·5071640
	137	1 34	34·063	2·44	18	24·35	0·12	0·833	0·5074486	143	9	1193	495	43	0·5072603
													Mean	...	0·5072528
										Mean of Day and Night				...	**0·5072529**

It will be noticed that at some stations, notably Alīgarh, Muttra and Dehra Dūn in April, the differences between the daily means are large. Thus, at Muttra there is a range of 22×10^{-7} secs., at Alīgarh, of 26 and at Dehra Dūn, of 25. These discrepancies are believed to be mainly due to variations in the clock rate or possibly to the flash not working uniformly.

It should be possible to form some idea as to the variations in the rate of the clock by deducing the rate from the time of vibration of a pendulum at Dehra Dūn where the true time of vibration is known. This method, of course, assumes that the whole source of error is in the rate and is, therefore, only a rough one but it is difficult to see what other cause could account for the large variations in the times of vibration of any one pendulum on different days. The temperature of the pendulum room is nearly always so steady that it is impossible that any large errors are introduced by the pendulum not being at the same temperature as that shewn by the thermometer in the dummy pendulum, and it is quite impossible for other uncertainties such as air pressure, flexure and the actual estimation of the coincidences to produce anything approaching the variations that we find. A probable source of error *viz.*, lack of uniformity in the movement of the flash shutter is practically the same thing as a variation of clock rate and cannot be dissociated from it.

We have some excellent data for determining the fluctuations in clock rate in some observations that were made in Dehra Dūn in August, 1913 during the visit of 2 members of the de Filippi expedition. On each day our pendulums were each swung once at 3 hour intervals and both our clock (S & R) and theirs (a chronometer by Poole) were used for each swing. On 3 out of the 4 days work the mean rate for the day of each clock was determined by star observations (on the 4th night clouds prevented this), and the mean time of vibration by each clock agreed to 1×10^{-7} sec., while the mean difference between the means of the individual pendulums was only 3×10^{-7} secs., the greatest difference being 6×10^{-7} secs. We can, thus, assume with confidence that the mean time of vibration of each pendulum was correct, and we can deduce the actual rate of the clock at the time of swinging each pendulum.

These deduced rates are herewith shewn :—

Date	Mean Time approx.	Rate of Clock (S & R)	Rate of Chronr. (Poole)	Rates deduced from star observations	
				S & R	Poole
	h m	secs.	secs.	secs.	secs.
1913 Aug., 27th	8 30	−2·03	+0·44		
	12 00	1·50	0·41		
	15 00	0·97	0·83		
	18 00	1·07	0·41		
28th	8 05	−1·65	+0·66		
	11 05	1·77	0·46		
	14 30	1·11	0·49		
	17 30	1·50	0·49	−1·50	+0·52
29th	8 20	−1·50	+0·58		
	11 10	2·23	0·56		
	14 20	1·28	0·53		
	17 30	1·23	0·51	−1·59	+0·44
30th	8 10	−1·55	+0·32		
	11 10	1·75	0·41		
	14 10	0·65	0·41		
	17 10	0·60	0·46	−1·13	+0·50

We notice at once that the deduced rates of our clock S & R show large variations. Thus, on August 29th there is an apparent change in rate of 1 second between 11 a. m. and 5-30 p. m. and a larger change on the 30th. A change in rate of 1 second per diem is equivalent to a change of 59×10^{-7} secs. in the time of vibration of our pendulums. We also notice that our clock has a greater losing rate during the morning than in the afternoon, and that the actual rate approaches the mean rate at about 1 p m. If further observations were to point to this, it would be sufficient to swing each pendulum once daily, the hours of observation extending from 11 a. m. to 3 p. m. but at present it would be unsafe to do this.

Enough evidence has, however, been given to show that the rate of our clock does vary largely throughout the day but it is unlikely that, with the four complete sets of swings that we take at present, our mean time of vibration is much in error.

In Table III are shown the times of vibration at Dehra Dūn at the beginning and end of the season. These observations were made in the new pendulum room which forms part of the building containing the bar alley and seismograph room. The new room is about 300 feet south of the old pendulum room. It will be noted that there is no difference between the mean times of vibration in the two rooms.

Table III.—Times of vibration at Dehra Dūn.

Date	137	138	139	140	Mean
1912-13	s	s	s	s	s
November, 11-12	0·5072575	0·5074984	0·5071602	0·5070867	0·5072507
„ 12-13	2605	4985	1621	0864	2519
„ 13-14	2586	4976	1606	0864	2508
„ 14-15	2590	4993	1616	0883	2521
Mean	0·5072589	0·5074985	0·5071611	0·5070869	0·5072514
April, 9-10	0·5072586	0·5074978	0·5071585	0·5070868	0·5072504
„ 10-11	2586	5020	1619	0867	2523
„ 15-16	2593	4992	1618	0872	2519
„ 16-17	2593	5001	1631	0892	2529
Mean	0·5072589	0·5074998	0·5071613	0·5070875	0·5072519
General Mean	0·5072589	0·5074992	0·5071612	0·5070872	0·5072516
Difference, Apr.-Nov.	0	+ 13	+ 2	+ 6	+ 5

It will be noted that the mean time of vibration for the season is the same as for the previous year, though the individual means are not in good agreement. The differences between the mean and individual pendulums are shown in Table IV.

Table IV.—Differences between the mean and individual pendulums.

Station	137	v	138	v	139	v	140	v
Dehra Dūn ...	−75	+ 1	+2471	+ 1	+903	− 4	+1645	+ 3
Lalitpur ...	−71	+ 5	−2472	0	+903	− 4	+1639	− 3
Bina ...	−81	− 5	−2466	+ 6	+906	− 1	+1642	0
Bhopāl ...	−86	−10	−2469	+ 3	+907	0	+1647	+ 5
Goona ...	−80	− 4	−2463	+ 9	+904	− 3	+1639	− 3
Kaliānpur ...	−81	− 5	−2472	0	+903	− 4	+1650	+ 8
Jhānsi ...	−76	0	−2475	− 3	+909	+ 2	+1642	0
Gwalior ...	−73	+ 3	−2474	− 2	+908	+ 1	+1639	− 3
Sīpri ...	−77	− 1	−2476	− 4	+906	− 1	+1647	+ 5
Dholpur ...	−59	+17	−2480	− 8	+905	− 2	+1636	− 6
Agra ...	−79	− 3	−2475	− 3	+904	− 3	+1649	+ 7
Muttra ...	−73	+ 3	−2472	0	+905	− 2	+1640	− 2
Hāthras ...	−75	+ 1	−2470	+ 2	+910	+ 3	+1637	− 5
Alīgarh ...	−74	+ 2	−2470	+ 2	+915	+ 8	+1631	−11
Khurja ...	−78	− 2	−2471	+ 1	+910	+ 3	+1639	− 3
Dehra Dūn ...	−70	+ 6	−2479	− 7	+906	− 1	+1644	+ 2
Means	−76		−2472		+907		+1642	
Means of 1911-12	−72		−2474		+903		+1644	

There is again no evidence of any sudden or gradual change in any of the pendulums and the mean differences agree well with those of the previous year.

In Table V are shown the mean time of vibration of each pendulum at each station and the values of g deduced.

Table V.—Mean times of vibration and deduced values of g.

Station		137	138	139	140	Mean
Dehra Dūn ...	s.	0·5072589	0·5074902	0·5071612	0·5070872	0·5072516
Bhopāl ...	s.	0·5073513	0·5075896	0·5072520	0·5071780	0·5073427
		+924	+904	+908	+908	+911
	g.	978·706	978·714	978·712	978·712	978·711
Kaliānpur ...	s.	0·5073339	0·5075730	0·5072355	0·5071608	0·5073258
		+750	+738	+743	+736	+742
	g.	978·773	978·778	978·776	978·779	978·777
Bina ...	s.	0·5073290	0·5075675	0·5072303	0·5071567	0·5073209
		+701	+683	+691	+695	+693
	g.	978·792	978·799	978·796	978·795	978·795
Goona ...	s.	0·5073259	0·5075642	0·5072275	0·5071540	0·5073179
		+670	+650	+663	+668	+663
	g.	978·804	978·812	978·807	978·805	978·807
Lalitpur ...	s.	0·5073231	0·5075632	0·5072257	0·5071521	0·5073160
		+642	+640	+645	+649	+644
	g.	978·815	978·816	978·814	978·812	978·814
Sīpri ...	s.	0·5073078	0·5075477	0·5072095	0·5071354	0·5073001
		+489	+485	+483	+482	+485
	g.	978·874	978·876	978·877	978·877	978·876
Jhānsi ...	s.	0·5072989	0·5075388	0·5072004	0·5071271	0·5072913
		+400	+396	+392	+399	+397
	g.	978·909	978·910	978·912	978·909	978·910
Gwalior ...	s.	0·5072861	0·5075262	0·5071880	0·5071149	0·5072788
		+272	+270	+268	+277	+272
	g.	978·958	978·959	978·960	978·956	978·958
Dholpur ...	s.	0·5072740	0·5075161	0·5071776	0·5071045	0·5072681
		+151	+169	+164	+173	+165
	g	979·005	978·998	979·000	978·996	978·999
Agra ...	s.	0·5072613	0·5075009	0·5071630	0·5070885	0·5072534
		+24	+17	+18	+13	+18
	g.	979·054	979·056	979·056	979·058	979·056
Muttra ...	s.	0·5072565	0·5074964	0·5071587	0·5070852	0·5072492
		−24	−28	−25	−20	−24
	g.	979·072	979·074	979·073	979·071	979·072
Hāthras ...	s.	0·5072559	0·5074954	0·5071574	0·5070847	0·5072484
		−30	−38	−38	−25	−32
	g.	979·075	979·078	979·078	979·073	979·075
Aligarh ...	s.	0·5072560	0·5074956	0·5071571	0·5070855	0·5072486
		−29	−36	−41	−17	−30
	g.	979·074	979·077	979·079	979·070	979·075
Khurja ...	s.	0·5072546	0·5074939	0·5071558	0·5070829	0·5072468
		−43	−53	−54	−43	−48
	g.	979·080	979·083	979·084	979·080	979·082

The Reduction to Sea Level.

The orographical correction was only computed for Kaliānpur and was found to be inappreciable there.

The abstract of the season's results is given in Table VI.

Table VI.—Abstract of results.

Station	Height	γ_0	Corrections		γ_B	g	$g-\gamma_B$
			for height	for mass (Bouguer)			
	feet	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*	*dynes*
Bhopāl ..	1630	978·835	−0·153	+0·055	978·737	978·711	−0·026
Kaliānpur ...	1763	978·892	−0·165	+0·059	978·786	978·777	−0·009
Bina ...	1355	978·896	−0·127	+0·046	978·815	978·795	−0·020
Goona ...	1569	978·928	−0·147	+0·053	978·834	978·807	−0·027
Lalitpur ...	1199	978·931	−0·112	+0·040	978·859	978·814	−0·045
Sīpri ...	1533	978·982	−0·144	+0·052	978·890	978·876	−0·014
Jhānsi ...	858	978·983	−0·080	+0·029	978·932	978·910	−0·022
Gwalior ...	658	979·039	−0.062	+0·022	978·999	978·958	−0·041
Dholpur ...	577	979·072	−0·054	+0·019	979·037	978.999	−0·038
Agra ...	535	979·107	−0·050	+0·018	979·075	979·056	−0·019
Muttra ...	562	979·129	−0·053	+0·019	979·095	979·072	−0·023
Hāthras ...	587	979·139	−0·055	+0·020	979·104	979·075	−0·029
Alīgarh ...	612	979·160	−0·057	+0·021	979·124	979·075	−0·049
Khurja ...	649	979·186	−0·061	+0.022	979·147	979.082	−0·065

Once again we make the same assumption that a residual of −0·030 represents normal gravity, and we see that we have three areas where gravity is in excess. The first, comprising the stations Bhopāl to Goona, undoubtedly forms part of the main "hidden chain" and again, as at Maihar and Japla, we find a small negative belt indicated by the residual at Lalitpur dividing the main hidden chain from a detached area of high density shewn here by the residuals at Jhānsi and Sīpri. Until the country between Jhānsi and Allahābād and on to Sasarām has been examined it is impossible to say whether these three areas of high density form one continuous belt or whether they are isolated. Similarly, the negative residuals at Lalitpur, Maihar and Japla may indicate a continuous trough of low density.

The third area of high density lies round the stations Agra to Hāthras and may, of course, extend to the east and west. As was stated at the beginning of this chapter, the residuals at the stations Kaliāna to Gesupur indicated the existence of such an area not far south of Gesupur and the pendulums, while locating this area of high density, have also indicated a small trough of relatively low density between Gesupur and Hāthras, the value of $g-\gamma_B$ at Gesupur being −0·043 whereas at Khurja it is −0·065.

Regarding the observations at Kaliānpur a list is appended showing the values of gravity obtained by Captains Basevi and Heaviside with the old seconds-pendulums and those with the present half-seconds apparatus.

Station	Value of g		Difference
	with old seconds-pendulums	with half-seconds pendulums	
	dynes	*dynes*	*dyne*
Dehra Dūn ...	978·962	979·063	+0·101
Madras ...	978·238	978·279	+0·041
Colāba ...	978·605	978·631	+0·026
Kaliāna ...	979·107	979·154	+0·047
Nojli ...	979·116	979·143	+0·027
Mussooree (Camel's Back)	978·751	978·793	+0·042
Miān Mīr ...	979·274	979·383	+0·109
Bangalore ...	977·998	978·025	+0·027
Kaliānpur ...	978·723	978·777	+0·054

The values of g in both series of observations depend on the value at Dehra Dūn. There is, however, a large discrepancy in this base value and the differences between the old and new values of dg (gravity at Dehra Dūn *minus* gravity at station) are, with the exception of Miān Mīr, even greater than the differences of g. With regard to Miān Mīr it is to be noted that at this station a specially light stand for the pendulums was used by Captain Basevi, and as this stand was not used at Dehra Dūn the observations at Miān Mīr are not strictly comparable with the rest of the series. It is not proposed to attempt to explain the discrepancies between the old and new series of observations; and with regard to Kaliānpur, the last old station to be reoccupied, it is only possible to say that the discrepancy is of about the same order of magnitude as at the other stations.

CHAPTER VIII.

The Hayford Correction for Topography and Isostatic Compensation.

Hitherto, in the abstracts of each season's work, the Bouguer hypothesis for topography has alone been used. This hypothesis assumes that all surface masses are uncompensated and takes no account of the curvature of the sea-level surface. The first correction, for height, allows for the increased distance of the station from the earth's centre; the second, for mass, is based on the assumption that the station stands on an indefinitely extended horizontal plain whose mass is uncompensated; while a third correction is occasionally necessary to allow for the departure of the actual surface of the earth from this assumed plain.

The fact that *all* Bouguer residuals close to the Himalaya or other high mountains are negative, points to the strong probability of some sort of underground compensation, and this chapter shows the method which has been employed to correct for this.

It is, first, necessary to make some definite assumptions as to the extent and depth of compensation. Mr. J. F. Hayford, late of the United States Coast and Geodetic Survey, to whom we are much indebted for his investigation into the "isostatic" correction to gravity results, has assumed that compensation is complete at a depth of 113·7 kilometres below the earth's surface, and, with small modifications which will be dealt with later, we have accepted his assumptions. By complete compensation we mean that at and below the depth of compensation any element of mass is subject to equal pressures from all directions, and from this it follows that the mass in any prismatic column standing on a base of unit area at the depth of compensation and extending up to the actual surface of earth or sea is always the same, whatever the height of the column may be. Therefore, the higher the column the smaller the density, or in other words, excesses of mass (mountains) are compensated by deficiencies of density, and defects of mass (oceans) by excesses of density, the actual value of density in each column being derived directly from its height, since the mass equals height × density and is constant.

Other assumptions made by Mr. Hayford are:—

(a) The earth is a sphere of radius 6370 kilometres.

(b) The mean surface density of the earth is 2·67.

(c) Ratio of surface density to mean density of the earth as a whole is $\frac{1}{2 \cdot 09}$.

(d) Value of k the "gravitation constant" or the acceleration due to the attraction of unit mass at unit distance is 6673×10^{-11} in the C. G. S. system of units.

The computation of the effect of topography and its isostatic compensation on the value of gravity at a station can be divided into two main heads:—

I. The effect of masses near the station where curvature need not be considered.

II. The effect of distant masses where curvature must be allowed for.

Taking distant masses first, it is necessary to state here that we have so far accepted all Mr. Hayford's assumptions and reduction tables for the effect of masses situated outside a radius of 103·6 miles from the station. Within this radius we have computed new reduction tables based on slightly different assumptions. This radius of 103·6 miles or 166·7 kilometres is the boundary between near and distant masses in main heads I and II above.

It is advisable to give a short description of Mr. Hayford's method of computing the effect of distant masses, and the following is abstracted from his publication* on the subject.

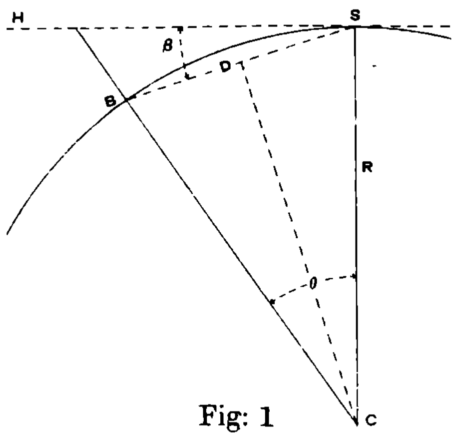

Fig: 1

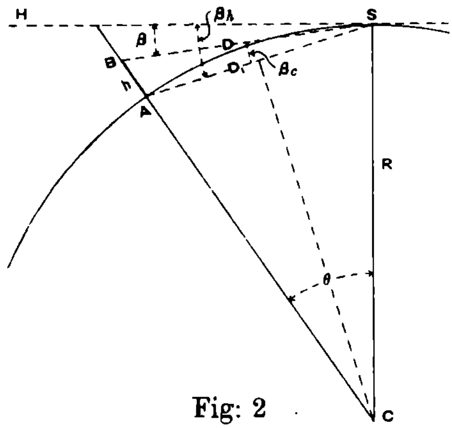

Fig: 2

The attraction of an elementary mass dm situated at B (fig. 1) acting upon a mass of 1 gramme at the station of observation, S, is

$$\frac{kdm}{D^2} \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

where k is the gravitation constant and D the distance of the elementary mass from the station, *i.e.* SB in the figure. The vertical component of this attraction, which is all that is concerned in this investigation, is

$$kdm\frac{\sin\beta}{D^2} \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

in which β is the angle of depression, below the horizon of the station, of the straight line from S to B. If the station and the elementary mass are at the same height above sea-level, we have

$$\beta = \frac{\theta}{2}$$

and

$$D = 2R\sin\frac{\theta}{2}$$

Substituting in formula (2) the vertical attraction becomes

$$kdm\frac{\sin\frac{\theta}{2}}{4R^2\sin^2\frac{\theta}{2}} \text{ or } kdm\,E \quad \ldots \quad \ldots \quad (3)$$

where E depends only on the direction and distance of the elementary mass from the station.

* *The Effect of Topography and Isostatic Compensation upon the Intensity of Gravity* by J. F. Hayford and W. Bowie.

If the elementary mass is higher than the station, the difference of height being h, we have (fig. 2)

$$\sin \beta_c = \frac{h \cos \frac{\theta}{2}}{D}$$

and in the same triangle,

$$D^2 = D_1^2 + h^2 + 2D_1 h \sin \frac{\theta}{2}$$

also $$\beta_h = \frac{\theta}{2}$$

and $$\beta = \beta_h - \beta_c$$

Therefore, substituting in formula (2), the vertical attraction becomes

$$\text{kdm} \frac{\sin \left\{ \frac{\theta}{2} - \sin^{-1} \frac{h \cos \frac{\theta}{2}}{\sqrt{D_1^2 + h^2 + 2D_1 h \sin \frac{\theta}{2}}} \right\}}{D_1^2 + h^2 + 2D_1 h \sin \frac{\theta}{2}} \text{ or kdm } E_1 \quad \ldots \quad (4)$$

Similarly, when the elementary mass is lower than the station, the vertical attraction may be shewn to be

$$\text{kdm} \frac{\sin \left\{ \frac{\theta}{2} + \sin^{-1} \frac{h \cos \frac{\theta}{2}}{\sqrt{D_1^2 + h^2 - 2D_1 h \sin \frac{\theta}{2}}} \right\}}{D_1^2 + h^2 - 2D_1 h \sin \frac{\theta}{2}} \text{ or kdm } E_2 \quad \ldots \quad (5)$$

The only assumption made in these formulæ is that the earth is a sphere. Mr. Hayford shows that the error in this assumption is very small and may be neglected.

If now the surface of the earth be divided up into zones by concentric circles with the station as centre, to obtain the vertical attraction in any such zone it is necessary to integrate the expressions (3), (4) and (5) within the necessary limits of θ and h. The expressions E. E_1 and E_2 cannot*, however, according to the writers of the American publication referred to, be directly integrated with respect to θ and h by calculus, and an integration by numerical computation was made. The vertical component of the attraction of the topography in any zone was, therefore, expressed as km × (average value of E for the zone).

For the effect of the compensation of the topography the formulæ are the same. The negative mass involved is m, the same as the mass of the topography but of opposite sign, the values of E are those fixed by the direction and distance of the compensation from the station and h is made to vary from zero at sea-level to 113·7 kilometres below that surface.

The effect of the topography and compensation might have been computed separately, but it was believed that greater rapidity would be secured without loss of accuracy by combining the two.

---

* The integrations have been performed in India.

With any selected value of θ, E was computed for several values of h down to the depth of compensation. By successive trials with increasing numbers of values of h it was ascertained how many values were necessary to obtain sufficient accuracy in the mean value of E corresponding to the selected value of θ. Proceeding thus, values of E were obtained for values of θ varying from 1° 30′ to 180° (when θ = 1° 29′ 58″, the distance = 103·6 miles).

The next step was to determine the limits of zones. It was known from a preliminary study of the problem that for all distant zones the attraction would be nearly proportional to the height. Therefore, it was decided to determine such widths for the selected zones, and such a number of compartments in each zone, that an attraction of 0·0001 dyne for any one compartment would correspond to a height of 100, 1000 or 10000 feet in that compartment. The unit of height corresponding to 0·0001 dyne and the number of compartments in each zone were arbitrarily selected, and will be seen in the list of zones*.

Starting from the antipodes, $\theta = 180°$, the attraction in successive sub-zones of 2° width was computed until the total attraction amounted to 0·0001 dyne, the limit of the innermost sub-zone being obtained by interpolation, and so on for each successive zone.

The area of a zone lying between limiting values of θ, θ_1 and θ_2, on the surface of a sphere of radius R is

$$2\pi R^2 (\cos\theta_1 - \cos\theta_2)$$

and, since the mass in any zone may be represented by $\delta \times h \times$ area, the attraction of the mass in the zone whose average height is h is equal to $k\delta h \times 2\pi R^2 (\cos\theta_1 - \cos\theta_2) \times$ (mean value of E for the zone).

The details of the computation of the limit of zone 1 are shewn below, the values of E being interpolated from those published by Mr. Hayford.

Zone 1.
h = 10000 feet.

θ_1 to θ_2	log ($\cos\theta_1 - \cos\theta_2$)	log ($k\delta h 2\pi R^2$)	log E	Attraction
				dyne
180° to 178°	$\bar{4}$·7847599	17·1412982	$\bar{21}$·7444495	0·0000004683
178 to 176	$\bar{3}$·2616672	17·1412982	$\bar{21}$·7447622	·0000014052
176 to 174	$\bar{3}$·4831878	17·1412982	$\bar{21}$·7452310	·0000022894
174 to 172	$\bar{3}$·6287771	17·1412982	$\bar{21}$·7460111	·0000032816
172 to 170	$\bar{3}$·7372165	17·1412982	$\bar{21}$·7469454	·0000042214
170 to 168	$\bar{3}$·8234873	17·1412982	$\bar{21}$·7481880	·0000051638
168 to 166	$\bar{3}$·8949748	17·1412982	$\bar{21}$·7495817	·0000061074
166 to 164	$\bar{3}$·9558801	17·1412982	$\bar{21}$·7514331	·0000070569
164 to 162	$\bar{2}$·0088215	17·1412982	$\bar{21}$·7535065	·0000080099
162 to 160	$\bar{2}$·0555274	17·1412982	$\bar{21}$·7559510	·0000089697
160 to 158	$\bar{2}$·0972122	17·1412982	$\bar{21}$·7586848	·0000099356
158 to 156	$\bar{2}$·1347634	17·1412982	$\bar{21}$·7617024	·0000109085
156 to 154	$\bar{2}$·1688362	17·1412982	$\bar{21}$·7649976	·0000118886
154 to 152	$\bar{2}$·1999307	17·1412982	$\bar{21}$·7685641	·0000128764
152 to 150	$\bar{2}$·2284568	17·1412982	$\bar{21}$·7723951	·0000138724
			Total ...	0·0001064551

* The unit of the table has lately been changed to 10^{-5} dyne

The change for 2° in the last sub-zone is 0·0000138724; therefore, the change for 56′ is 0·0000064738, and if the limit of the zone is taken as 150° 56′ the total attraction is 0·0001 − 0·0000000187. The inner limit of zone 1 is, therefore, 150° 56′, to the nearest minute. It must be noted that as R and k are in the C.G.S. system, h must be converted into centimetres.

The other zones were computed in a similar manner except that the widths of the sub-zones were reduced as θ became less.

For ocean zones, since the space between sea-level and the solid surface of the earth is filled with sea water of density 1·027, the defect of density in this space is $2{\cdot}67 - 1{\cdot}027 = 2{\cdot}67 \times 0{\cdot}615 = \delta \times 0{\cdot}615$, and if an elevation of 1000 feet in any land compartment produces an attraction of 0·00001 dyne the corresponding ocean depth to produce this attraction will be

$$\frac{1000}{0{\cdot}615} \text{ feet} = 1626 \text{ feet} = 271 \text{ fathoms.}$$

Hence the unit of depth for ocean zones in the reduction tables.

So far it has been assumed that the attraction is proportional to the height. This is not strictly true, but the error was found to be inappreciable for zones 1 to 13. For zones 14 to 18 a few special computations were made, when it was found that the necessary corrections were small and varied regularly. These are shewn in the reduction tables as "departure from proportionality."

Similarly, it was at first assumed that the station was at sea-level. Here, again, the correction for height of station was found to be negligible for zones 1 to 13 and small for the remainder. These corrections are also shewn in the reduction tables.

The reduction tables for distant zones (main head II) are shewn below :—

REDUCTION TABLE FOR OUTER ZONES.

The unit of correction is 10^{-5} dyne, *minus* for land and *plus* for water.

Zone	Radii in angles subtended at centre of the earth		Number of compartments	Unit of height which produces an effect of 10^{-5} dyne in each compartment	Unit of depth which produces an effect of 10^{-5} dyne in each compartment
	Outer	Inner			
	° ′ ″	° ′ ″		*feet*	*fathoms*
1	180 0 0	150 56 0	1	1000	271
2	150 56 0	105 48 0	6	1000	271
3	105 48 0	72 13 0	10	1000	271
4	72 13 0	51 4 0	12	1000	271
5	51 4 0	35 58 0	16	1000	271
6	35 58 0	26 41 0	18	1000	271
7	26 41 0	20 41 0	2	100	27·1
8	20 41 0	14 9 0	4	100	27·1
9	14 9 0	10 44 0	4	100	27·1
10	10 44 0	7 51 30	6	100	27·1
11	7 51 30	5 46 34	8	100	27·1
12	5 46 34	4 19 13	10	100	27·1
13	4 19 13	3 3 5	16	100	27·1
14	3 3 5	2 33 46	10	100	27·1
15	2 33 46	2 11 53	10	100	27·1
16	2 11 53	1 54 52	10	100	27·1
17	1 54 52	1 41 13	10	100	27·1
18	1 41 13	1 29 58	10	100	27·1

SPECIAL REDUCTION TABLES.

ZONES 14 to 18.

The unit of correction is 10^{-4} dyne*, *minus* for land and *plus* for water.

The correction found from the previous table must be divided by ten before entry in the second column of the five succeeding tables.

The unit here is ten times as large as that in all the other tables.

Zone	Correction as read from map	Correction for departure from proportionality	Correction for elevation of station at 5000 feet	10000 feet	15000 feet
14	+ 150	+ 6	− 1	− 2	− 3
	+ 125	+ 4	− 1	− 2	− 3
	+ 100	+ 3	− 1	− 1	− 2
	+ 75	+ 2	− 1	− 1	− 2
	+ 50	+ 1	0	− 1	− 1
	+ 25	0	0	0	0
	0	0	0	0	0
	− 25	0	0	0	0
	− 50	0	0	+ 1	+ 1
	− 75	+ 1	0	+ 1	+ 1
	− 100	+ 2	+ 1	+ 1	+ 2
15	+ 150	+ 5	− 1	− 3	− 4
	+ 125	+ 4	− 1	− 2	− 3
	+ 100	+ 2	− 1	− 2	− 3
	+ 75	+ 1	− 1	− 1	− 2
	+ 50	+ 1	0	− 1	− 1
	+ 25	0	0	0	− 1
	0	0	0	0	0
	− 25	0	0	0	+ 1
	− 50	0	0	+ 1	+ 1
	− 75	+ 1	+ 1	+ 1	+ 2
	− 100	+ 1	+ 1	+ 2	+ 3
16	+ 150	+ 4	− 2	− 3	− 5
	+ 125	+ 3	− 1	− 3	− 4
	+ 100	+ 2	− 1	− 2	− 3
	+ 75	+ 1	− 1	− 1	− 2
	+ 50	0	− 1	− 1	− 2
	+ 25	0	0	− 1	− 1
	0	0	0	0	0
	− 25	0	0	+ 1	+ 1
	− 50	0	+ 1	+ 1	+ 2
	− 75	+ 1	+ 1	+ 1	+ 2
	− 100	+ 1	+ 1	+ 2	+ 3
17	+ 150	+ 3	− 2	− 4	− 6
	+ 125	+ 2	− 2	− 3	− 5
	+ 100	+ 1	− 1	− 3	− 4
	+ 75	+ 1	− 1	− 2	− 3
	+ 50	0	− 1	− 1	− 2
	+ 25	0	− 1	− 1	− 1
	0	0	0	0	0
	− 25	0	+ 1	+ 1	− 1
	− 50	0	+ 1	+ 1	− 2
	− 75	+ 1	+ 1	+ 2	− 3
	− 100	+ 1	+ 1	+ 3	− 4

* Corrections in units of 10^{-5} dyne may be read off from diagrams I and II at the end of the book.

SPECIAL REDUCTION TABLES—(*Contd.*).

ZONES 14 to 18—(*Contd.*).

Zone	Correction as read from map	Correction for departure from proportionality	Correction for elevation of station at		
			5000 feet	10000 feet	15000 feet
18	+ 150	+ 1	− 2	− 5	− 7
	+ 125	+ 1	− 2	− 4	− 6
	+ 100	+ 1	− 2	− 3	− 5
	+ 75	0	− 1	− 2	− 3
	+ 50	0	− 1	− 3	− 2
	+ 25	0	0	− 1	− 1
	0	0	0	0	0
	− 25	0	0	+ 1	+ 1
	− 50	0	+ 1	+ 2	+ 2
	− 75	0	+ 1	+ 2	+ 3
	− 100	0	+ 2	+ 3	+ 5

The unit of correction is 0·0001 dyne, *minus* for land and *plus* for water, the correction being applied to γ and not g. In all these zones the effect of the compensation is greater than that of the topography, the correction representing the combined effect.

This account of Mr. Hayford's reduction tables is somewhat brief, but full details will be found in *The Effect of Topography and Isostatic Compensation upon the Intensity of Gravity* published at the Government Printing Office, Washington, U.S.A. from which publication most of the above has been abstracted.

We now come to the near zones inside 103·6 miles, and for these new reduction tables have been computed by us based on a slightly different assumption. This difference is that the depth at which isostatic compensation is assumed to be complete is taken as 70 miles (=112·65 kilometres instead of 113·7 kilometres) below *sea-level*, instead of below the *actual surface* of the earth. With regard to the difference in depth Mr. Hayford has computed the change in correction produced by altering the compensation depth from 113·7 to 85·3 kilometres for 11 gravity stations. The maximum change for the inner zones of these 11 stations is −0·0227 dyne and the mean −0·0107 dyne: for the outer zones the maximum and mean changes are −0·0206 and +0·0018 respectively, for a change in compensation depth of 28 kilometres. If, therefore, the depth of compensation in our reduction tables was altered by 1 kilometre to agree with Mr. Hayford's, or if his value was altered to ours, the maximum change is not likely to be as great as 0·001 dyne $\left(\frac{0\cdot0227}{28} = 0\cdot0008, \text{ and } \frac{0\cdot0206}{28} = 0\cdot0007\right)$ and may be neglected.

The other assumption made by us, that compensation is complete at 70 miles below sea-level instead of below the surface of the earth, is believed to have a negligible effect. Mr. Hayford's assumption was only made to simplify the computations, and he allows that ours is correct. Therefore, we need only consider the change in the correction for the outer (or Hayford) zones. The effect of the plan adopted by Mr. Hayford is to displace the isostatic compensation upwards for land areas and downwards for ocean areas by an amount equal to the height or depth of the area concerned. The result is virtually the same as lowering or raising the station and, as may be seen in the reduction tables, the correction for elevation of station is negligible for zones 1 to 13 and very small for the remainder.

Of the other assumptions made by Mr. Hayford, (a) to (d) on page 139 of this chapter, we have accepted (b) and (c); for the radius of the earth we have taken 20, 900,000 feet which is equivalent to about 6370·2 kilometres instead of his value of 6370 kilometres.

For the gravitation constant in our computations the value, $G = \frac{3g}{4\pi R \Delta}$, has been used where $g = 978$ cms. and $\Delta =$ mean density of the earth $= 5 \cdot 576$. This gives the value 657×10^{-10} whereas, as stated on page 139, Mr. Hayford used the value 667×10^{-10}. The difference is 1·5 per cent. For the inner zones the largest correction that has so far been found is at Sandakphu where it equals 0·202 dyne. The change in this correction produced by taking Mr. Hayford's value of $k \times 2\pi\delta$ would be 0·003 dyne at this station, and at all stations except those on or very near high ground the change would be negligible. For the great majority of stations, therefore, the effect of the changes of assumption in our reduction tables is negligible.

The formula used for the attraction of the topography in a zone on the station whose height is the same as the zone was:—

$$\frac{3g}{2R}\frac{\delta}{\Delta}\left\{r_2 - r_1 - \left(\sqrt{r_2^2 + h^2} - \sqrt{r_1^2 + h^2}\right)\right\}$$

where $g = 978$ cms.
$R =$ radius of earth $= 20{,}900{,}000$ feet
$\delta =$ mean surface density of earth $= 2 \cdot 67$
$\Delta =$ mean density of earth as a whole $= 5 \cdot 576$
$\frac{\delta}{\Delta} = \frac{1}{2 \cdot 09}$
$r_1, r_2 =$ radii of inner and outer edges of zone
$h =$ mean height of zone or station in feet

The value of the constant is 0·000033584 or if h, r_1 and r_2 are expressed in 100-feet units, as they have been in our computations, the value is 0·0033584.

The radii of the zones were selected as follows:—

Zone	Outer radius	Zone	Outer radius
A	10 feet	I	3 miles
B	200 feet	J	5 miles
C	600 feet	K	8 miles
D	1400 feet	L	12 miles
E	½ mile	M	20 miles
F	1 mile	N	32 miles
G	1½ miles	O	60 miles
H	2 miles	P	103·6 miles

The outer radius of zone P is the same as the inner radius of zone 18, and as the numbered zones extend to the antipodes, the whole surface of the earth is dealt with.

In zones H to P the attraction was computed for every 1000 feet of height from zero to 12000 feet (h = 0, 10, 20, etc. to 120, h being expressed in 100-feet units), and values for smaller intervals of height were interpolated without difficulty. For zones B to G the attraction was computed for every 100 feet of height up to 3000 feet and thence for every 500 feet, and in zones B to E, where it varies rapidly for small values of h, it has been shewn for intervals of h less than 100 feet.

A specimen computation is shewn below.

ZONE J. Inner radius 3 miles. Outer radius 5 miles.							
Effect $= 0{\cdot}0033584 \left\{ r_2 - r_1 - \left(\sqrt{r_2^2 + h^2} - \sqrt{r_1^2 + h^2} \right) \right\}$							
$r_1 = 158{\cdot}4$ units of 100 feet			$r_2 = 264{\cdot}0$ units of 100 feet		$r_2 - r_1 = 105{\cdot}600$		
	$r_1^2 = 25090{\cdot}56$		$r_2^2 = 69696{\cdot}00$		$\sqrt{r_2^2+h^2} - \sqrt{r_1^2+h^2}$ $= A$	$r_2 - r_1 - A$ $= B$	Effect $=$ $0{\cdot}0033584\ B$
h	$r_1^2 + h^2$	$\sqrt{r_1^2+h^2}$	$r_2^2 + h^2$	$\sqrt{r_2^2 + h^2}$			
10	25190·56	158·715	69796·00	264·189	105·474	0·126	0·00042
20	25490·56	159·658	70096·00	264·756	105·098	0·502	·00169
30	25990·56	161·216	70596·00	265·699	104·483	1·117	·00375
40	26690·56	163·372	71296·00	267·013	103·641	1·959	·00658
50	27590·56	166·104	72196·00	268·693	102·589	3·011	·01011
60	28690·56	169·383	73296·00	270·732	101·349	4·251	·01427
70	29990·56	173·178	74596·00	273·123	99·945	5·655	·01899
80	31490·56	177·456	76096·00	275·855	98·399	7·201	·02418
90	33190·56	182·183	77796·00	278·919	96·736	8·864	·02977
100	35090·56	187·325	79696·00	282·305	94·980	10·620	·03566
110	37190·56	192·849	81796·00	286·000	93·151	12·449	·04180
120	39490·56	198·722	84096·00	289·993	91·271	14·329	·04812

Values for every 100 feet of height were obtained by interpolation and entered in the complete reduction tables. The interpolated values are not likely to be in error by more than 0·00002 dyne.

The tables have only been computed up to a height of 12000 feet. Greater heights are occasionally found for portions of zones round Himalayan stations. In such cases it is necessary to increase the portion of the zone dealt with so that the mean height in such portion is less than 12000 feet. An example of this will be found in the details of the computation of the correction for Dehra Dūn in Chapter IX.

The tabulated values give the effect of the topography in a zone on a station whose height is the same as that of the zone. Where these heights differ, as they usually will in all but the near zones, the following procedure is to be adopted. First, take the effect of a zone whose height is the same as that of the station and then subtract therefrom the effect of a zone whose height equals the difference of height of station and zone, it being immaterial which is the higher.

The two figures 3 and 4 will explain this.

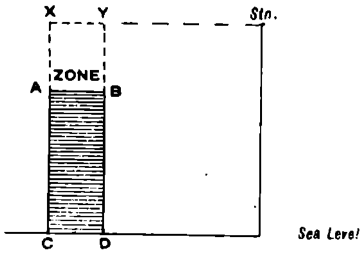

Fig: 3

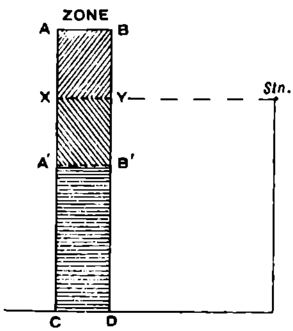

Fig: 4

In figure 3 the station is higher than the zone. The effect of the zone A B D C on the station is obviously the effect of the zone X Y D C *minus* that of the zone X Y B A *i.e.* that of a zone whose height is the same as that of the station *minus* that of a zone whose height equals difference of height of station and zone.

In figure 4 the portion A B Y X of the zone is above the station, and, consequently, its attraction on the station is upwards. The effect of this portion of the zone, therefore, cancels the effect of the portion X Y B′ A′ where X A = X A′, and the total effect of the zone is the same as if its height were A′ C and is calculated in the same way as in figure 3.

It would, of course, have been perfectly simple to make out tables with main argument height of zone and secondary argument difference between height of station and height of zone, but the tables would certainly be far more bulky than they are at present.

For those portions of zones which are covered by water, we must first, take the effect of a zone whose height equals height of station *plus* depth of water and subtract the effect of a zone whose height equals height of station, the difference being multiplied by 0·615. This factor takes account of the fact that below sea-level the zone is filled with water of density 1·027 instead of solid earth of density 2·67. The defect of density is, therefore, 1·643 or $\delta \times 0{\cdot}615$. The sign of the correction will be *minus*.

We now come to the computation of the compensation effect. Taking first land areas, the assumption made was that the upper surface of compensation was at sea-level or in other words all masses above sea-level are of normal density, 2·67, and are compensated by deficiencies of density *below* sea-level. This was the original assumption made by Mr. Hayford in his definition of isostasy, but subsequently modified for computing purposes.

The effect of the compensation in the zone on the station is obtained by subtracting the effect of a zone whose height equals the height of the station from that of a zone whose height equals 70 miles *plus* height of station, the deficiency of density in both cases being the same. This gives the effect on the station of the compensation in a hollow cylinder (or zone) extending from sea-level down to the depth of compensation. The deficiency of density is obtained immediately from figure 5.

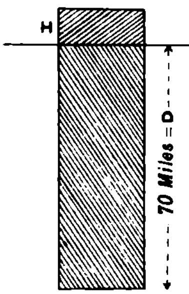

Fig: 5

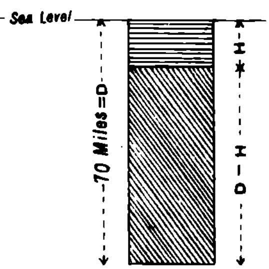

Fig. 6

The excess of mass above sea-level in the zone is balanced by the defect of mass below sea-level. If δ' be the deficiency of density below sea-level, we have

$$\delta' \times 70 \text{ miles} = H \times 2{\cdot}67$$

or

$$\delta' = \frac{H \times 2{\cdot}67}{70 \text{ miles}} = \frac{H\delta}{D}.$$

The effect of the compensation in a zone whose height is H on a station whose height is h is, therefore,

$$\frac{H}{D} \times \frac{3g}{2R} \times \frac{\delta}{\Delta} \left\{ \sqrt{r_2^2 + h^2} - \sqrt{r_1^2 + h^2} - \left(\sqrt{r_2^2 + (D + h)^2} - \sqrt{r_1^2 + (D + h)^2} \right) \right\}.$$

The quantity inside the brackets only varies with the height of station and the quantity outside, only with the height of zone. Also, since the factor $\frac{H}{D} \times \frac{3g}{2R} \times \frac{\delta}{\Delta}$ is very small (0·00010904 when

H = 12000 feet) it is only necessary to take out the quantity inside the brackets to the 1st place of decimals in order to be correct to 5 places in the final result. The quantities $\left(\sqrt{r_2^2 + h^2} - \sqrt{r_1^2 + h^2}\right)$ have already been computed for the topographical effects (*vide* specimen zone J), and the quantities $\left(\sqrt{r_2^2 + (D + h)^2} - \sqrt{r_1^2 + (D + h)^2}\right)$ vary very slowly up to zone M, at least, as the following table will show

Values of $\sqrt{r_2^2 + (D + h)^2} - \sqrt{r_1^2 + (D + h)^2}$										
h	ZONE									
	B	E	F	H	J	K	M	N	O	P
0 *feet*	0	0	0·3	0·7	6·0	14·6	94·0	220·0	804·0	1733·1
4000 ,,	0	0	0·3	0·7	6·0	14·5	93·0	217·9	798·1	1725·1
8000 ,,	0	0	0·3	0·7	5·9	14·4	92·1	215·9	792·2	1717·2
12000 ,,	0	0	0·3	0·6	5·8	14·2	91·2	213·9	786·3	1709·3

The compensation was first computed with H = h = 1000 feet, 2000 feet etc. up to 12000 feet and entered in the tables in the column "station same height as zone". Values for every 500 feet of height and in some cases every 100 feet were obtained by interpolation. To obtain the values of the corrections for difference of height of station and zone shewn in the tables it was only necessary to compute with a new value of h. In entering the compensation reduction tables, therefore, the main argument is height of zone, while in the topography tables it is height of station, and the two corrections are taken out separately.

In computing the effect of the compensation under water zones, it has to be remembered that the compensation necessarily begins at the bottom of the ocean and not at sea-level. Figure 6 shows how the compensating excess of density is obtained.

The defect of the mass of the water is balanced by the excess in the portion below sea bottom. The defect of the mass of the water is $(\delta - \delta_w)$ H and if δ' be the compensating excess of density we have

$$(D - H)\,\delta' = (\delta - \delta_w)\,H$$

or

$$\delta' = \frac{H}{D - H}(\delta - \delta_w)$$

$$= \frac{H}{D - H} \times 0{\cdot}615\,\delta$$

The effect of the compensation of a water zone of depth H on a station whose height is h was obtained by subtracting the effect of a zone whose height equals H + h from the effect of a zone whose height equals 70 miles + h, both zones being of density $0{\cdot}615\,\delta \times \frac{H}{D - H}$. The effect is, therefore,

$$0{\cdot}615 \times \frac{H}{D-H} \times \frac{3g}{2R} \times \frac{\delta}{\Delta}\left\{\sqrt{r_2^2 + (h + H)^2} - \sqrt{r_1^2 + (h + H)^2} - \left(\sqrt{r_2^2 + (D + h)^2} - \sqrt{r_1^2 + (D + h)^2}\right)\right\}.$$

The values are shewn in the reduction tables. It will be noticed that it is unnecessary to consider any but small values of h and H in the inner zones, because the station being on land and part of the zone covered by water, great heights and depths will not be found. For zone P the greatest heights and depths will be found in the extreme south of India where the station may be over 8000 feet and portions of zone P of depth 10000 feet.

One point remains to be dealt with. It will be noted that there is an abrupt change of method in dealing with the effect of topography and compensation at a distance of 108·6 miles from the station. Inside this radius the formula used takes no account of the curvature of the sea-level surface. A simple computation will, however, show that at a distance of 80 miles from the station, *i. e.*, nearly in the middle of zone P, a point at sea-level is over 4000 feet below the horizon of the sea-level surface at the station. The actual figures are shewn below :—

At middle of	zone	P,	the sea-level is	4460	feet below the horizon of the station.
„	„	O	„	1410	„
„	„	N	„	450	„
„	„	M	„	170	„

The formula for distant masses, kmE, takes full account of curvature but is far more cumbersome to compute than that for near masses. Accordingly, it was desired to extend the use of the latter formula as far as possible. In view, however, of the figures given above it is necessary to make some allowance for curvature in, at least, zones N, O and P.

Dealing first with the topography, the two figures 7 and 8 give the two cases that can occur, *viz.*, zone above station and zone below station. The curvature is, of course, much exaggerated.

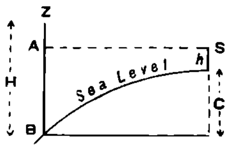

Fig: 7

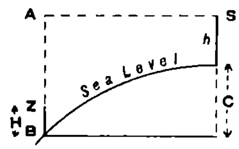

Fig: 8

S is the station, Z the centre of the zone, C is the amount by which the sea-level at Z is depressed below that at S. The effect of a zone of height H on a station of height h may be considered as the effect of a zone of height (h + C) *i.e.*, A B in the figures, *minus* that of a zone of height (h + C − H) *i.e.*, A Z in the figures. In computing the topographical effects in zones M, N, O and P, therefore, we must take height of station as h + C instead of h and difference of height of station and zone as h + C − H instead of h − H. For the compensation, the column "station same height as zone" in, say, zone P was computed with the value "station above zone by 4460 feet" and similarly for zones M, N and O. For the compensation, therefore, the actual heights of station and zone will be used in entering the tables.

Strictly speaking, this method should be checked by computing values in these zones by the exact formula for distant masses but this has not been done. Mr. Hayford has, however, checked his values in this way and states that in his outer zone the error is less than 1 part in 200 on the average. Assuming that the error in our slightly different outer zone would be about the same, the error in zone P of mean height 12000 feet would be less than 0·0003.

It will be noted in the reduction tables that, whereas the outer or numbered zones are as a rule subdivided into compartments, the inner or lettered zones are not so divided. In computing the effect of the inner zones, however, they have as a rule been divided into natural instead of rigid compartments *i.e.*, the division has been made along contours, the zone being divided into blocks in order of height.

The reduction tables for the inner zones together with the rules explaining their employment are herewith appended.

REDUCTION TABLES FOR INNER ZONES.

(0 mile to 103·6 miles).

Rules for using the tables :—

Topography. For land zones, A to L, enter table with argument height of station: then enter it with argument difference of height of station and zone (it being immaterial which is the higher) and subtract the latter result from the former. The result will be *positive* unless the height of zone exceed twice the height of station.

For water zones, A to L, enter table with argument height of station: then enter it with argument sum of height of station and depth of zone, and subtract the latter result from the former, multiplying the difference by 0·615. The result will always be *negative.*

For land or water zones, M to P, the correction for curvature is applied by increasing the height of station by the curvature and using this sum instead of the actual height when applying the rules given above. The curvature for each zone, M to P, is given in the tables.

Compensation. For land or water zones, A to P, enter table with argument height or depth of zone as the case may be, and take out the quantity found in the second column. This is the compensation effect for the case of station at the same height as the zone *i. e.* at sea level for water zones; its sign is always *negative* for land zones and *positive* for water zones: a correction, which is to be found from the subsequent columns of the table, must be applied to it if the station is above or below the zone. The curvature correction is included in the tables.

In many cases the height of a zone varies sufficiently to make it necessary to deal with it in several portions, each of different height. In this case the results are taken out for each height as indicated above, and each multiplied by the factor representing the ratio of the area of the portion of the particular height to the area of the whole zone. The total effect is found by summing these products.

ZONE A.

Inner radius 0 foot. Outer radius 10 feet.

Topography.

Height	*Correction*
feet	10^{-5} *dynes*
10	+ 20
50	30
100 to 1000	33
1000 to 12000	+ 34

Compensation.

Nil.

ZONE B.

Inner radius 10 feet. Outer radius 200 feet.

Topography.

Height	Correction	Height	Correction	Height	Correction
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
10	+ 13	180	+ 341	1200	+ 582
20	38	200	361	1300	586
30	65	220	379	1400	590
40	92	240	395	1500	593
50	117	260	410	1600	596
60	141	280	423	1700	599
70	164	300	435	1800	601
80	185	350	460	1900	603
90	206	400	480	2000	605
100	225	500	509	2500	611
110	243	600	529	3000	616
120	260	700	544	4000	621
130	276	800	556	5000	625
140	291	900	565	6000	627
150	305	1000	572	9000	631
160	+ 318	1100	+ 578	12000	+ 632

Compensation.

Nil.

ZONE C.

Inner radius 200 feet. Outer radius 600 feet.

Topography.

Height	*Correction*	Height	*Correction*	Height	*Correction*	Height	*Correction*
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
20	+ 2	320	+ 327	650	+ 657	2000	+ 1081
40	9	340	352	700	692	2200	1104
60	19	360	376	750	724	2400	1123
80	34	380	400	800	754	2600	1140
100	51	400	423	850	782	2800	1154
120	71	420	445	900	807	3000	1166
140	93	440	467	950	830	3500	1190
160	117	460	488	1000	852	4000	1210
180	142	480	509	1100	890	4500	1224
200	169	500	529	1200	924	5000	1236
220	196	520	548	1300	952	6000	1254
240	224	540	566	1400	977	7000	1267
260	251	560	584	1500	1000	8000	1276
280	277	580	601	1600	1020	10000	1289
300	+ 302	600	+ 618	1800	+ 1054	12000	+ 1299

Compensation.

Land.

Height of zone	*Correction*
Up to 2000 feet	0
Above 2000 feet	-1×10^{-5} dynes

ZONE D.

Inner radius 600 feet. Outer radius 1400 feet.

Topography.

Height	Correction	Height	Correction	Height	Correction	Height	Correction
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
50	+ 4	850	+ 680	1800	+ 1400	3800	+ 2007
100	16	900	730	1900	1452	4000	2038
150	36	950	778	2000	1501	4200	2067
200	61	1000	825	2100	1545	4400	2094
250	93	1050	871	2200	1588	4600	2118
300	131	1100	916	2300	1627	4800	2141
350	173	1150	959	2400	1664	5000	2161
400	219	1200	1000	2500	1698	5500	2207
450	267	1250	1040	2600	1731	6000	2245
500	317	1300	1079	2700	1762	6500	2278
550	368	1350	1117	2800	1790	7000	2307
600	421	1400	1153	2900	1818	7500	2332
650	474	1450	1188	3000	1843	8000	2354
700	527	1500	1221	3200	1890	9000	2390
750	579	1600	1286	3400	1933	10000	2419
800	+ 630	1700	+ 1345	3600	+ 1972	12000	+ 2463

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station	
		Below zone by 500 feet	Above zone by 500 feet
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
1000	− 5	− 1	+ 1
3000	− 7	− 1	+ 1
12000	− 8	0	0

Water.

Depth of zone	Height of station	
	0 foot	100 feet
feet	10^{-5} *dynes*	10^{-5} *dynes*
100	0	0
200	+ 1	+ 1

ZONE E.

Inner radius 1400 feet. Outer radius ½ mile.

Topography.

Height	Correction	Height	Correction	Height	Correction	Height	Correction	Height	Correction
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
100	+ 6	1200	+ 618	2100	+ 1311	3000	+ 1862	4800	+ 2558
200	22	1250	650	2150	1346	3100	1913	4900	2586
300	50	1300	698	2200	1381	3200	1962	5000	2613
400	87	1350	738	2250	1415	3300	2010	5200	2664
500	133	1400	778	2300	1448	3400	2056	5400	2712
550	159	1450	818	2350	1481	3500	2101	5600	2757
600	188	1500	858	2400	1513	3600	2144	5800	2800
650	218	1550	898	2450	1545	3700	2186	6000	2841
700	249	1600	937	2500	1576	3800	2226	6500	2933
750	281	1650	976	2550	1607	3900	2264	7000	3013
800	315	1700	1015	2600	1638	4000	2301	7500	3084
850	350	1750	1054	2650	1668	4100	2337	8000	3147
900	387	1800	1092	2700	1697	4200	2372	8500	3204
950	424	1850	1130	2750	1726	4300	2406	9000	3254
1000	462	1900	1167	2800	1754	4400	2439	9500	3300
1050	500	1950	1204	2850	1782	4500	2470	10000	3341
1100	539	2000	1240	2900	1809	4600	2500	11000	3413
1150	+ 578	2050	+ 1276	2950	+ 1836	4700	+ 2529	12000	+ 3475

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station	
		Below zone by 1000 feet	Above zone by 1000 feet
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	− 5	− 1	+ 1
1000	− 10	− 1	+ 2
2000	− 16	− 4	+ 3
3000	− 19	− 5	+ 3
5000	− 21	− 4	+ 3
12000	− 23	− 2	+ 2

Water.

Depth of zone	Station at sea-level	Correction for height of station at 200 ft.
feet	10^{-5} *dynes*	
100	+ 1	0
200	+ 1	0
300	+ 2	0

ZONE F.

Inner radius ½ mile. Outer radius 1 mile.

Topography.

Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
100	+ 3	1800	+ 868	3500	+ 2315	5200	+ 3564	6900	+ 4497	8800	+ 5255
200	13	1900	944	3600	2397	5300	3627	7000	4544	9000	5321
300	29	2000	1027	3700	2478	5400	3689	7100	4590	9200	5385
400	50	2100	1112	3800	2558	5500	3750	7200	4635	9400	5447
500	78	2200	1197	3900	2637	5600	3810	7300	4679	9600	5508
600	112	2300	1284	4000	2715	5700	3869	7400	4722	9800	5566
700	151	2400	1370	4100	2792	5800	3927	7500	4765	10000	5622
800	196	2500	1457	4200	2868	5900	3984	7600	4807	10200	5677
900	245	2600	1545	4300	2943	6000	4039	7700	4848	10400	5730
1000	299	2700	1632	4400	3016	6100	4093	7800	4888	10600	5781
1100	358	2800	1719	4500	3088	6200	4147	7900	4927	10800	5831
1200	420	2900	1806	4600	3159	6300	4200	8000	4966	11000	5879
1300	487	3000	1892	4700	3230	6400	4252	8100	5004	11200	5926
1400	556	3100	1978	4800	3299	6500	4303	8200	5042	11400	5972
1500	630	3200	2063	4900	3367	6600	4353	8300	5079	11600	6016
1600	705	3300	2148	5000	3434	6700	4402	8400	5116	11800	6058
1700	+ 783	3400	+ 2232	5100	+ 3500	6800	+ 4450	8600	+ 5187	12000	+ 6099

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station			
		Below zone by		Above zone by	
		1000 ft.	2000 ft.	1000 ft.	2000 ft.
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	− 12	0	...	+ 1	+ 2
1000	− 23	0	...	+ 2	+ 4
2000	− 41	− 4	− 6	+ 4	+ 9
3000	− 57	− 7	− 11	+ 7	+ 12
4000	− 67	− 9	− 18	+ 8	+ 14
8000	− 82	− 9	− 21	+ 7	+ 14
12000	− 86	− 8	− 16	+ 7	...

Water.

Depth of zone	Station at sea-level	Correction for station at 300 ft.
feet	10^{-5} *dynes*	
100	+ 1	0
200	+ 3	0
300	+ 4	0
400	+ 6	0

ZONE G.

Inner radius 1 mile. Outer radius 1½ miles.

Topography.

Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
200	+ 4	2100	+ 432	3900	+ 1262	5700	+ 2189	7500	+ 3038	9300	+ 3757
400	17	2200	470	4000	1314	5800	2239	7600	3081	9400	3793
500	26	2300	510	4100	1366	5900	2289	7700	3124	9500	3829
600	38	2400	552	4200	1417	6000	2338	7800	3167	9600	3864
700	52	2500	594	4300	1469	6100	2387	7900	3209	9700	3899
800	67	2600	637	4400	1521	6200	2436	8000	3251	9800	3934
900	85	2700	681	4500	1573	6300	2484	8100	3292	9900	3968
1000	104	2800	726	4600	1625	6400	2533	8200	3333	10000	4002
1100	125	2900	772	4700	1677	6500	2581	8300	3374	10200	4069
1200	148	3000	818	4800	1729	6600	2628	8400	3414	10400	4135
1300	173	3100	865	4900	1780	6700	2675	8500	3454	10600	4199
1400	200	3200	913	5000	1832	6800	2722	8600	3493	10800	4261
1500	229	3300	961	5100	1883	6900	2768	8700	3532	11000	4322
1600	259	3400	1010	5200	1935	7000	2814	8800	3570	11200	4382
1700	291	3500	1060	5300	1986	7100	2860	8900	3608	11400	4440
1800	324	3600	1110	5400	2037	7200	2905	9000	3646	11600	4497
1900	359	3700	1160	5500	2088	7300	2950	9100	3683	11800	4553
2000	+ 395	3800	+ 1211	5600	+ 2138	7400	+ 2994	9200	+ 3720	12000	+ 4608

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station					
		Below zone by			Above zone by		
		1000 ft.	2000 ft.	3000 ft.	1000 ft.	2000 ft.	3000 ft.
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	− 12	...	...	...	0	+ 1	+ 1
1000	− 23	0	...	...	+ 1	+ 2	+ 3
2000	− 45	− 1	− 2	...	+ 3	+ 5	+ 8
3000	− 66	− 3	− 6	− 7	+ 4	+ 9	+ 13
4000	− 82	− 5	− 10	− 13	+ 6	+ 12	+ 17
5000	− 94	− 8	− 15	− 20	+ 7	+ 13	+ 19
6000	− 105	− 8	− 17	− 25	+ 9	+ 15	+ 21
8000	− 119	− 9	− 20	− 31	+ 8	+ 16	+ 23
10000	− 128	− 10	− 20	− 32	+ 8	+ 16	...
12000	− 134	− 9	− 20	− 31	...	...	...

Water.

Depth of zone	Station at sea-level	Correction for station at 1000 ft.
feet	10^{-5} *dynes*	
200	+ 3	0
400	+ 6	0
600	+ 9	0
800	+ 12	0
1000	+ 14	0

ZONE H.

Inner radius 1½ miles. Outer radius 2 miles.

Topography.

Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
200	+ 3	2100	+ 225	3900	+ 708	5700	+ 1336	7500	+ 1999	9300	+ 2633
400	10	2200	246	4000	741	5800	1372	7600	2035	9400	2666
500	15	2300	268	4100	774	5900	1409	7700	2071	9500	2700
600	21	2400	291	4200	807	6000	1446	7800	2107	9600	2733
700	28	2500	314	4300	840	6100	1483	7900	2143	9700	2766
800	36	2600	338	4400	874	6200	1520	8000	2178	9800	2799
900	44	2700	363	4500	908	6300	1557	8100	2214	9900	2831
1000	53	2800	388	4600	943	6400	1594	8200	2250	10000	2864
1100	63	2900	414	4700	977	6500	1631	8300	2286	10200	2928
1200	74	3000	441	4800	1012	6600	1668	8400	2321	10400	2991
1300	86	3100	468	4900	1047	6700	1705	8500	2357	10600	3054
1400	100	3200	496	5000	1082	6800	1742	8600	2392	10800	3116
1500	115	3300	525	5100	1118	6900	1779	8700	2427	11000	3177
1600	131	3400	554	5200	1154	7000	1816	8800	2462	11200	3237
1700	148	3500	584	5300	1190	7100	1853	8900	2496	11400	3296
1800	166	3600	614	5400	1226	7200	1890	9000	2531	11600	3355
1900	185	3700	645	5500	1263	7300	1926	9100	2565	11800	3412
2000	+ 205	3800	+ 676	5600	+ 1299	7400	+ 1963	9200	+ 2599	12000	+ 3469

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station					
		Below zone by			Above zone by		
		1000 ft.	2000 ft.	3000 ft.	1000 ft.	2000 ft.	3000 ft.
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	− 12	...	...	...	0	+ 1	+ 1
1000	− 23	0	...	...	0	+ 1	+ 2
1500	− 34	0	...	...	+ 1	+ 2	+ 3
2000	− 45	− 1	− 1	...	+ 1	+ 3	+ 4
2500	− 57	− 1	− 2	...	+ 2	+ 4	+ 6
3000	− 68	− 2	− 3	− 4	+ 2	+ 5	+ 8
4000	− 87	− 3	− 6	− 7	+ 4	+ 8	+ 12
5000	− 104	− 4	− 8	− 11	+ 6	+ 11	+ 16
6000	− 118	− 6	− 11	− 16	+ 6	+ 12	+ 18
7000	− 130	− 7	− 14	− 20	+ 7	+ 14	+ 20
8000	− 140	− 8	− 16	− 24	+ 7	+ 14	+ 21
10000	− 157	− 9	− 18	− 28	+ 9	+ 17	...
12000	− 168	− 9	− 19	− 30	...	...	...

Water.

Depth of zone	Station at sea-level	Correction for station at 2000 ft.
feet	10^{-5} *dynes*	10^{-5} *dynes*
500	+ 7	0
1000	+ 14	0
1500	+ 21	− 1
2000	+ 28	− 2

ZONE I.

Inner radius 2 miles. Outer radius 3 miles.

Topography.

Height.	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn	Height	Corrn.
feet	10^{-5}*dynes*	*feet*	10^{-5}*dynes*	*feet*	10^{-5}*dynes*	*feet*	10^{-5}*dynes*	*feet*	10^{-5}*dynes*	*feet*	10^{-5}*dynes*
200	+ 3	2100	+ 229	3900	+ 753	5700	+ 1497	7500	+ 2372	9300	+ 3301
400	10	2200	251	4000	789	5800	1543	7600	2423	9400	3353
500	15	2300	274	4100	826	5900	1589	7700	2474	9500	3405
600	21	2400	298	4200	864	6000	1636	7800	2525	9600	3457
700	28	2500	323	4300	902	6100	1683	7900	2576	9700	3509
800	36	2600	348	4400	941	6200	1730	8000	2628	9800	3561
900	44	2700	374	4500	981	6300	1778	8100	2679	9900	3612
1000	53	2800	401	4600	1021	6400	1826	8200	2731	10000	3664
1100	64	2900	429	4700	1062	6500	1874	8300	2782	10200	3767
1200	76	3000	458	4800	1103	6600	1923	8400	2834	10400	3870
1300	89	3100	488	4900	1145	6700	1972	8500	2886	10600	3973
1400	103	3200	518	5000	1187	6800	2021	8600	2937	10800	4075
1500	118	3300	549	5100	1230	6900	2071	8700	2989	11000	4176
1600	134	3400	581	5200	1273	7000	2120	8800	3041	11200	4276
1700	151	3500	614	5300	1317	7100	2170	8900	3093	11400	4376
1800	169	3600	648	5400	1361	7200	2220	9000	3145	11600	4476
1900	188	3700	682	5500	1406	7300	2271	9100	3197	11800	4576
2000	+ 208	3800	+ 717	5600	+ 1451	7400	+ 2321	9200	+ 3249	12000	+ 4676

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station			
		Below zone by		Above zone by	
		2000 ft.	4000 ft.	2000 ft.	4000 ft.
feet	10^{-5}*dynes*	10^{-5}*dynes*	10^{-5}*dynes*	10^{-5}*dynes*	10^{-5}*dynes*
500	− 23	...	...	+ 1	+ 2
1000	− 46	...	...	+ 1	+ 3
1500	− 68	...	...	+ 2	+ 5
2000	− 91	− 1	...	+ 3	+ 8
2500	− 113	− 2	...	+ 4	+ 11
3000	− 135	− 3	...	+ 5	+ 13
3500	− 156	− 4	...	+ 7	+ 16
4000	− 177	− 6	− 8	+ 9	+ 20
4500	− 197	− 7	− 11	+ 11	+ 24
5000	− 216	− 9	− 15	+ 13	+ 27
5500	− 234	− 11	− 19	+ 15	+ 30
6000	− 251	− 13	− 23	+ 16	+ 33
6500	− 268	− 16	− 27	+ 18	+ 36
7000	− 284	− 18	− 31	+ 20	+ 39
7500	− 299	− 20	− 35	+ 21	+ 42
8000	− 314	− 21	− 39	+ 23	+ 44
8500	− 328	− 23	− 44	+ 24	...
9000	− 340	− 25	− 48	+ 25	...
9500	− 352	− 27	− 52	+ 26	...
10000	− 364	− 28	− 55	+ 27	...
11000	− 386	− 30	− 61	...	...
12000	− 405	− 33	− 67	...	...

Water.

Depth of zone	Station at sea-level	Correction for station at 3000 ft.
feet	10^{-5}*dynes*	10^{-5}*dynes*
500	+ 14	0
1000	+ 28	− 1
1500	+ 43	− 3
2000	+ 57	− 4
2500	+ 70	− 5
3000	+ 84	− 6

ZONE J.

Inner radius 3 miles. Outer radius 5 miles.

Topography.

Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
200	+ 1	2400	+ 242	4200	+ 723	6000	+ 1427	7800	+ 2312	9600	+ 3328
400	6	2500	262	4300	757	6100	1472	7900	2365	9700	3387
600	15	2600	283	4400	791	6200	1517	8000	2418	9800	3447
800	27	2700	305	4500	826	6300	1563	8100	2472	9900	3506
1000	42	2800	328	4600	862	6400	1609	8200	2526	10000	3566
1100	51	2900	351	4700	898	6500	1656	8300	2581	10200	3687
1200	61	3000	375	4800	935	6600	1703	8400	2636	10400	3809
1300	72	3100	400	4900	973	6700	1751	8500	2692	10600	3932
1400	83	3200	426	5000	1011	6800	1800	8600	2748	10800	4056
1500	95	3300	452	5100	1050	6900	1849	8700	2805	11000	4180
1600	108	3400	479	5200	1090	7000	1899	8800	2862	11200	4306
1700	122	3500	507	5300	1130	7100	1949	8900	2919	11400	4432
1800	137	3600	536	5400	1171	7200	2000	9000	2977	11600	4558
1900	153	3700	565	5500	1212	7300	2051	9100	3035	11800	4685
2000	169	3800	595	5600	1254	7400	2103	9200	3093	12000	+ 4812
2100	186	3900	626	5700	1296	7500	2155	9300	3151		
2200	204	4000	658	5800	1339	7600	2207	9400	3210		
2300	+ 223	4100	+ 690	5900	+ 1383	7700	+ 2259	9500	+ 3269		

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station					
		Below zone by			Above zone by		
		2000 ft.	4000 ft.	6000 ft.	2000 ft.	4000 ft.	6000 ft.
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	− 45	...	...	...	+ 1	+ 2	+ 3
1000	− 91	...	...	...	+ 1	+ 3	+ 5
1500	− 136	...	...	...	+ 2	+ 5	+ 8
2000	− 181	− 1	...	...	+ 3	+ 7	+ 12
2500	− 225	− 2	...	...	+ 4	+ 10	+ 16
3000	− 269	− 3	...	...	+ 5	+ 12	+ 21
3500	− 312	− 4	...	...	+ 7	+ 16	+ 26
4000	− 355	− 5	− 7	...	+ 8	+ 19	+ 31
4500	− 397	− 7	− 10	...	+ 10	+ 23	+ 37
5000	− 439	− 9	− 13	...	+ 12	+ 26	+ 42
5500	− 480	− 10	− 17	...	+ 14	+ 30	+ 48
6000	− 520	− 12	− 20	− 23	+ 16	+ 34	+ 54
6500	− 559	− 14	− 24	− 29	+ 18	+ 38	...
7000	− 598	− 17	− 29	− 35	+ 20	+ 42	...
7500	− 635	− 19	− 33	− 41	+ 23	+ 47	...
8000	− 672	− 21	− 37	− 48	+ 25	+ 51	...
8500	− 708	− 24	− 42	− 56	+ 26	...	...
9000	− 743	− 26	− 47	− 63	+ 28	...	...
9500	− 777	− 29	− 52	− 70	+ 30	...	...
10000	− 810	− 31	− 57	− 77	+ 33	...	...
10500	− 842	− 32	− 62	− 84	...	...	...
11000	− 874	− 34	− 66	− 92	...	...	...
11500	− 904	− 36	− 71	− 100	...	...	...
12000	− 932	− 39	− 76	− 108	...	...	...

Water.

Depth of zone	Station at sea-level	Correction for station at		
		1000 ft.	2000 ft.	3000 ft.
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	+ 28	0	0	− 1
1000	+ 56	0	− 1	− 1
1500	+ 84	0	− 1	− 2
2000	+ 111	0	− 1	− 3
2500	+ 139	− 1	− 2	− 4
3000	+ 167	− 2	− 4	− 6
3500	+ 194	− 2	− 4	− 7
4000	+ 221	− 3	− 5	− 8

ZONE K.

Inner radius 5 miles. Outer radius 8 miles.

Topography.

Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.
feet	10^{-5}*dynes*	*feet*	10^{-5}*dynes*	*feet*	10^{-5}*dynes*	*feet*	10^{-5}*dynes*	*feet*	10^{-5}*dynes*	*feet*	10^{-5}*dynes*
200	+ 0	2200	+ 115	4200	+ 415	6200	+ 892	8200	+ 1529	10200	+ 2310
400	3	2400	137	4400	455	6400	949	8400	1601	10400	2395
600	8	2600	161	4600	497	6600	1007	8600	1675	10600	2481
800	15	2800	186	4800	541	6800	1067	8800	1750	10800	2569
1000	24	3000	213	5000	586	7000	1129	9000	1826	11000	2657
1200	35	3200	242	5200	633	7200	1192	9200	1904	11200	2747
1400	47	3400	273	5400	681	7400	1256	9400	1983	11400	2838
1600	61	3600	306	5600	731	7600	1322	9600	2063	11600	2929
1800	77	3800	341	5800	783	7800	1390	9800	2144	11800	3022
2000	+ 95	4000	+ 377	6000	+ 837	8000	+ 1459	10000	+ 2226	12000	+ 3116

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station							
		Below zone by				Above zone by			
		2000ft.	4000ft.	6000ft.	8000ft.	2000ft.	4000ft.	6000ft.	8000ft.
feet	10^{-5}*dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	− 66	...	...	...	...	+ 0	+ 1	+ 2	+ 3
1000	− 131	...	...	...	...	+ 0	+ 1	+ 3	+ 5
1500	− 196	...	...	...	...	+ 1	+ 2	+ 5	+ 8
2000	− 261	− 1	...	...	...	+ 1	+ 4	+ 7	+ 11
2500	− 326	− 1	...	...	...	+ 2	+ 5	+ 10	+ 15
3000	− 391	− 1	...	...	...	+ 3	+ 7	+ 13	+ 19
3500	− 456	− 2	...	...	...	+ 4	+ 9	+ 16	+ 24
4000	− 519	− 3	− 3	...	...	+ 5	+ 11	+ 19	+ 29
4500	− 583	− 4	− 5	...	...	+ 6	+ 14	+ 23	...
5000	− 646	− 5	− 7	...	...	+ 7	+ 16	+ 27	...
5500	− 709	− 6	− 9	...	...	+ 9	+ 19	+ 32	...
6000	− 771	− 7	− 11	− 13	...	+ 10	+ 22	+ 36	...
6500	− 833	− 8	− 14	− 16	...	+ 11	+ 25	...	...
7000	− 894	− 10	− 17	− 20	...	+ 12	+ 27	...	...
7500	− 955	− 12	− 20	− 24	...	+ 14	+ 31	...	...
8000	− 1015	− 13	− 23	− 28	− 30	+ 16	+ 35	...	...
8500	− 1075	− 15	− 26	− 33	− 35	+ 18	...	...	...
9000	− 1134	− 16	− 29	− 38	− 41	+ 20	...	...	...
9500	− 1192	− 18	− 33	− 43	− 48	+ 22	...	...	...
10000	− 1249	− 20	− 36	− 48	− 55	+ 24	...	...	...
10500	− 1306	− 22	− 39	− 53	− 62				
11000	− 1362	− 24	− 43	− 59	− 70				
11500	− 1417	− 26	− 48	− 65	− 78				
12000	− 1471	− 28	− 52	− 72	− 86				

Interpolation Table

100	13	11
200	26	22
300	39	33
400	52	44
500	65	55

Water.

Depth of zone	Station at sea-level	Correction for station at	
		2000 ft.	4000 ft.
feet	10^{-5}*dynes*	10^{-5}*dynes*	10^{-5}*dynes*
500	+ 40	0	0
1000	+ 81	0	− 1
1500	+ 121	− 1	− 2
2000	+ 161	− 1	− 2
2500	+ 202	− 1	− 4
3000	+ 242	− 2	− 4
3500	+ 282	− 2	− 5
4000	+ 322	− 3	− 6
4500	+ 362	− 3	− 8
5000	+ 402	− 4	− 9

ZONE L.

Inner radius 8 miles. Outer radius 12 miles.

Topography.

Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
400	+ 2	2800	+ 104	5100	+ 342	6900	+ 622	8700	+ 981	10500	+ 1415
800	8	3200	135	5400	383	7200	677	9000	1048	10800	1494
1200	19	3600	170	5700	427	7500	733	9300	1118	11100	1575
1600	34	4000	211	6000	472	7800	792	9600	1189	11400	1658
2000	53	4400	256	6300	520	8100	853	9900	1262	11700	1743
2400	+ 76	4800	+ 303	6600	+ 570	8400	+ 916	10200	+ 1337	12000	+ 1830

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station							
		Below zone by				Above zone by			
		2000ft.	4000ft.	6000ft	8000ft.	2000ft.	4000ft.	6000ft.	8000ft.
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	− 83	...	...	...	...	0	+ 1	+ 1	+ 1
1000	− 165	...	...	...	...	0	+ 1	+ 1	+ 2
1500	− 247	...	...	...	...	0	+ 2	+ 3	+ 4
2000	− 329	0	...	...	...	0	+ 2	+ 3	+ 5
2500	− 412	− 1	...	...	...	+ 1	+ 3	+ 4	+ 7
3000	− 494	− 1	...	...	...	+ 1	+ 4	+ 6	+ 10
3500	− 576	− 1	...	...	...	+ 2	+ 5	+ 8	+ 13
4000	− 658	− 1	− 1	...	...	+ 3	+ 6	+ 10	+ 16
4500	− 740	− 2	− 2	...	...	+ 3	+ 7	+ 12	...
5000	− 821	− 2	− 3	...	...	+ 4	+ 8	+ 14	...
5500	− 903	− 3	− 4	...	...	+ 4	+ 10	+ 17	...
6000	− 984	− 4	− 5	− 5	...	+ 5	+ 11	+ 20	...
6500	− 1064	− 4	− 6	− 7	...	+ 6	+ 13	...	...
7000	− 1144	− 5	− 8	− 10	...	+ 6	+ 15	...	...
7500	− 1225	− 6	− 10	− 11	...	+ 8	+ 17	...	...
8000	− 1305	− 7	− 12	− 13	− 13	+ 9	+ 20	...	...
8500	− 1384	− 7	− 13	− 16	− 17	+ 10	...	...	...
9000	− 1463	− 8	− 15	− 19	− 20	+ 11	...	...	...
9500	− 1542	− 9	− 17	− 22	− 23	+ 13	...	...	...
10000	− 1620	− 11	− 19	− 25	− 27	+ 14	...	...	...
10500	− 1698	− 12	− 21	− 28	− 31				
11000	− 1775	− 13	− 23	− 31	− 36				
11500	− 1852	− 15	− 26	− 35	− 41				
12000	− 1928	− 16	− 29	− 39	− 47				

Interpolation Table

100	16	16
200	33	31
300	49	47
400	66	62
500	82	78

Water.

Depth of zone	Station at sea-level	Correction for station at		
		2000ft.	4000ft.	6000ft.
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	+ 51	0	0	− 1
1000	+ 102	0	− 1	− 1
1500	+ 153	0	− 1	− 1
2000	+ 204	− 1	− 1	− 2
2500	+ 255	− 1	− 2	− 3
3000	+ 306	− 1	− 2	− 4
3500	+ 357	− 1	− 3	− 5
4000	+ 409	− 2	− 4	− 7
4500	+ 460	− 2	− 4	− 8
5000	+ 511	− 2	− 5	− 9
5500	+ 562	− 3	− 6	− 10
6000	+ 614	− 4	− 7	− 12

ZONE M.

Inner radius 12 miles. Outer radius 20 miles.

Curvature 170 feet.

Topography.

Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
500	+ 3	3000	+ 95	5200	+ 286	7200	+ 546	9200	+ 888	11200	+ 1310
1000	11	3500	129	5600	331	7600	608	9600	966	11600	1404
1500	24	4000	169	6000	380	8000	673	10000	1047	12000	+ 1500
2000	42	4400	205	6400	433	8400	742	10400	1132		
2500	+ 66	4800	+ 244	6800	+ 488	8800	+ 813	10800	+ 1219		

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station: Below zone by 4000 ft.	Below zone by 8000 ft.	Below zone by 12000 ft.	Above zone by 4000 ft.	Above zone by 8000 ft.	Above zone by 12000 ft.
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	− 150	...	...	...	0	+ 1	+ 1
1000	− 299	...	...	...	0	+ 1	...
1500	− 448	...	...	...	0	+ 2	...
2000	− 597	...	...	...	0	+ 2	...
2500	− 747	...	...	...	+ 1	+ 3	...
3000	− 896	...	...	...	+ 1	+ 4	...
3500	− 1046	...	...	...	+ 2	+ 6	...
4000	− 1196	+ 2	...	...	+ 2	+ 8	...
4500	− 1345	+ 1	...	...	+ 2	+ 10	...
5000	− 1494	0	...	...	+ 4	+ 12	...
5500	− 1643	0	...	...	+ 5	...	...
6000	− 1792	− 1	...	...	+ 5	...	...
6500	− 1941	− 1	...	..	+ 7	...	...
7000	− 2090	− 1	...	...	+ 9	...	...
7500	− 2238	− 2	...	...	+ 11	...	...
8000	− 2386	− 4	− 1	...	+ 12	...	...
8500	− 2534	− 6	− 3	...	+ 14	...	...
9000	− 2682	− 7	− 6	...	+ 16	...	...
9500	− 2830	− 8	− 8	...			
10000	− 2978	− 9	− 10	...			
10500	− 3124	− 11	− 13	...			
11000	− 3270	− 14	− 16	...			
11500	− 3416	− 16	− 20	...			
12000	− 3562	− 17	− 24	− 19			

Interpolation Table

100	30	29
200	60	58
300	89	88
400	119	117
500	149	146

Water.

Depth of zone	Station at sea-level	Correction for station at 2000 ft.	4000 ft.	6000 ft.
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	+ 92	0	0	0
1000	+ 184	0	0	0
1500	+ 276	0	0	0
2000	+ 369	0	0	0
2500	+ 462	0	0	0
3000	+ 555	0	0	− 1
3500	+ 648	0	0	− 1
4000	+ 741	0	− 1	− 2
4500	+ 834	0	− 1	− 3
5000	+ 928	0	− 2	− 4
5500	+ 1022	0	− 2	− 5
6000	+ 1116	− 1	− 3	− 6
6500	+ 1210	− 1	− 4	...
7000	+ 1304	− 2	− 5	...

Interpolation Table

100	19
200	37
300	56
400	74
500	93

ZONE N.

Inner radius 20 miles. Outer radius 32 miles.

Curvature 450 feet.

Topography.

Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
500	+ 1	2500	+ 38	4500	+ 120	6500	+ 252	8500	+ 429	10500	+ 654
1000	6	3000	54	5000	149	7000	292	9000	481	11000	718
1500	14	3500	74	5500	180	7500	335	9500	536	11500	784
2000	+ 24	4000	+ 95	6000	+ 215	8000	+ 380	10000	+ 593	12000	+ 853

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station					
		Below zone by			Above zone by		
		4000 feet	8000 feet	12000 feet	4000 feet	8000 feet	12000 feet
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
200	− 75	0	...	...	0	0	− 1
400	− 150	0	...	...	0	− 1	− 1
600	− 226	0	...	...	0	− 1	− 2
800	− 301	0	...	...	− 1	− 2	− 3
1000	− 377	+ 1	...	...	− 1	− 2	− 3
1200	− 452	+ 1	...	...	− 1	− 3	− 4
1400	− 528	+ 2	...	...	− 2	− 3	− 4
1600	− 603	+ 2	...	...	− 2	− 4	− 5
1800	− 679	+ 3	...	...	− 3	− 4	− 5
2000	− 754	+ 3	...	...	− 3	− 4	− 6
2200	− 830	+ 3	...	...	− 3	− 4	− 6
2400	− 905	+ 4	...	...	− 3	− 4	− 7
2600	− 981	+ 4	...	...	− 4	− 5	− 7
2800	− 1056	+ 4	...	...	− 4	− 5	...
3000	− 1132	+ 5	...	...	− 4	− 5	...
3500	− 1321	+ 6	...	...	− 4	− 5	...
4000	− 1510	+ 7	...	...	− 4	− 6	...
4500	− 1700	+ 7	...	...	− 4	− 6	...
5000	− 1889	+ 8	...	...	− 4	− 6	...
5500	− 2079	+ 8	...	...	− 4	− 6	...
6000	− 2269	+ 8	...	...	− 4	− 7	...
6500	− 2458	+ 8	...	...	− 4	− 7	...
7000	− 2648	+ 8	...	...	− 4	− 7	...
7500	− 2838	+ 8	...	...	− 4	...	...
8000	− 3029	+ 8	+ 21	...	− 4		
8500	− 3219	+ 8	+ 21	...	− 4		
9000	− 3409	+ 7	+ 21	...	− 4		
9500	− 3599	+ 7	+ 21	...	− 4		
10000	− 3789	+ 7	+ 21	...	− 4		
10500	− 3979	+ 7	+ 21	...	...		
11000	− 4169	+ 7	+ 20	...	...		
11500	− 4359	+ 7	+ 20	...	...		
12000	− 4549	+ 7	+ 19	+ 38	...		

Interpolation Table	
100	38
200	76
300	114
400	152
500	190

Water.

Depth of zone	Station at sea-level	Correction for station at		
		2000 ft.	4000 ft.	6000 ft.
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	+ 116	0	0	+ 1
1000	+ 232	0	+ 1	+ 1
1500	+ 348	0	+ 1	+ 1
2000	+ 465	+ 1	+ 2	+ 2
2500	+ 582	+ 1	+ 2	+ 2
3000	+ 699	+ 1	+ 2	+ 3
3500	+ 817	+ 1	+ 2	+ 3
4000	+ 935	+ 1	+ 2	+ 3
4500	+ 1053	+ 1	+ 2	+ 3
5000	+ 1171	+ 1	+ 3	+ 4
5500	+ 1289	+ 1	+ 3	+ 4
6000	+ 1408	+ 2	+ 4	+ 5
6500	+ 1527	+ 2	+ 4	...
7000	+ 1647	+ 2	+ 3	...
7500	+ 1766	+ 2	+ 3	...
8000	+ 1886	+ 1	+ 3	...

Interpolation Table	
100	24
200	47
300	71
400	94
500	118

ZONE O.

Inner radius 32 miles. Outer radius 60 miles.

Curvature 1410 feet.

Topography.

Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.
feet	10^{-5} dynes	feet	10^{-5} dynes	feet	10^{-5} dynes	feet	10^{-5} dynes	feet	10^{-5} dynes
500	+ 1	3000	+ 42	5500	+ 141	8000	+ 297	10500	+ 510
1000	5	3500	57	6000	167	8500	335	11000	560
1500	10	4000	74	6500	195	9000	375	11500	612
2000	18	4500	94	7000	227	9500	418	12000	666
2500	+ 29	5000	+ 116	7500	+ 261	10000	+ 463	12500	+ 722

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station: Below zone by 2000 feet	4000 feet	6000 feet	8000 feet	10000 feet	12000 feet	Above zone by 2000 feet	4000 feet	6000 feet	8000 feet	10000 feet	12000 feet
feet	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes
100	− 62	...	...	...	...	...	...	0	− 1	− 1	− 2	− 3	− 4
200	− 124	...	...	...	...	...	...	− 1	− 1	− 2	− 3	− 4	− 5
300	− 186	...	...	...	...	...	...	− 1	− 1	− 2	− 4	− 5	− 6
400	− 247	...	...	...	...	...	...	− 1	− 2	− 3	− 5	− 6	− 7
500	− 309	...	...	...	...	...	...	− 1	− 2	− 4	− 6	− 7	− 8
600	− 370	...	...	...	...	...	...	− 2	− 3	− 5	− 6	− 8	− 9
700	− 432	...	...	...	...	...	...	− 2	− 3	− 5	− 7	− 9	− 10
800	− 493	...	...	...	...	...	...	− 2	− 4	− 6	− 8	− 10	− 11
900	− 555	...	...	...	...	...	...	− 2	− 4	− 6	− 8	− 11	− 12
1000	− 616	...	...	...	...	...	...	− 3	− 5	− 7	− 9	− 11	− 13
1100	− 678	...	...	...	...	...	...	− 3	− 5	− 8	− 10	− 12	...
1200	− 739	...	...	...	...	...	...	− 3	− 6	− 9	− 11	− 13	...
1300	− 801	...	...	...	...	...	...	− 3	− 6	− 10	− 12	− 14	...
1400	− 863	...	...	...	...	...	...	− 4	− 7	− 10	− 13	− 16	...
1500	− 925	...	...	...	...	...	...	− 4	− 7	− 11	− 14	− 17	...
1600	− 987	...	...	...	...	...	...	− 4	− 8	− 12	− 15	− 18	...
1700	− 1049	...	...	...	...	...	...	− 4	− 8	− 12	− 15	− 19	...
1800	− 1111	...	...	...	...	...	...	− 5	− 9	− 13	− 16	− 21	...
1900	− 1173	...	...	...	...	...	...	− 5	− 9	− 13	− 17	− 22	...
2000	− 1235	+ 5	...	...	...	...	...	− 5	− 10	− 14	− 18	− 23	...
2100	− 1297	+ 5	...	...	...	...	...	− 5	− 10	− 14	− 19	− 24	...
2200	− 1359	+ 5	...	...	...	...	...	− 5	− 11	− 15	− 20	− 25	...
2300	− 1421	+ 6	...	...	...	...	...	− 6	− 11	− 16	− 21	− 26	...
2400	− 1483	+ 6	...	...	...	...	...	− 6	− 12	− 17	− 22	− 27	...
2500	− 1545	+ 6	...	...	...	...	...	− 6	− 12	− 17	− 23	− 28	...
2600	− 1607	+ 6	...	...	...	...	...	− 6	− 13	− 18	− 23	− 28	...
2700	− 1669	+ 7	...	...	...	...	...	− 7	− 13	− 19	− 24	− 29	...
2800	− 1731	+ 7	...	...	...	...	...	− 7	− 14	− 20	− 25	− 30	...
2900	− 1794	+ 7	...	...	...	...	...	− 7	− 14	− 20	− 26	− 31	...
3000	− 1856	+ 8	+ 16	...	...	...	...	− 7	− 15	− 21	− 27	− 32	...
3500	− 2168	+ 9	+ 18	...	...	...	...	− 8	− 17	− 24	− 31	...	...
4000	− 2479	+ 10	+ 20	...	...	...	...	− 9	− 19	− 27	− 35	...	...
4500	− 2792	+ 11	+ 22	...	...	...	...	− 10	− 21	− 30	...	...	...
5000	− 3105	+ 12	+ 24	+ 38	...	...	...	− 12	− 23	− 33	...	...	...
5500	− 3418	+ 13	+ 26	+ 41	...	...	...	− 13	− 25	− 36	...	...	...
6000	− 3732	+ 14	+ 29	+ 44	...	...	...	− 14	− 26	− 39	...	...	...
6500	− 4047	+ 15	+ 31	+ 47	...	...	...	− 15	− 28	...	...	...	...
7000	− 4362	+ 16	+ 33	+ 50	+ 69	...	...	− 16	− 30	...	..	...	...
7500	− 4678	+ 17	+ 35	+ 54	+ 73	...	...	− 17	− 32	...	...	...	...
8000	− 4994	+ 18	+ 37	+ 57	+ 77	...	...	− 17	− 33	...	...	...	...
8500	− 5311	+ 19	+ 39	+ 60	+ 81	...	...	...	...	...	...	...	...
9000	− 5628	+ 20	+ 41	+ 62	+ 85	+ 107	...	...	...				
9500	− 5947	+ 21	+ 43	+ 65	+ 88	+ 112	...	...	...				
10000	− 6266	+ 21	+ 44	+ 67	+ 92	+ 117	...	...	...				
10500	− 6584	+ 22	+ 46	+ 70	+ 96	+ 122	...	...	...				
11000	− 6903	+ 23	+ 47	+ 72	+ 99	+ 126	...	...	...				
11500	− 7222	+ 24	+ 49	+ 75	+ 103	+ 131	...	...	...				
12000	− 7542	+ 25	+ 50	+ 77	+ 106	+ 135	+ 166	...	...				

Interpolation Table

100	62	63	64
200	125	126	128
300	187	190	192
400	250	253	256
500	312	316	320

Water.

Depth of zone	Stn. at sea-level	Corrn. for stn. at 2000 feet	4000 feet	6000 feet	8000 feet
feet	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes	10^{-5} dynes
500	+ 189	+ 1	+ 2	+ 3	+ 3
1000	+ 379	+ 2	+ 3	+ 5	+ 6
1500	+ 569	+ 2	+ 4	+ 7	+ 9
2000	+ 760	+ 3	+ 6	+ 9	+ 12
2500	+ 952	+ 4	+ 8	+ 12	+ 15
3000	+ 1144	+ 5	+ 9	+ 14	+ 18
3500	+ 1336	+ 5	+ 10	+ 16	+ 21
4000	+ 1529	+ 6	+ 12	+ 18	+ 23
4500	+ 1722	+ 7	+ 14	+ 20	...
5000	+ 1916	+ 8	+ 15	+ 22	...
5500	+ 2110	+ 8	+ 16	+ 24	...
6000	+ 2304	+ 9	+ 17	+ 25	...
6500	+ 2500	+ 9	+ 18	...	...
7000	+ 2695	+ 10	+ 19	...	...
7500	+ 2891	+ 10	+ 20	...	...
8000	+ 3087	+ 11	+ 21	...	...
8500	+ 3284	+ 12			
9000	+ 3482	+ 13			
9500	+ 3680	+ 13			
10000	+ 3878	+ 14			

Interpolation Table

100	38	39	39
200	76	78	79
300	115	116	118
400	153	155	158
500	191	194	197

ZONE P.

Inner radius 60 miles. Outer radius 108·6 miles.

Curvature 4460 feet.

Topography.

Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.	Height	Corrn.
feet	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*	*feet*	10^{-5} *dynes*
500	+ 0	3500	+ 27	6500	+ 94	9500	+ 201	12500	+ 348	15500	+ 535
1000	2	4000	36	7000	109	10000	223	13000	376	16000	570
1500	5	4500	46	7500	125	10500	246	13500	407	16500	606
2000	9	5000	56	8000	142	11000	270	14000	436	17000	+ 644
2500	14	5500	68	8500	161	11500	295	14500	468		
3000	+ 20	6000	+ 80	9000	+ 181	12000	+ 321	15000	+ 501		

Compensation.

Land.

Height of zone	Station same height as zone	Correction for station: Below zone by 2000 feet	4000 feet	6000 feet	8000 feet	10000 feet	12000 feet	Above zone by 2000 feet	4000 feet	6000 feet	8000 feet	10000 feet	12000 feet
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
100	− 53	...	...	...	...	...	...	0	− 1	− 1	− 2	− 2	− 3
200	− 106	...	...	...	...	...	...	− 1	− 1	− 2	− 3	− 4	− 5
300	− 159	...	...	...	...	...	...	− 1	− 2	− 3	− 4	− 6	− 7
400	− 211	...	...	...	...	...	...	− 1	− 2	− 4	− 6	− 8	− 10
500	− 264	...	...	...	...	...	...	− 2	− 3	− 5	− 7	− 9	− 12
600	− 317	...	...	...	...	...	...	− 2	− 4	− 6	− 8	− 11	− 14
700	− 370	...	...	...	...	...	...	− 2	− 4	− 7	− 9	− 12	− 15
800	− 422	...	...	...	...	...	...	− 2	− 5	− 8	− 10	− 13	− 16
900	− 475	...	...	...	...	...	...	− 3	− 6	− 9	− 12	− 15	...
1000	− 527	...	...	...	...	...	...	− 3	− 7	− 10	− 13	− 17	...
1100	− 580	...	...	...	...	...	...	− 3	− 7	− 11	− 15	− 19	...
1200	− 632	...	...	...	...	...	...	− 4	− 8	− 12	− 16	− 20	...
1300	− 685	...	...	...	...	...	...	− 4	− 9	− 13	− 17	− 22	...
1400	− 738	...	...	...	...	...	...	− 5	− 10	− 14	− 18	− 23	...
1500	− 791	...	...	...	...	...	...	− 5	− 10	− 15	− 20	− 25	...
1600	− 844	...	...	...	...	...	...	− 5	− 11	− 16	− 21	− 26	...
1700	− 897	...	...	...	...	...	...	− 6	− 11	− 17	− 23	− 28	...
1800	− 950	...	...	...	...	...	...	− 6	− 12	− 18	− 24	− 30	...
1900	− 1003	...	...	...	...	...	...	− 6	− 12	− 19	− 26	− 32	...
2000	− 1056	+ 7	...	...	...	...	...	− 7	− 13	− 20	− 27	− 33	...
2100	− 1109	+ 7	...	...	...	...	...	− 7	− 13	− 21	− 29	− 35	...
2200	− 1162	+ 7	...	...	...	...	...	− 7	− 14	− 22	− 30	− 37	...
2300	− 1215	+ 8	...	...	...	...	...	− 8	− 15	− 23	− 31	− 39	...
2400	− 1268	+ 8	...	...	...	...	...	− 8	− 16	− 24	− 32	− 40	...
2500	− 1321	+ 8	...	...	...	...	...	− 8	− 16	− 25	− 33	...	...
2600	− 1374	+ 9	...	...	...	...	...	− 9	− 17	− 26	− 35	...	...
2700	− 1427	+ 9	...	...	...	...	...	− 9	− 18	− 27	− 36	...	...
2800	− 1480	+ 9	...	...	...	...	...	− 9	− 19	− 28	− 37	...	...
2900	− 1534	+ 10	...	...	...	...	...	− 10	− 19	− 29	− 39	...	...
3000	− 1587	+ 10	...	...	...	...	...	− 10	− 20	− 30	− 40	...	...
3500	− 1855	+ 12	...	...	...	...	...	− 12	− 23	− 35	− 46	...	...
4000	− 2123	+ 14	+ 28	...	...	...	...	− 13	− 26	− 39	− 52	...	...
4500	− 2392	+ 16	+ 31	...	...	...	...	− 15	− 29	− 44	− 58	...	...
5000	− 2662	+ 17	+ 34	...	...	...	...	− 17	− 33	− 49	− 64	...	...
5500	− 2933	+ 19	+ 37	...	...	...	...	− 19	− 36	− 54	...	...	...
6000	− 3205	+ 20	+ 40	+ 61	...	...	...	− 20	− 39	− 59	...	...	...
6500	− 3477	+ 22	+ 43	+ 65	...	...	...	− 22	− 43	− 64	...	...	...
7000	− 3750	+ 23	+ 46	+ 70	...	...	...	− 23	− 46	− 69	...	...	...
7500	− 4024	+ 25	+ 49	+ 75	...	...	...	− 25	− 49	...	...	...	...
8000	− 4299	+ 26	+ 52	+ 80	+ 108	+ 137	...	− 26	− 52	...	...	...	...
8500	− 4575	+ 28	+ 55	+ 84	+ 114	+ 145	...	− 28	− 55	...	...	...	...
9000	− 4851	+ 30	+ 59	+ 89	+ 120	+ 152	...	− 30	− 59				
9500	− 5128	+ 32	+ 62	+ 93	+ 126	+ 160	...	− 32	...				
10000	− 5406	+ 33	+ 65	+ 98	+ 133	+ 167	...	− 33	...				
10500	− 5685	+ 35	+ 69	+ 103	+ 139	+ 175	...	− 35	...				
11000	− 5965	+ 36	+ 72	+ 108	+ 145	+ 183	...	− 36	...				
11500	− 6246	+ 38	+ 76	+ 113	+ 151	+ 190	...	...	...				
12000	− 6527	+ 39	+ 79	+ 118	+ 157	+ 198	+ 240	...	...				

Interpolation Table

100	54	54	55	56
200	107	109	110	112
300	161	163	166	168
400	214	218	221	224
500	268	272	276	280

Water.

Depth of zone	Station at sea-level	Correction for station at 2000 feet	4000 feet	6000 feet	8000 feet	10000 feet
feet	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*	10^{-5} *dynes*
500	+ 162	+ 1	+ 2	+ 3	+ 4	+ 5
1000	+ 323	+ 2	+ 4	+ 6	+ 8	+ 10
1500	+ 485	+ 3	+ 6	+ 9	+ 12	+ 15
2000	+ 648	+ 4	+ 8	+ 12	+ 16	+ 20
2500	+ 811	+ 5	+ 10	+ 15	+ 20	...
3000	+ 975	+ 6	+ 12	+ 18	+ 24	...
3500	+ 1140	+ 7	+ 14	+ 21	+ 28	...
4000	+ 1304	+ 8	+ 16	+ 24	+ 32	...
4500	+ 1469	+ 9	+ 19	+ 27	...	...
5000	+ 1634	+ 11	+ 22	+ 32	...	...
5500	+ 1800	+ 12	+ 24	+ 35	...	...
6000	+ 1966	+ 13	+ 26	+ 38	...	...
6500	+ 2132	+ 14	+ 28	...	...	...
7000	+ 2299	+ 15	+ 30	...	...	...
7500	+ 2466	+ 16	+ 32	...	...	...
8000	+ 2634	+ 17	+ 34			
8500	+ 2802	+ 18	...			
9000	+ 2971	+ 19	...			
9500	+ 3140	+ 20	...			
10000	+ 3309	+ 22	...			

Interpolation Table

100	33	33	34
200	65	66	67
300	97	99	101
400	130	132	134
500	162	165	168

CHAPTER IX.

The Application of the Compensation correction and the Deduction of the values of $g-\gamma_c$.

We now come to the application of the Hayford compensation correction, and this, as may be imagined, is a laborious business. It entails the estimation of heights and depths of zones covering the whole earth and this not once only, but for each gravity station, taking that station as centre and drawing concentric circles to define the zones.

In practice, however, the labour has been very much reduced by interpolation, especially for the outer zones. It is obvious that for two stations fairly close together, say 120 miles apart, the areas covered by zone 1 will be nearly the same in each case and the effects will, consequently, be practically identical. The proportion of area common to both zones will of course decrease as the nearer zones are dealt with, until in zone O (outer radius 60 miles) there is no overlapping of zones. It follows, therefore, that if there should be another gravity station between these two, it would be quite safe to interpolate the correction for many of the outer zones and this has been done freely.

The actual method employed was this. The outer zones 1 to 11 were divided into 3 groups :—zones 1 to 6, 7 to 9, and 10 and 11. The actual effects for each group of zones were then computed for certain points, not necessarily actual gravity stations. The coordinates of the points selected for each group and the actual combined effects of the topography and compensation are given below :—

Zones	Latitude	Longitude	Effect	Zones	Latitude	Longitude	Effect
			10^{-5} *dynes*				10^{-5} *dynes*
1 to 6	34°	64°	+ 134	7 to 9 (*contd.*)	27°	98°	− 180
	8	77 − 40′	+ 154		24	96	− 177
	32	101	+ 222		22	89	− 174
	10	101	+ 221		20	99	− 108
7 to 9	35	72	− 247		25	67	− 81
	24	90	− 200		22	78	− 53
	29	81	− 198		16	95	− 24
	26	84	− 195		16	82	+ 115
	30	74	− 191		12	99	+ 164
	27	90	− 182		16	73	+ 242
					8	77 − 40′	+ 463

Zones	Latitude	Longitude	Effect	Zones	Latitude	Longitude	Effect
			10^{-5} *dynes*				10^{-5} *dynes*
10 and 11	28°	96°	−987	10 and 11 (*contd.*)	29°	67°	−342
	27	90	−966		25	73	−232
	31	78	−914		20	98	−208
	27	84	−833		19	94	−114
	31	74	−819		20	86	− 63
	28	75	−792		21	81	− 54
	25	96	−783		17	98	− 53
	27	80	−756		25	67	− 24
	34	72	−658		22	75	+ 19
	24	87	−615		15	98	+ 54
	30	70	−600		12	99	+ 69
	23	99	−519		18	84	+133
	22	94	−487		19	78	+198
	22	89	−448		20	72	+241
	23	83	−407		14	80	+419
	24	78	−404		15	74	+476
	27	71	−386		8	77−40′	+799

The estimation of heights for zones 1 to 6 was done from Harmsworth's Atlas. The zones were first drawn on a small globe, and thence projected on to the orographical map in the atlas. For the other zones use was made of a special bathy-orographical map of Asia and the Indian Ocean prepared by Captain Cowie some 5 years ago from the latest available information.

It should be remembered that for zones 1 to 6 a correction of 0·00001 dyne corresponds to a height of 1000 feet and for zones 7 to 11, to a height of 100 feet; and, seeing that there is no tendency for the estimation of heights to be persistently too great or too small, the error in any of the above effects is not likely to be more than 0·0001 dyne.

The effects were then plotted on three small scale maps of India (charts I, II and III at end) one for each group of zones, and lines of equal effect or corrections drawn by interpolation. This presented no great difficulties as the amounts varied fairly regularly. In all the groups, as was pointed out in Chapter VIII, the effect of the compensation is greater than that of the topography; consequently, a negative sign denotes a predominance of land, a positive sign, of ocean areas.

It was at first intended to treat zone 12 by this method; but, having computed the effects of this zone at a few stations, it was seen that in some parts of India, especially where the Himālaya are just included in this zone, the contours would be so close together as to make interpolation unsafe. It was decided, therefore, to compute the effects inside zone 11 (about 400 miles from the station) for each gravity station, though in some parts of the country, where stations are fairly close together and more than 400 miles from the Himālaya or other areas where great changes of height are found, the effects in zones 12 to 18 were obtained by linear interpolation, as will be presently described.

For zones 1 to 11, therefore, the effects of topography and compensation on a gravity station are read directly off the three charts and the total error for these zones is unlikely to be more than about 0·0004 dyne.

Inside zone 11 interpolation was not as a rule used, but the heights and depths were estimated from the map. In order to avoid covering the map with circles, a template of transparent celluloid was made. On this the circles and radial lines defining the zones and compartments were drawn, and the template was placed on the map with the centre of the circles over the gravity station.

For zones 12 to O the old 32 mile to the inch contoured map of India was used until the middle of the recess season of 1913 when the new 32-mile layer map became available. For zones M and N the $\frac{1}{4}$-inch Indian Atlas sheets were employed, inside zone M (*i. e.* within 12 miles of the station) 1-inch maps were used, and in cases where the station was in hilly country a special sketch map of the immediate surroundings was, as a rule, prepared at the time of making the gravity determinations.

Zones A to N were not as a rule divided into rigid compartments, but the proportion of the whole area of the zone between pairs of contours was estimated by eye, or in some cases measured by planimeter, and the effect of each part taken from the reduction tables. Zones O to 14 were divided into 10 equal compartments starting from north and proceeding clock-wise, and for zones 18 to 14, where the effect is proportional to the height, (except for small errors which are allowed for in the special reduction tables) the mean of the ten compartments was taken as the height of the zone. Zones 13 and 12 were divided into 16 and 10 compartments respectively in the reduction tables, and, therefore, the effect of these whole zones was the sum of the effects of the compartments.

Generally the estimation of heights by eye is fairly simple; in zones, however, which include parts of the Himālaya or other high mountains some more rigid method had to be employed. In a great many cases the planimeter was used to measure the fraction of the compartment between each pair of contours, but with practice it is possible to make a fairly accurate estimate of these fractions by inspection. It is to be remembered that an error of 1000 feet in any compartment in zones 18 to 7 only introduces an error of 0·0001 dyne in the correction.

It has been stated above that the effect of zones 18 to 12 was in some cases found by linear interpolation and the method, which is simple, will now be described. Let us suppose that the effect of these zones at 3 stations A, B and C has been found from the map, and that it is required to find the effect at another station D situated in or near the triangle A B C.

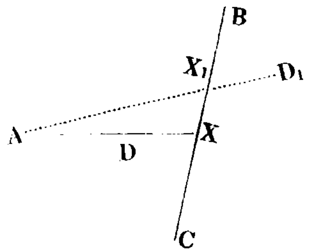

Fig: 9

In the figure the points A, B, C and D show the actual relative positions of the stations, the scale being immaterial. Join B C and A D, and if D is inside the triangle produce the latter to cut B C in X. Let the effects of zones 18 to 12 at each station be represented by a, b, c, d and x. Then, since we are assuming that the effects vary uniformly, *i. e.* are susceptible to interpolation

$$x = \frac{BX}{BC}(c - b) + b$$

and

$$d = \frac{AD}{AX}(x - a) + a$$

This method was employed for several stations in Central India where the effects of these zones do not vary greatly. As a rule, the effects at 4 stations were obtained from the maps and the effect at one of them was then interpolated from the other three. If the agreement between the actual and interpolated value was good, other stations near these 4 were dealt with by interpolation and much labour saved thereby. The actual method is the same as that employed by Mr. Hayford, but, whereas we have only used it for zones 18 to 12 and have obtained the effects for zones 11 to 1 from the contoured charts, Mr. Hayford has used the method throughout.

It is not proposed in this paper to give the details of the computation of the Hayford correction for all stations. In order, however, to explain by a concrete example the use of the reduction tables the details of the correction for Dehra Dūn are shewn below :--

DEHRA DUN,
Latitude 30° 19′ 29″,
Longitude 78° 3′ 22″,
Height 2241 feet.
Unit of correction is 10^{-5} dyne.

Height	Fraction	Correction for Topography	Correction for Compensation	Total
	ZONE A			
feet 2240	1·0	+ 34	0	+ 34
	ZONE B			
2240	1·0	+ 608	0	+ 608
	ZONE C			
2240	1·0	+ 1108	− 1	+ 1107
	ZONE D			
2240	1·0	+ 1604	− 6	+ 1598
	ZONE E			
2240	1·0	+ 1408	− 17	+ 1391
	ZONE F			
2240	1·0	+ 1232	− 45	+ 1187
	ZONE G			
2400	½	+ 242	− 27	
2100	½	+ 241	− 23	
		+ 483	− 50	+ 433
	ZONE H			
2430	½	+ 126	− 28	
2100	½	+ 127	− 24	
		+ 253	− 52	+ 201
	ZONE I			
2460	⅕	+ 64	− 28	
2360	⅕	+ 32	− 13	
2125	⅕	+ 65	− 24	
2050	⅕	+ 64	− 23	
2000	⅕	+ 32	− 11	
		+ 257	− 99	+ 158
Carried over ...		+ 6987	− 270	+ 6717
Brought forward ...		+ 6987	− 270	+ 6717
	ZONE J			
feet 3000	·03	+ 4	− 10	
2900	·24	+ 46	− 62	
2350	·16	+ 34	− 34	
2100	·37	+ 78	− 70	
1800	·20	+ 41	− 33	
		+ 203	− 209	− 6
	ZONE K			
4000	·1	+ 5	− 52	
3800	·2	+ 12	− 99	
3300	·1	+ 9	− 43	
2400	·1	+ 12	− 31	
2250	·1	+ 12	− 29	
2100	·3	+ 36	− 82	
1900	·1	+ 12	− 25	
		+ 98	− 361	− 263
	ZONE L			
6500	⅛	− 22	− 134	
5600	⅛	− 10	− 115	
8200	⅛	+ 7	− 66	
1700	⅛	+ 8	− 35	
2100	⅛	+ 8	− 43	
2200	⅛	+ 8	− 45	
2000	⅛	+ 8	− 41	
5200	⅛	− 6	− 107	
		+ 1	− 586	− 585
Carried over ...		+ 7289	− 1426	+ 5863

Height	Fraction	Correction for Topography	Correction for Compensation	Total
Brought forward ...		+ 7289	− 1426	+ 5863
ZONE M h = 2411				
feet				
6400	·1	− 11	− 191	
7300	·1	− 19	− 218	
5000	·1	− 1	− 149	
3000	·2	+ 11	− 179	
1700	·1	+ 5	− 51	
1600	·1	+ 5	− 48	
1400	·2	+ 10	− 84	
2100	·1	+ 6	− 63	
		+ 6	− 983	− 977
ZONE N h = 2691				
6000	·3	− 7	− 678	
5000	·1	+ 1	− 188	
3000	·2	+ 9	− 226	
1700	·1	+ 4	− 64	
1200	·1	+ 3	− 45	
900	·1	+ 2	− 34	
1400	·1	+ 3	− 53	
		+ 15	− 1288	− 1273
Carried over ...		+ 7310	− 3697	+ 3613

Height	Fraction	Correction for Topography	Correction for Compensation	Total
Brought forward ...		+ 7310	− 3697	+ 3613
ZONE O h = 3651				
feet				
10400	·1	− 15	− 642	
9200	·1	− 8	− 568	
4500	·1	+ 6	− 278	
4300	·1	+ 6	− 265	
1000	·1	+ 3	− 62	
900	·2	+ 5	− 111	
1000	·1	+ 3	− 62	
5200	·1	+ 5	− 321	
6500	·1	+ 3	− 401	
		+ 8	− 2710	− 2702
ZONE P h = 6701				
13700*	·1	− 1		
16300*	·1	− 11		
8700*	·1	+ 9		
3900	·1	+ 8	− 206	
800	·3	+ 7	− 127	
900	·1	+ 3	− 48	
3300	·1	+ 7	− 175	
8700*	·1	+ 9		
* = 11850	·4		− 2504	
		+ 31	− 3060	− 3029
Carried over ...		+ 7349	− 9467	− 2118

Height	Correction
Brought forward ...	− 2118
ZONE 18	
feet	
18000	
15500	
13000	
3600	
700	
700	
700	
800	
2000	
10300	
Mean = 6030 *feet*	− 603
a	0
b	0
	− 603
Carried over	− 2721

Height	Correction
Brought forward ...	− 2721
ZONE 17	
feet	
14100	
14000	
12700	
3200	
700	
700	
700	
800	
2200	
11900	
Mean = 6100 *feet*	− 610
a	0
b	0
	− 610
Carried over	− 3331

Height	Correction
Brought forward ...	− 3331
ZONE 16	
feet	
16000	
15000	
12100	
2000	
600	
700	
700	
800	
1700	
13500	
Mean = 6310 *feet*	− 631
a	+ 10
b	0
	− 621
ZONE 15	
16000	
16000	
13100	
2300	
600	
800	
800	
700	
1600	
14300	
Mean = 6620 *feet*	− 662
a	+ 10
b	0
	− 652
ZONE 14	
15500	
16500	
15000	
2200	
500	
800	
800	
600	
1500	
13700	
Mean = 6710 *feet*	− 671
a	+ 10
b	0
	− 661
Carried over	− 5265

Height	Correction
Brought forward ...	− 5265
ZONE 13	
feet	
16000	
16000	
16000	
16000	
13200	
1700	
500	
500	
900	
1400	
1000	
600	
600	
1000	
9200	
15000	
Mean = 6850 *feet*	− 1096
ZONE 12	
16000	
16000	
15500	
2600	
600	
1100	
1100	
500	
3000	
14000	
Mean = 7040 *feet*	− 704

Total	=	− 7065
	=	−0·0707*
By interpolation from charts		
Zones 11 and 10		−0·0091
Zones 9 to 7		−0·0020
Zones 6 to 1		+0·0017
Total correction		−0·0801
γ_0	=	979·347
Correction for height		−0·210
,, ,, mass		−0·080
γ_c	=	979·057
g	=	979·063
$g-\gamma_c$	=	+0·006 dyne

a = Correction for departure from proportionality.
b = Correction for height of station.
* To 4 places of decimals only, since interpolation from charts is only possible to 4 places.

Zones A to L require no explanation. For zones M to P, curvature has been allowed for as explained at the end of Chapter VIII, by taking height of station *plus* curvature as the argument for entering the topography tables, the value of height *plus* curvature being shewn in the example. Cf. zone M, where 2411 = 2241 + 170.

In zone P we see that the heights of two of the compartments exceed 12000 feet, the greatest height allowed for in the reduction tables. To enable the effect to be computed, two other compartments are joined to these when the mean height of the whole four becomes less than 12000 feet. This device is only necessary for computing the compensation where the argument is height of zone. For the topography corrections the tables for the outer zones have been extended beyond 12000 feet.

The total topography correction up to zone P is seen to be +0·07349. This agrees closely, as it should, with the sum of the Bouguer and orographical corrections *viz.*, +0·071 (*vide* Chapter I.) The difference 0·0025 is due to curvature not being allowed for in the Bouguer correction. As has been stated, the Bouguer hypothesis assumes that the station is situated on an infinite plain of the same height as the station. If curvature had not been taken into account in zones M to P, the total topography correction would have been + 0·07152, and the agreement with the sum of the two Bouguer corrections is thus almost exact. The estimations of height were made independently, separated by an interval of several years and our confidence in the estimation is, therefore, increased.

Beyond zone P the effects of topography and compensation are combined, and the correction varies very nearly directly with the height. The corrections for departure from proportionality (of effect to height) and for elevation of station are taken from the special reduction tables. These tables are only shewn to 4 places of decimals and the fifth place has, therefore, not been shewn in the example.

We give below the details of the computation of height of some of the compartments round Debra Dūn. In these tables f is the fraction of the compartment dealt with and h, the height.

ZONE O.

Compartment 1			Compartment 2			Compartment 4			Compartment 10		
h	f	h × f	h	f	h × f	h	f	h × f	h	f	h × f
17000	·20	3400	17500	·07	1225	6500	·14	910	4500	·41	1845
12000	·26	3120	11500	·30	3450	4500	·64	2880	7500	·26	1750
7000	·13	910	7500	·54	4050	2600	·11	286	10500	·09	945
8000	·11	880	5500	·09	495	2200	·11	242	8000	·24	1920
5500	·09	495									
7500	·21	1575									
Mean height		10380			9220			4318			6460

ZONE P.

Compartment 1			Compartment 2			Compartment 4			Compartment 9		
h	f	h × f	h	f	h × f	h	f	h × f	h	f	h × f
8500	·15	1275	10000	·03	300	6500	·13	845	6500	·06	390
12000	·29	3480	12000	·23	2760	5000	·45	2250	5500	·08	440
15500	·06	930	16500	·52	8580	2500	·18	450	5000	·30	1500
16000	·50	8000	21000	·16	3360	1600	·15	240	2600	·24	624
			21500	·06	1290	900	·09	81	1500	·16	240
									900	·16	144
Mean height		13685			16290			3866			3338

ZONE 18. ZONE 15. ZONE 12.

Zone 18 Compartment 1			Zone 18 Compartment 4			Zone 15 Compartment 3			Zone 12 Compartment 4		
h	f	h × f	h	f	h × f	h	f	h × f	h	f	h × f
9300	·15	1395	6500	·18	1170	16500	·40	6600	16000	·06	960
12000	·40	4800	5000	·26	1300	14500	·22	3190	12000	·03	360
12500	·15	1875	4500	·15	675	12000	·15	1800	8000	·04	320
16500	·30	4950	1800	·13	234	7500	·14	1050	4000	·09	360
			900	·28	252	5500	·09	495	2400	·11	264
									1600	·07	112
									700	·04	28
									400	·56	224
Mean height		13020			3631			13135			2628

The fraction of the zone or compartment between the various contours was, in all the examples given, measured by planimeter, and is not likely to be much in error. There are, however probabilities of errors in the heights The contours of the new 32-mile map of India, from which all these estimations of height were made, are at the following intervals:—

250 feet	2000 feet	10000 feet
500 ,,	3000 ,,	15000 ,,
1000 ,,	6000 ,,	20000 ,,

But the height of an area between any two of these is obviously not always the mean of the two contour heights. For instance, the mean height of a conical hill 3000 feet high is not 1500 feet but 1000 feet; and if, as is usually the case, the slopes tend to be concave, the mean height over the whole area covered by the base will be less than 1000 feet. Cases may also occur where the mean height of the area between two contours will be greater than the mean of the contour heights. The heights shewn in the example, then, were derived from a study of the lie of the ground as shewn by the contours, and the method cannot be rigidly given.

Reverting again to the details of the correction for Dehra Dūn, there is one other point which it is advisable to emphasize, and that is that the effect of the masses above sea level (*i.e.* the topography) is never negligible when curvature is taken into account. This point is, perhaps, apt to be lost sight of, since in the numbered zones, 18 to 1, the sign of the correction is always the same as the sign of the compensation effect *i.e.*, *minus* for land and *plus* for ocean areas. This, of course, merely means that the effect of the compensation is greater than that of the topography. It is simple to obtain an idea of the relative effects of the topography and the compensation. The effect of the mass in a zone has been shewn in Chapter VIII to be km × (average value of E for the zone) where E represents the expression—

$$\frac{\sin\left\{\frac{\theta}{2} \pm \sin^{-1}\frac{h\cos\frac{\theta}{2}}{\sqrt{D_1^2 + h^2 \pm 2D_1 h \sin\frac{\theta}{2}}}\right\}}{D_1^2 + h^2 \pm 2D_1 h \sin\frac{\theta}{2}}$$

The effect of the compensation is also kmE; but in this case, though m is the same as for the topography (but of opposite sign), E will differ since D_1 and h are not the same in the two cases. Consequently, the ratio of the topography effect to the combined effect may be expressed as $\frac{E_T}{E_C - E_T}$, where the suffixes represent topography and compensation. Mr. Hayford has published the values of E_T and E_C (though for the computations of the limits of zones he has only used $E_C - E_T$) and we can thus easily find these ratios. The following table shows approximately the mean values of $\frac{E_T}{E_C - E_T}$, or the factors by which the combined effect is to be multiplied to obtain the topography effect in the different numbered zones.

Zone	Factor	Zone	Factor	Zone	Factor
18	0·050	12	0·5	6	15
17	0·067	11	0·8	5	27
16	0·08	10	1·5	4	46
15	0·11	9	2·6	3	72
14	0·15	8	5·0	2	98
13	0·25	7	9·0	1	110

Taking Dehra Dūn as an example the following are the topography effects in the numbered zones:—

Zone	Effect	Zone	Effect	Zone	Effect
18	+ 31	12	+ 352	6, 5, 4, 3, 2, 1	−1037
17	+ 41	11, 10	+1001		
16	+ 50				
15	+ 73	9, 8, 7	+1100		
14	+101				
13	+274				
				Total =	+ 1986
				i. e.	+ 0·01986 dyne

These figures are only approximate, especially in zones 11 to 1 where the combined corrections have not been found for the individual zones. A mean factor for each of the three groups of zones has been taken, the values being 1·1, 5·5 and 61 respectively. It is certain, however, that the topography beyond 103·6 miles will affect the second place of decimals of a dyne, and it may be asked, therefore, why topography has not always been allowed for quite apart from any question of compensation; the reason is again curvature. The old method of reduction took no account of this and, consequently, the attraction of distant masses was, rightly, assumed to be negligible.

It would no doubt be instructive to separate the topography and compensation effects in the numbered zones for all stations, but this has not been done.

The following tables contain a list of all the stations for which the Hayford correction has been computed, with the values of $g-\gamma_C$ (*vide* Chapter I) deduced. The values of $g-\gamma_B$ are also shewn for the sake of comparison, and the stations have been divided into groups according to their situation with regard to hills or other topographical features.

Class I.—Mountain stations.

Station	Height	Hayford correction	$g-\gamma_C$	$g-\gamma_B$
	feet	*dyne*	*dyne*	*dyne*
Sandakphu	11766	+ 0·141	+ 0·048	− 0·155
Ootacamund	7395	+ ·183	+ ·012	− ·046
Mussooree (Camel's Back) ...	6924	+ ·032	+ ·053	− ·123
Quetta	5520	+ ·024	+ ·007	− ·153
Yercaud	4493	+ ·116	− ·033	− ·057
		Mean ...	+ 0·017	− 0·107
		Mean (neglecting Yercaud) ...	+ 0·030	− 0·119
		Range ...	0·086	0·098

Class II.—Stations near foot of mountains.

Station	Distance from mountains	Hayford correction	$g-\gamma_C$	$g-\gamma_B$
	miles	*dyne*	*dyne*	*dyne*
Rājpur	1	− 0·066	+ 0·026	−0·143
Dehra Dūn	7	− ·080	+ ·006	− ·145
Roorkee	35	− ·057	− ·044	− ·129
Siliguri	10	− ·110	− ·039	− ·160
Jalpaiguri	30	− ·093	− ·020	− ·121
Pathānkot	10	− ·088	− ·076	− ·199
Sibi	10	− ·067	− ·059	− ·139
Salem	7	+ ·012	− ·048	− ·068
		Mean ...	− 0·032	−0·138
		Range ...	0·102	0·131

Class III.—Stations within 100 miles of mountains.

Station	Approximate distance from mountains	Hayford correction	$g-\gamma_C$	$g-\gamma_B$
	miles	*dyne*	*dyne*	*dyne*
Kaliāna	60	− 0·047	− 0·007	− 0·081
Jacobābād	80	− ·024	+ ·038	+ ·008
Miān Mīr	90	− ·033	+ ·040	− ·017
Gorakhpur	80	− ·046	− ·070	− ·125
Majhauli Rāj	90	− ·037	− ·057	− ·101
Muzaffarpur	95	− ·038	− ·042	− ·086
		Mean ...	− 0·016	− 0·067
		Range ...	0·110	0·133

Class IV.—Plains of North India and Bengal.

Station	Locality	Hayford correction	$g-\gamma_C$	$g-\gamma_B$
		dyne	*dyne*	*dyne*
Montgomery	Punjab plains	− 0·019	+ 0·019	− 0·019
Gesupur	Ganges valley	− ·025	+ ·005	− ·043
Khurja	,,	− ·024	− ·019	− ·065
Alīgarh	,,	− ·021	− ·007	− ·049
Hāthras	Jumna valley	− ·020	+ ·011	− ·029
Muttra	,,	− ·019	+ ·015	− ·023
Agra	,,	− ·018	+ ·017	− ·019
Dholpur	Chambal valley	− ·015	− ·005	− ·038
Allahābād	Ganges valley	− ·021	+ ·009	− ·022
Moghal Sarai	,,	− ·024	− ·005	− ·038
Buxar	,,	− ·026	− ·014	− ·047
Arrah	,,	− ·028	− ·028	− ·062
Monghyr	,,	− ·031	− ·025	− ·061
Kisnapur	,,	− ·027	+ ·039	+ ·008
Chātra	,,	− ·019	+ ·005	− ·016
		Mean ...	+ 0·001	− 0·035
		Range ...	0·067	0·073

Class V.—Stations in or near the Central Indian highlands.

(Arranged in order of height).

Station	Height	Hayford correction	$g-\gamma_C$	$g-\gamma_B$
	feet	*dyne*	*dyne*	*dyne*
Sasarām	340	− 0·023	+ 0·009	− 0·025
Gaya	361	− ·023	+ ·003	− ·032
Japla	474	− ·022	+ ·002	− ·036
Mortakka	576	− ·016	+ ·005	− ·030
Gwalior	658	− ·012	− ·007	− ·041
Daltonganj	707	− ·018	+ ·025	− ·017
Jalgaon	760	− ·009	+ ·020	− ·015
Jhānsi	858	− ·007	+ ·014	− ·022
Bilāspur	878	− ·008	+ ·013	− ·025
Mukhtiāra	926	− ·009	− ·019	− ·059
Raipur	996	+ ·001	− ·003	− ·035
Hoshangābād	1002	− ·010	+ ·021	− ·023
Khandwa	1014	− ·003	+ ·047	+ ·010
Amgaon	1032	− ·001	− ·003	− ·039
Amraoti	1123	− ·001	+ ·026	− ·013
Maihar	1161	− ·006	− ·003	− ·048
Lalitpur	1199	− ·003	− ·002	− ·045
Damoh	1213	− ·005	+ ·004	− ·042
Katni	1254	− ·006	+ ·007	− ·041
Shāhpur	1284	− ·006	+ ·023	− ·026
Ellichpur	1314	− ·001	+ ·031	− ·014
Bina	1355	·000	+ ·026	− ·020
Jubbulpore	1467	− ·002	+ ·030	− ·021
Umaria	1499	− ·002	+ ·029	− ·023
Sipri	1533	+ ·009	+ ·029	− ·014
Goona	1568	+ ·007	+ ·019	− ·027
Ujjain	1612	+ ·009	− ·011	− ·056
Bhopāl	1630	+ ·007	+ ·022	− ·026
Saugor	1757	+ ·010	+ ·011	− ·038
Kaliānpur	1763	+ ·011	+ ·039	− ·009
Mhow	1903	+ ·024	− ·015	− ·055
Pendra	1996	+ ·013	+ ·008	− ·046
Seoni	2032	+ ·016	+ ·036	− ·016
Asirgarh	2077	+ ·027	+ ·030	− ·007
Badnūr	2103	+ ·018	+ ·038	− ·015
Rānchi	2172	+ ·021	+ ·030	− ·022
	Mean	...	+ 0·015	− 0·028
	Range	...	0·066	0·069

Class VI.—Stations on or near the sea-coast.

Station	Hayford correction	$g-\gamma_C$	$g-\gamma_B$
	dyne	*dyne*	*dyne*
Colāba	0·000	+ 0·063	+ 0·062
Cuttack	·000	+ ·006	+ ·003
Madras	+ ·040	− ·053	− ·014

	$g-\gamma_C$	$g-\gamma_B$
	dyne	*dyne*
General Mean	**+0·004**	**−0·049**
Mean of Classes IV and V	**+0·011**	**−0·030**

It is to be noted that the assumption made in Chapters IV-VII, that a value of $g-\gamma_B$ of $-0\cdot030$ represents normal gravity in India, is fairly correct. The mean of the Bouguer residuals in Classes IV and V, *i.e.*, for stations far removed from any large excesses or defects of mass, is found to be exactly this amount.

Comparing now the two series of residuals it is at once evident that, as was to be expected, the compensation hypothesis has very materially reduced the values of $g-\gamma$ at stations on and near high ground. In the first group the change in the mean residual is 0·124, in the second group, 0·106 and in the third, 0·051. If, however, we change our equatorial constant, 978·030 in the formula for γ_0 to 978·034 in the first series and 977·981 in the second, and thus make the mean residual in each case equal to zero the changes in the mean residuals in the groups are, of course, reduced and become—

	Mean $g-\gamma_C$	Mean $g-\gamma_B$	Change
	dyne	*dyne*	*dyne*
Class I	+ 0·013	− 0·058	+ 0·071
	+ ·026*	− ·070*	+ ·096*
Class II	− ·036	− ·089	+ ·053
Class III	− ·020	− ·018	− ·002
Class IV	− ·003	+ ·014	− ·017
Class V	+ ·011	+ ·021	− ·010

In the first place we note that the new residuals are less than the Bouguer residuals in 4 out of the 5 classes, or in other words, the new residuals do not show quite such a close relation to the topography as is exhibited by the Bouguer method. The range of the new residuals in each class is also smaller than that of the Bouguer. From this it is evident that some sort of compensation does exist. It appears, however, that it is not complete, more especially in the Himālaya, this being shewn by the positive values of $g-\gamma_C$ at Mussooree and Sandakphu. It is quite certain also that when the Hayford corrections have been computed for the other Himālayan stations, *viz.*, Simla, Darjeeling and Kurseong the residuals at these stations will be positive, though it is impossible to guess their amounts.

The next point to be noted is the large deficiency of gravity along the foot of the Himālaya and other mountains. This is our chief geodetic problem in India, and Colonel Burrard has suggested a sub-crustal crack or rift all along the foot of the hills as a solution.

We have the two main facts, *viz.*—

(1) At Himālayan stations the positive residuals show that compensation is not complete, *i.e.* the underground deficiencies of density are less than the isostatic theory requires.

(2) At sub-Himālayan stations the negative residuals show that compensation is more than complete, *i.e.* the underground deficiencies of density are greater than the theory requires.

Put in this form a possible solution presents itself. Let us assume that the deficiencies of density under the Himālaya, instead of varying with the height, are constant, and also that

---

* Neglecting Yercaud, which is situated on a small detached hill mass, thus differing from the other mountain stations.

they extend beyond the Himālaya for a distance of, say, 100 miles. The second assumption will at once increase the compensation effect, *i.e.* decrease γ_C at sub-Himālayan stations. If we then assume that this constant deficiency of density is less than the theory demands under the Himālaya but greater under the sub-Himālayan plains we shall reduce the divergence between the residuals in the two areas.

Now, let us take some actual figures. Assume

(i) that Himālayan compensation extends for a distance of 100 miles to the south of the mountains.

(ii) that it is constant over the whole area.

(iii) that the amount of deficiency is equal to the theoretical deficiency under an area whose height is 3000 feet, *i.e.* it is $\frac{3000 \times 2\cdot67}{70 \times 5280} = 0\cdot022$.

The deficiencies of density in any zone are, according to the theory, a direct function of the height and are represented by the expression $\frac{H\,\delta}{70 \text{ miles}}$ (*vide* Chapter VIII), the height of zone, H, not otherwise appearing in the formula for the compensation effect.

The third assumption makes the computation of the new compensation correction a simple matter, and the method is explained in detail in the following pages.

Take the 4 stations, Mussooree (Camel's Back), Rājpur, Dehra Dūn and Roorkee, and consider first the zones A to P only. The actual compensation effects in these zones are:— Mussooree, $-0\cdot1152$; Rājpur, $-0\cdot1071$; Dehra Dūn, $-0\cdot0947$*; and Roorkee, $-0\cdot0372$. But, since Roorkee is about 35 miles from the Himālaya, some portion of zone P (60 to 103·6 miles) will be more than 100 miles from the Himālaya and in this portion, which by calculation is about ·23 of the whole zone P, the compensation is by hypothesis normal, *i.e.* depends on the height of the zone. At Dehra Dūn which is only 6 miles from the Himālaya, the portion of zone P outside the 100-mile line is so small as to be negligible. For Roorkee, then, the actual compensation correction for the area within the 100-mile line is found to be $-0\cdot0364$.

The compensation correction on our hypothesis is obtained by taking the height of all zones A to P as 3000 feet, and, neglecting for our purpose the small correction due to difference of height of station and zone, the correction will be $-0\cdot0698$ at the first three stations, and $-0\cdot0661$ for Roorkee neglecting ·23 of zone P. Substituting these figures for the actual compensation effects given above we get new values of $g-\gamma_C$ which are shewn below, the old values being exhibited for reference:—

	$g-\gamma_C$ (new value)	$g-\gamma_C$ (old value)
	dyne	*dyne*
Mussooree ...	+ 0·008	+ 0·053
Rājpur ...	− ·011	+ ·026
Dehra Dūn	− ·019	+ ·006
Roorkee ...	− ·014	− ·044

* *See* detailed computations on pages 170-172.

It will be advisable to consider the effect of our assumption on a station further from the Himālaya. Let us take Kaliāna which is about 25 miles S.W. of Roorkee and about 60 miles from the Himālaya. Here our 100-mile line cuts off about 1/6th of zone O and about 2/5ths of zone P. The total actual compensation correction at Kaliāna is $-0\cdot0297$ and the actual correction within the 100-mile line is $-0\cdot0275$. The correction on our assumption will be $-0\cdot0603$ for the same area. Consequently, the new residual at Kaliāna will be greater than the old one by $0\cdot0603-0\cdot0275$ *i.e.* $0\cdot033$, and will be $+\cdot026$.

Let us try the assumption that the compensation extends for a distance of 60 miles from the Himālaya. In this case, at Kaliāna only half the whole area out to zone P will be affected. At Roorkee the portions not affected are approximately $\cdot4$ of zone P, $\cdot3$ of zone O and 1/9th of zone N. At Dehra Dūn, Rājpur and Mussooree only portions of zone P will not be affected, the figures being approximately $\cdot25$, $\cdot23$ and $\cdot20$ respectively. In each case it is the lowest portions of the zones that are not affected. The actual and the new compensation corrections for these areas are shewn below :—

	Actual	New	$g-\gamma_C$	
			for 60 miles	for 100 miles
	dyne	*dyne*	*dyne*	*dyne*
Mussooree ...	−0·1142	−0·0666	+ 0·005	+ 0·008
Rājpur ...	−0·1062	−0·0661	− 0·014	− 0·011
Dehra Dūn ...	−0·0936	−0·0658	− 0·022	− 0·019
Roorkee ...	−0·0340	−0·0566	− 0·021	− 0·014
Kaliāna ...	−0·0206	−0·0349	+ 0·007	+ 0·026

So far we have only considered zones A to P, *i.e.* up to a distance of 104 miles from the station. Let us now consider the outer zones. For the sake of simplicity and, it is believed, with but little loss of accuracy, we will group together zones 18 to 14, *i.e.* between 104 and 211 miles from the station and consider zone 13 separately, this being a bigger zone, extending to 299 miles from the station.

Taking our first assumption that the uniform compensation extends 100 miles from the Himālaya we first compute the portions of zones within this 100-mile line. Neglecting for the present Dehra Dūn and Rājpur we find that the portions of the zones affected by the new assumption are —

	Zones 18 to 14	Zone 13
Mussooree ...	·74	·62
Roorkee ...	·64	·58
Kaliāna ...	·58	·56

For our purpose it is simpler to express these portions as the number of compartments. There are 50 compartments in zones 18 to 14, and 16 in zone 13. The numbers of compartments affected are therefore,—

	Zones 18 to 14	Zone 13
Mussooree ...	37	10
Roorkee ...	32	$9\frac{1}{4}$
Kaliāna ...	29	9

It must, of course, be remembered that the compartments affected are those in and near the Himālaya.

The next step is to find the actual compensation effects in these compartments, *i.e.* within the 100-mile line, and here it is to be remembered that the reduction tables for the outer zones give the combined effect of topography and compensation. To obtain the effect of the compensation alone we must multiply the combined effect by a factor differing in each zone, such factor being equal to 1 *plus* the topography factor given on page 175 of this chapter. For zones 18 to 14 we shall take 1·09 as the factor, *i.e.* the mean of those for each zone, and for zone 13 it is 1·25.

Similarly, we find the compensation effects of our new assumption.

The following table shows the various steps:—

Station	Zone	Actual			New			
		Total effect within 100-mile line	Factor	Compensation effect	Total effect within 100-mile line	Factor	Compensation effect	Difference
		dyne		*dyne*	*dyne*		*dyne*	*dyne*
Mussooree ...	18 to 14	−0·0324	1·09	−0·0353	−0·0111	1·09	−0·0121	−0·023
Roorkee ...	,,	−0·0225	1·09	−0·0245	−0·0096	1·09	−0·0105	−0·014
Kaliāna ...	,,	−0·0181	1·09	−0·0197	−0·0087	1·09	−0·0095	−0·010
Mussooree ...	13	−0·0106	1·25	−0·0133	−0·0030	1·25	−0·0038	−0·009
Roorkee ...	,,	−0·0090	1·25	−0·0113	−0·0028	1·25	−0·0035	−0·008
Kaliāna ...	,,	−0·0083	1·25	−0·0104	−0·0027	1·25	−0·0034	−0·007

Since the new compensation correction is less than the old, the correction to the value of $g-\gamma_c$ will be negative.

For the second assumption, that the compensation extends for 60 miles from the Himālaya, the method of procedure is the same but the number of compartments affected is, of course, altered. They are as follows:—

	Zones 18 to 14	Zone 13
Mussooree ...	31	$9\frac{1}{4}$
Roorkee ...	28	$8\frac{1}{2}$
Kaliāna ...	25	8

The actual and new compensation effects are —

	Zones 18 to 14			Zone 13		
	Actual	New	Difference	Actual	New	Difference
	dyne	*dyne*	*dyne*	*dyne*	*dyne*	*dyne*
Mussooree	−0·0348	−0·0101	−0·025	−0·0132	−0·0035	−0·010
Roorkee	−0·0242	−0·0092	−0·015	−0·0113	−0·0032	−0·008
Kaliāna	−0·0197	−0·0082	−0·012	−0·0103	−0·0030	−0·007

Since the values of the differences do not change very largely between Mussooree and Kaliāna, we can fairly safely interpolate the values for Rājpur and Dehra Dūn and take them as —

	60 miles		100 miles	
	Zones 18 to 14	Zone 13	Zones 18 to 14	Zone 13
	dyne	*dyne*	*dyne*	*dyne*
Rājpur	−0·024	−0·010	−0·022	−0·009
Dehra Dūn	−0·023	−0·010	−0·021	−0·009

The values of $g - \gamma_c$ on the two new assumptions will, therefore, be —

	Compensation		Original
	60 miles	100 miles	
	dyne	*dyne*	*dyne*
Mussooree	−0·030	−0·024	+0·053
Rājpur	−0·048	−0·042	+0·026
Dehra Dūn	−0·055	−0·049	+0·006
Roorkee	−0·044	−0·036	−0·044
Kaliāna	−0·012	+0·009	−0·007

If we extend our investigation beyond zone 13 we shall merely alter all the residuals by a small and practically constant amount.

Now, the most noticeable point is that the residuals at Roorkee and Kaliāna, on the assumption that Himālayan deficiency of density is (1) constant, (2) equal to 0·022 and (3) extends for 60 miles south of the Himālaya, are very nearly the same as those on our original hypothesis that compensation varies with the height; and that, though these two residuals are practically unaltered, we have greatly improved the Himālayan residuals by bringing them into closer agreement with those at sub-Himālayan stations, the range of the new residuals being 0·058 and 0·043 instead of 0·097.

So far we have assumed a height of 3000 feet for our deficiency of density, $\delta' = \dfrac{H\delta}{70 \text{ miles}}$.

Other deficiencies of density were then tried, and also the assumption that the constant deficiency extends only 32 miles from the Himālaya. Two more stations, Gesupur and Agra distant about 110 and 175 miles from the Himālaya, were also dealt with on the 60 miles hypothesis, and the results are shewn in the table below:—

Station	$g-\gamma_C$ (original)	$g-\gamma_C$ (new)									
		Compensation, 32 miles			Compensation, 60 miles				Compensation, 100 miles		
		H			H				H		
		3000 ft.	4000 ft.	5000 ft.	3000 ft.	4000 ft.	**5000 ft.**	6000 ft.	3000 ft.	4000 ft.	5000 ft.
		δ′			δ′				δ′		
		0·022	0·029	0·036	0·022	0·029	**0·036**	0·043	0·022	0·029	0·036
	dyne	*dyne*	*dyne*	*dyne*	*dyne*	*dyne*	*dyne*	*dyne*	*dyne*	*dyne*	*dyne*
Mussooree ...	+0·053	−0·033	−0·009	+0·015	−0·030	−0·003	**+0·024**	+0·050	−0·024	+0·003	+0·032
Rājpur ...	+0·026	−0·052	−0·030	−0·006	−0·048	−0·021	**+0·005**	+0·031	−0·042	−0·015	+0·014
Dehra Dūn ...	+0·006	−0·061	−0·038	−0·016	−0·055	−0·028	**−0·002**	+0·024	−0·049	−0·022	+0·007
Roorkee ...	−0·044	−0·060	−0·045	−0·030	−0·044	−0·022	**+0·001**	+0·022	−0·036	−0·011	+0·016
Kaliāna ...	−0·007	−0·027	−0·019	−0·012	−0·012	+0·004	**+0·019**	+0·035	+0·009	+0·033	+0·056
Gesupur ...	+0·005				0·000	+0·006	**+0·010**	+0·014			
Agra ...	+0·017				+0·016	+0·018	**+0·020**	+0·021			
Mean with regard to sign	+0·007	−0·047	−0·028	−0·010	−0·025	−0·007	**+0·011**	+0·028	−0·028	−0·002	+0·025
Mean without regard to sign	0·027	0·047	0·028	0·016	0·029	0·015	**0·012**	0·028	0·032	0·017	0·025
Range	0·097	0·034	0·036	0·045	0·071	0·046	**0·026**	0·036	0·058	0·055	0·049

The values of $g-\gamma_C$ in the column in heavy type are clearly the most accordant. The range and the mean without regard to sign are both smaller than in any other column, and the mean with regard to sign agrees exactly with that of all stations in Classes IV and V, *i.e.* those far removed from large excesses or defects of mass where we have reason to suppose gravity to be normal.

Assuming then that the deficiency of density under the Himālaya and the plains to the south is constant, the most suitable density deficiency is found to be 0·036, extending 60 miles south of the Himālaya.

The theoretical deficiency of density under the Gangetic plain near Kaliāna is 0·006, the height being about 800 feet. On our new hypothesis this deficiency suddenly changes to 0·036 near Kaliāna. An abrupt change of this sort is improbable but it is believed that, if the change in density had been assumed to occur gradually between, say, 55 and 65 miles from the Himālaya, the change in the new values of $g-\gamma_C$ would not be great.

No attempt has been made to give a physical interpretation of this hypothesis. The assumption of uniform deficiency of density was made to simplify computation and need not be insisted on. The point is that by assuming more than complete compensation near the foot of the Himālaya and incomplete compensation under them the discrepancy between the residuals in the hills and plains practically disappears. It would be interesting to try the effect of the hypothesis on the plumb-line deflections. It would probably reduce the anomalies, as the following considerations will show.

At Kaliāna the observed deflection is 1″ north and the calculated deflection, on the assumption of normal isostatic compensation, is 3″ north, leaving an anomaly of 2″ south unexplained. At Mussooree the corresponding quantities are 30″ and 17″ north, the anomaly being consequently 13″ north.

Now on the new hypothesis the attraction of the high Himālaya is increased, that of the outer hills and that of the plains within the 60-mile line are decreased.

At Kaliāna the attraction of the masses to the south is unaltered, while to the north the over-compensation of the near masses will tend to repel the plumb-line to the south and this repulsion will probably more than overcome the increased northerly attraction of the high Himālaya. The combined effect, therefore, will probably be a diminution of the computed northerly deflection, thus reducing the anomaly. At Mussooree the attraction of the northern masses is increased and that of the southern masses decreased so that the combined effect will be an increase in the computed northerly attraction, thus again reducing the anomaly.

The same assumption has been tried for the stations Sandakphu, Siliguri, Jalpaiguri and Kisnapur. The results are as follows:—

Station	$g-\gamma_C$ (original)	$g-\gamma_C$ (new)			
		Compensation, 32 miles		Compensation, 60 miles	
		H		H	
		5000 feet	6000 feet	5000 feet	6000 feet
		δ'		δ'	
		0·036	0·043	0·036	0·043
	dyne	*dyne*	*dyne*	*dyne*	*dyne*
Sandakphu	+0·048	−0·014	+0·012	−0·005	+0·022
Siliguri	−0·039	−0·034	−0·012	−0·019	+0·007
Jalpaiguri	−0·020	−0·008	+0·010	+0·015	+0·038
Kisnapur	+0·039	+0·038	+0·041	+0·045	+0·049
Range	0·087	0·072	0·053	0·064	0·042

Here the improvement is not so marked. It seems probable that the deficiency of density is greater than under the Mussooree-Kaliāna series, and that it does not extend so far from the Himālaya. The point to be noted is that the deficiency of gravity at Siliguri is always greater than at Sandakphu or Jalpaiguri just as at Dehra Dūn, with our new assumptions, it was less than at Mussooree and Kaliāna. In other words, the deficiency of density near the foot of the hills appears to be greater than either under the hills or under the plains, thus bearing out the hypothesis of the rift.

It is believed that the geological evidence tends to show that near the foot of the Himālaya the sub-surface rocks are in compression thus directly combating the geodetic evidence. It must be remembered, however, that geology is only concerned with the density of rocks within, at most, a mile or two of the surface. Geodesy deals with densities down to a depth of 70 miles.

So far we have only considered the Himālaya. Turning now to Baluchistān, we find the same phenomena, *viz.* excesses of gravity at Quetta and Jacobābād with a deficiency between them at Sibi. The excess at Quetta is small, and if we are entitled to deduce anything from one station it would seem that the Baluchistān hills are more completely compensated than the Himālaya.

In the Punjāb also we find the great deficiency at Pathānkot with excesses extending probably right across the plain from Miān Mīr to Montgomery. The compensation theory has materially reduced the difference between the residuals at Pathānkot and Miān Mīr respectively, but has not by any means eliminated it.

Let us now turn to Central India which is the only large area that has as yet been examined in any detail. The stations of this area are shewn in Class V, and it is first to be noted that the adoption of the compensation theory has hardly improved the residuals. It is thus difficult to determine whether compensation does or does not exist. The balance of evidence seems to show that if compensation exists it is not complete. The mean values of $g-\gamma_C$ tend to increase with the height of the station and more so than the Bouguer residuals. The table below shows this increase:—

Height	Mean $g-\gamma_C$	Mean $g-\gamma_B$
	dyne	*dyne*
below 1000 feet (11 stations)	+0·006	−0·031
below 1500 feet (13 stations)	+0·018	−0·027
above 1500 feet (12 stations)	+0·020	−0·028

Now, if $g-\gamma_C$ increases with the height, it appears to mean that we are not allowing enough for the effect of surface masses or that we are allowing too much for subterranean deficiencies of density. The agreement between the mean values of $g-\gamma_B$ for the different heights shows, however, that there is probably no great error in the estimation of the effect of surface masses and we must conclude, therefore, that we are allowing too much for compensation *i.e.*, the compensation is not complete. This conclusion is the same as that derived from the Himālayan residuals.

There is another point of agreement between the Central Indian plateau and the Himālaya. Looking at the charts at the end, we note the line of negative values from Gaya (No. 29) through Japla, Maihar to Lalitpur (No. 55) along the northern edge of the main belt of high density. North of this negative belt we have another line of stations where the values of $g-\gamma_C$ and $g-\gamma_B$ are either positive or less negative than at stations immediately to the south. We have clear evidence of this along four lines as the following table shows:—

Station	$(g-\gamma_C)-0·011$	Station	$(g-\gamma_C)-0·011$	Station	$(g-\gamma_C)-0·011$	Station	$(g-\gamma_C)-0·011$
	dyne		*dyne*		*dyne*		*dyne*
Kaliānpur	+0·028	Bina	+0·015	Katni	−0·004	Daltonganj	+0·014
Goona	+0·008	Lalitpur	−0·013	Maihar	−0·014	Japla	−0·009
Sīpri	+0·018	Jhānsi	+0·003	Allahābād	−0·002	Sasarām	−0·002

The second station of each group shows in each case a deficient density compared with the first and third (this deficiency is also shewn by the values of $g-\gamma_B$), just as stations such as Siliguri, Roorkee and Sibi showed deficient densities compared with the stations on both sides of them.

This similarity can hardly be a coincidence; it seems to prove the existence of a continuous line of deficient density running more or less along the northern edge of the Central Indian plateau.

The edge of this plateau is not clearly distinguishable; in some parts the ground falls gently, as from Bina to Jhānsi, in others more steeply as from Maihar to Allahābād.

Furthermore, the stations from Kaliānpur to Sipri are all over 1500 feet above mean sea-level, while from Daltonganj to Sasarām they are all less then 800 feet above it. It is, therefore, possible that this belt of deficiency has no relation to the surface topography but indicates the presence of a sub-crustal crack.

We have seen from the evidence of stations in and near mountains that it seems probable that compensation, though not complete, does exist in some degree. Turning now to coast stations we see that the values of $g-\gamma_C$ at the three stations for which the Hayford corrections have been computed do not help us to arrive at any definite conclusion. At Madras the small negative value of $g-\gamma_B$ is largely increased when the deep ocean close to the shore is assumed to be compensated. At Colāba the large positive value of $g-\gamma_B$ is practically unaltered since the ocean bed slopes very gradually and the effects of the compensation under land and sea respectively cancel each other.

No stations inland from Bombay and Madras have as yet been visited so that no data are available as to the subterranean densities in the neighbourhood. Assuming these to be normal we can only explain the values of $g-\gamma_C$ by postulating great over-compensation under the shallow Indian Ocean near Colāba and under-compensation under the deep Bay of Bengal. The residual deflection of the plumb-line in the prime vertical, after allowing for complete compensation, is, however, towards the sea at both stations*, and from this we should expect over-compensation under both oceans. The observed deflections depend on the assumption that the plumb-line is vertical at Kaliānpur, and the discrepancy between the indications of the pendulum and the plumb-line would be removed by the assumption of a westerly deflection at that station, for it would reduce the amount of the seaward deflection at Madras and increase that at Colāba.

Gravity observations near Kaliānpur support this assumption of a westerly deflection; for, in each of the three pairs of stations, Kaliānpur and Bina, Goona and Lalitpur, Sipri and Jhānsi, the stations of a pair being nearly in the same latitude, we find that gravity at the western station is higher than at the eastern, giving evidence of a relative deficiency of density to the east of Kaliānpur which would cause a westerly deflection. This, however, is not likely to be large enough to change the deflection at Madras from east to west, and to explain this deflection we must assume a line of deficiency inland.

The two charts IV and V at the end show the variations of gravity from the normal, the first, on the Bouguer hypothesis: the second, after allowing for complete compensation. The figures against each station are in chart IV equal to $(g-\gamma_B)+0\cdot030$ and in chart V to $(g-\gamma_C)-0\cdot011$, the correction $+0\cdot030$ and $-0\cdot011$ being the mean values of $g-\gamma_B$ and $g-\gamma_C$ at stations distant from high mountains and the sea. The figures represent, therefore, the values of $g-\gamma_B$ and $g-\gamma_C$ if the formula for γ_o were changed to

$$978\cdot000\ (1+0\cdot005302\ \sin^2\phi\ -0\cdot000007\ \sin^2 2\phi)$$ for the Bouguer method

and to $978\cdot041\ (1+\text{etc.})$ for the Hayford. It is interesting to note that Mr. Hayford deduced from the values of $g-\gamma_C$ in the United States of America an equatorial constant of 978·039.

* *See* page 14 of Professional Paper No 13.

It is at once noticeable that there is a great similarity between the results of the Bouguer and Hayford methods of reduction in Central India. Note especially the zero line from north of Sīpri to Daltonganj where the agreement is almost exact. This only shows that, as has often been pointed out, compensation does not help to get rid of local anomalies. The zero line along the edge of the Himālaya and Baluchistān mountains in the compensation chart is the most important difference between this chart and that of the Bouguer method of reduction.

THE SUMMARY OF CONCLUSIONS.

1. It is almost certain that the Himālaya and other high mountains of India are compensated to a great extent.

2. It is possible that this compensation extends into the plain, this being suggested by the line of deficient density along the foot of the hills.

3. Gravity determinations do not at present throw much light on the question of ocean compensation. The plumb-line, however, leads us to believe that such exists.

4. The Central Indian plateau may or may not be compensated, the residuals by the two methods agreeing closely with each other. Over the greater part of this area gravity is relatively in excess.

5. It is probable that a line of deficient density exists immediately to the north of the "hidden chain".

INDEX TO PENDULUM STATIONS (1907-08—1912-13)*.

* A list of the pendulum stations of seasons 1903-07 is given on page 4.

INDEX TO PENDULUM STATIONS (1907-08—1912-13)*.—(*Contd.*)

Observations have been continued annually at *Dehra Dūn*, and details of observations for the several seasons are given on the pages indicated below.

Season	1907-08	1908-09	1909-10	1910-11	1911-12	1912-13
Page	9,15	29,41	50.64	73.84	94,107	117,132

For the earlier seasons and other particulars *see* Professional Paper 10.

* A list of the pendulum stations of seasons 1903-07 is given on page 4.

SECULAR VARIATIONS OF THE PERIODS
OF THE PENDULUMS

Fig. 1

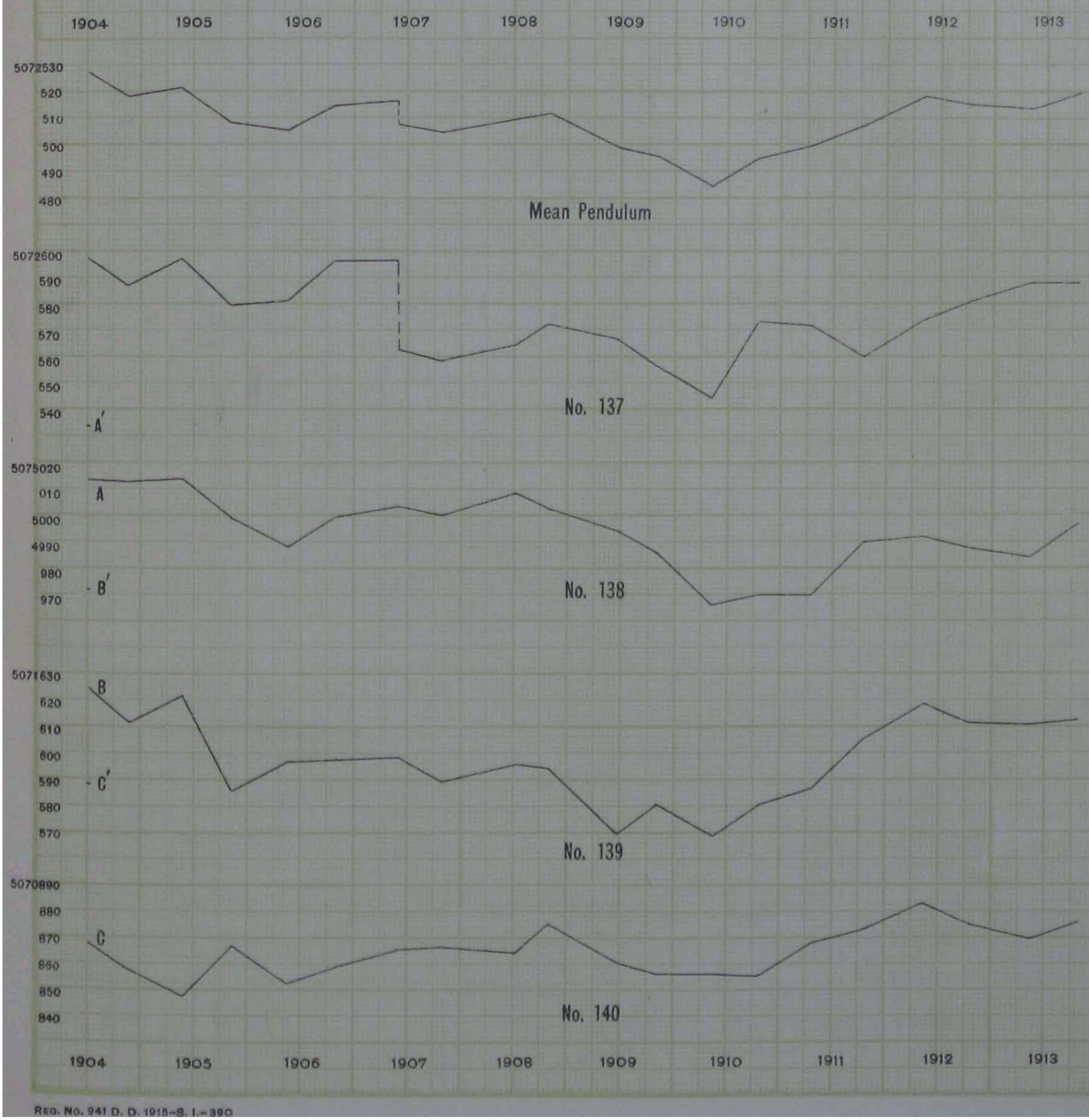

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DIAGRAM OF SPECIAL CORRECTIONS

UNIT ·00001 DYNE

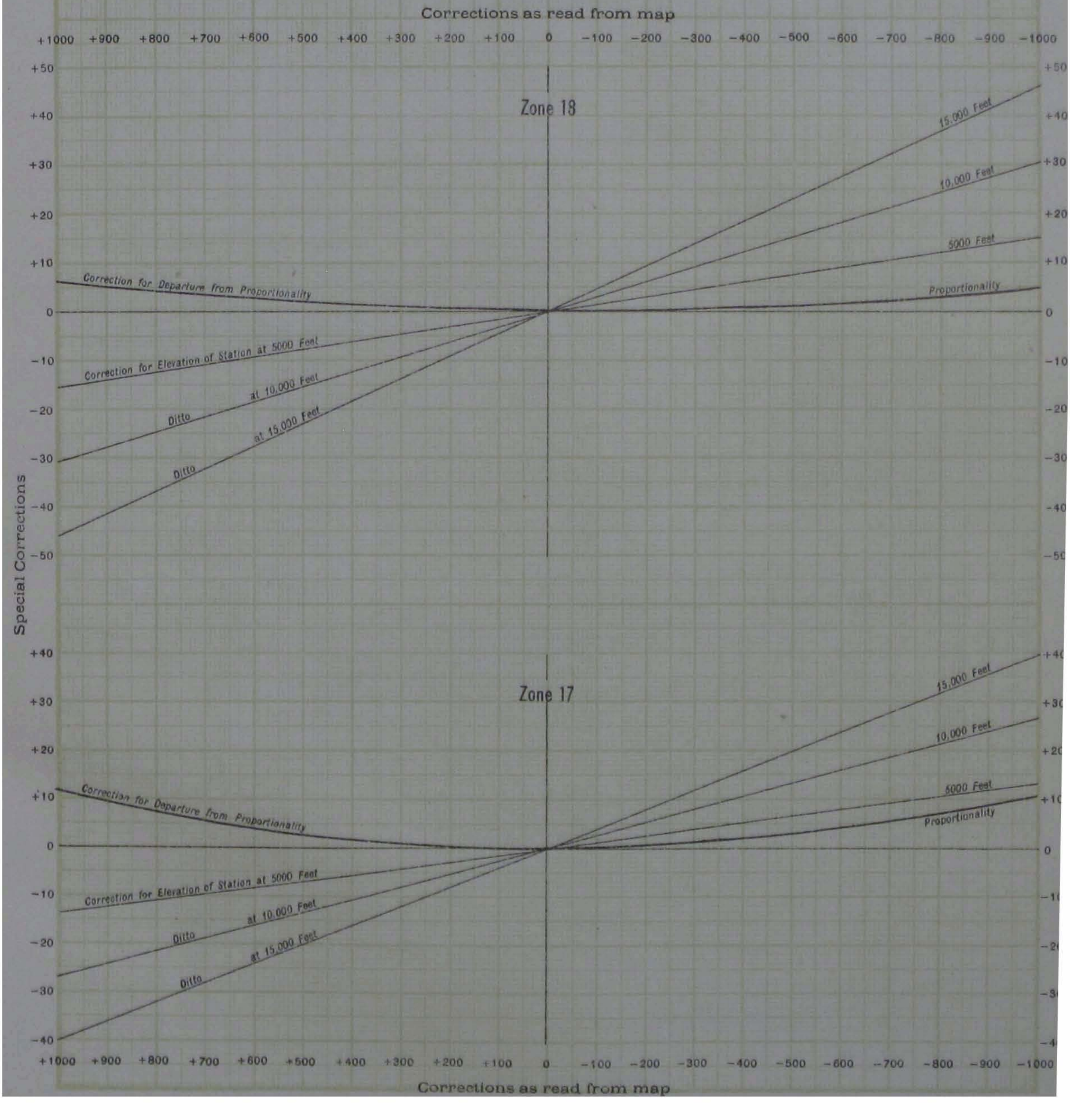
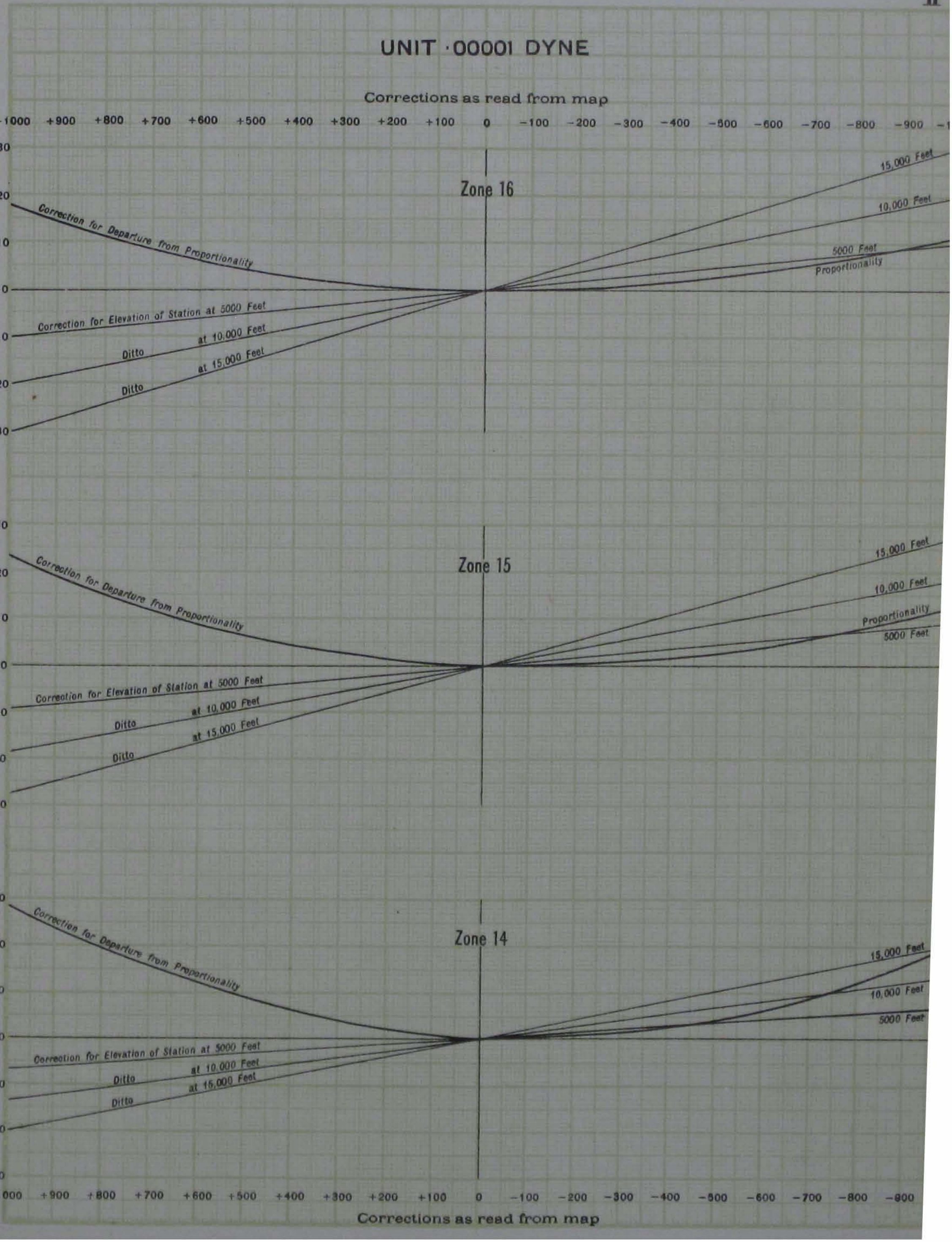


DIAGRAM OF SPECIAL CORRECTIONS

II



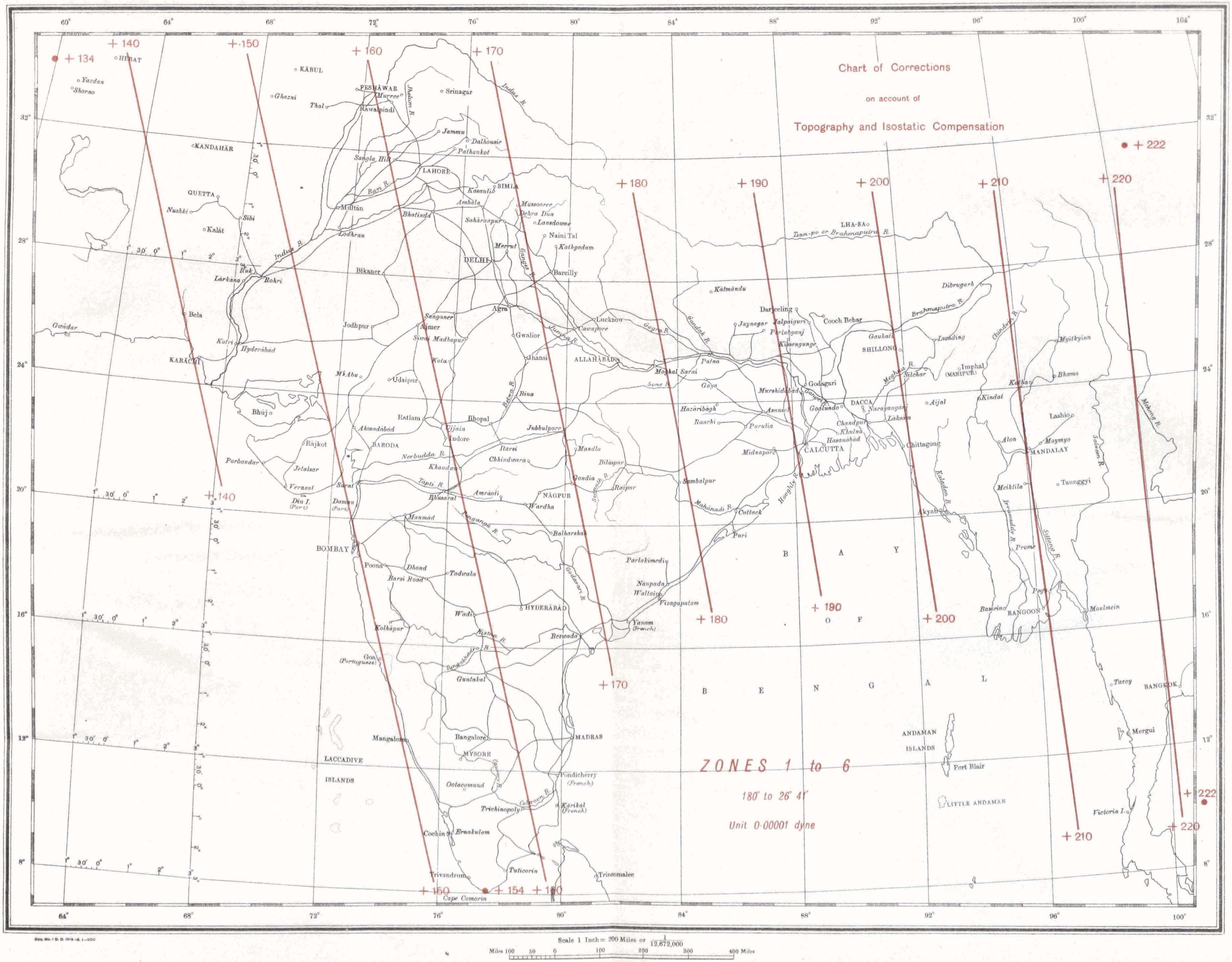


Chart of Corrections
on account of
Topography and Isostatic Compensation
ZONES 1 to 6
180° to 26° 41'
Unit 0·00001 dyne
B E N G A L
B A Y
O F
Scale 1 Inch = 200 Miles or 1/12,672,000
Miles 100 50 0 100 200 300 400 Miles

Chart II

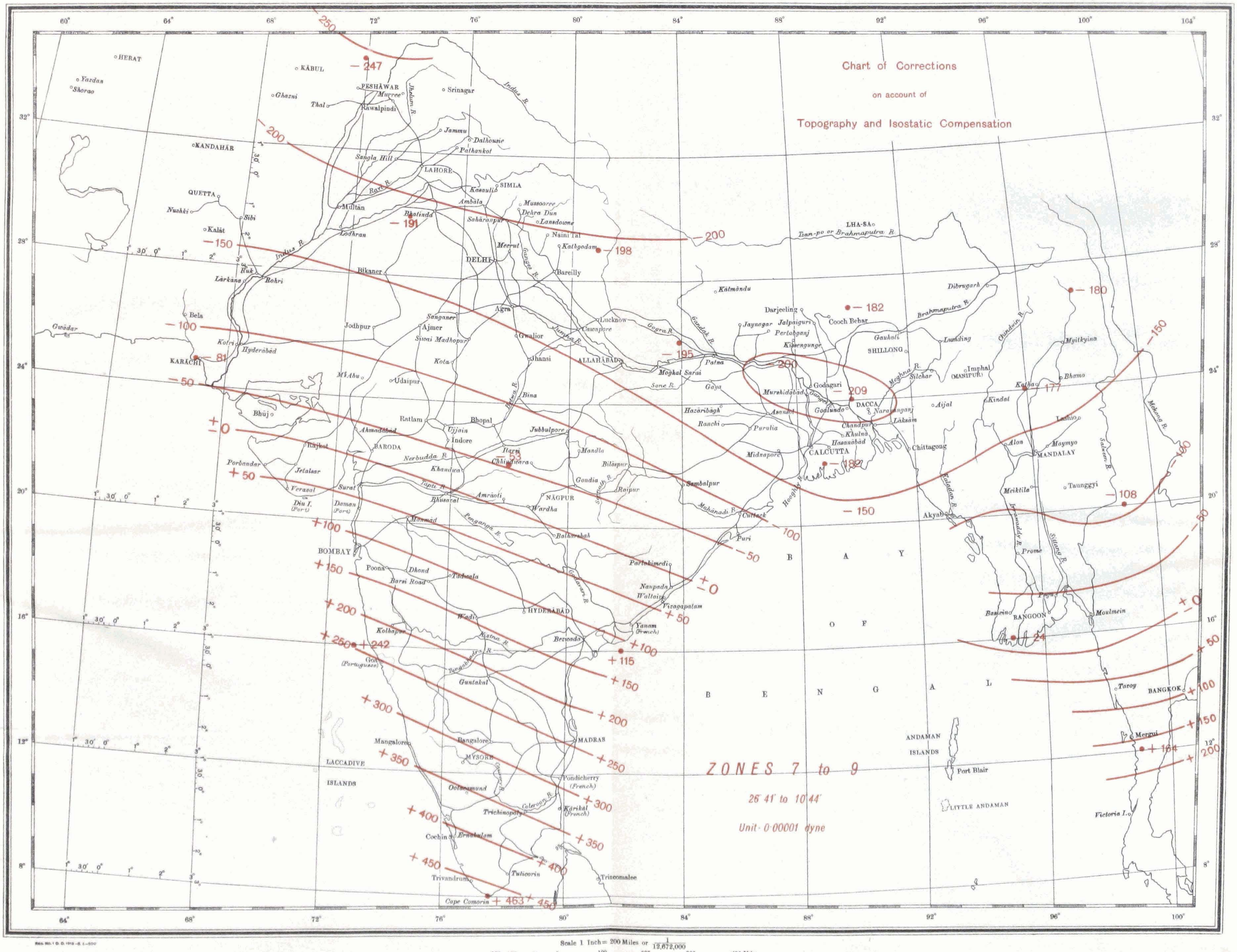


Chart of Corrections
on account of
Topography and Isostatic Compensation
ZONES 7 to 9
26° 41′ to 10° 44′
Unit · 0·00001 dyne
B A Y O F B E N G A L
LACCADIVE ISLANDS
ANDAMAN ISLANDS
Port Blair
LITTLE ANDAMAN
HERAT
KABUL
PESHAWAR
Srinagar
KANDAHAR
QUETTA
LAHORE
SIMLA
DELHI
Bikaner
Agra
Lucknow
ALLAHABAD
Patna
Darjeeling
LHA-SA
Kātmāndu
SHILLONG
DACCA
CALCUTTA
Chittagong
KARACHI
Hyderābād
Ahmadābād
BARODA
Bhopal
Jubbulpore
NĀGPUR
BOMBAY
Poona
HYDERĀBĀD
Vizagapatam
MADRAS
Bangalore
MYSORE
Pondicherry (French)
Trichinopoly
Cochin
Trivandrum
Tuticorin
Cape Comorin
Trincomalee
Mandalay
RANGOON
Moulmein
BANGKOK
Mergui
Akyab
Bhamo
Myitkyina
Dibrugarh
Brahmaputra R.
Indus R.
Ganges R.
Jumna R.
Scale 1 Inch = 200 Miles or 1/12,672,000
Miles 100 50 0 100 200 300 400 Miles

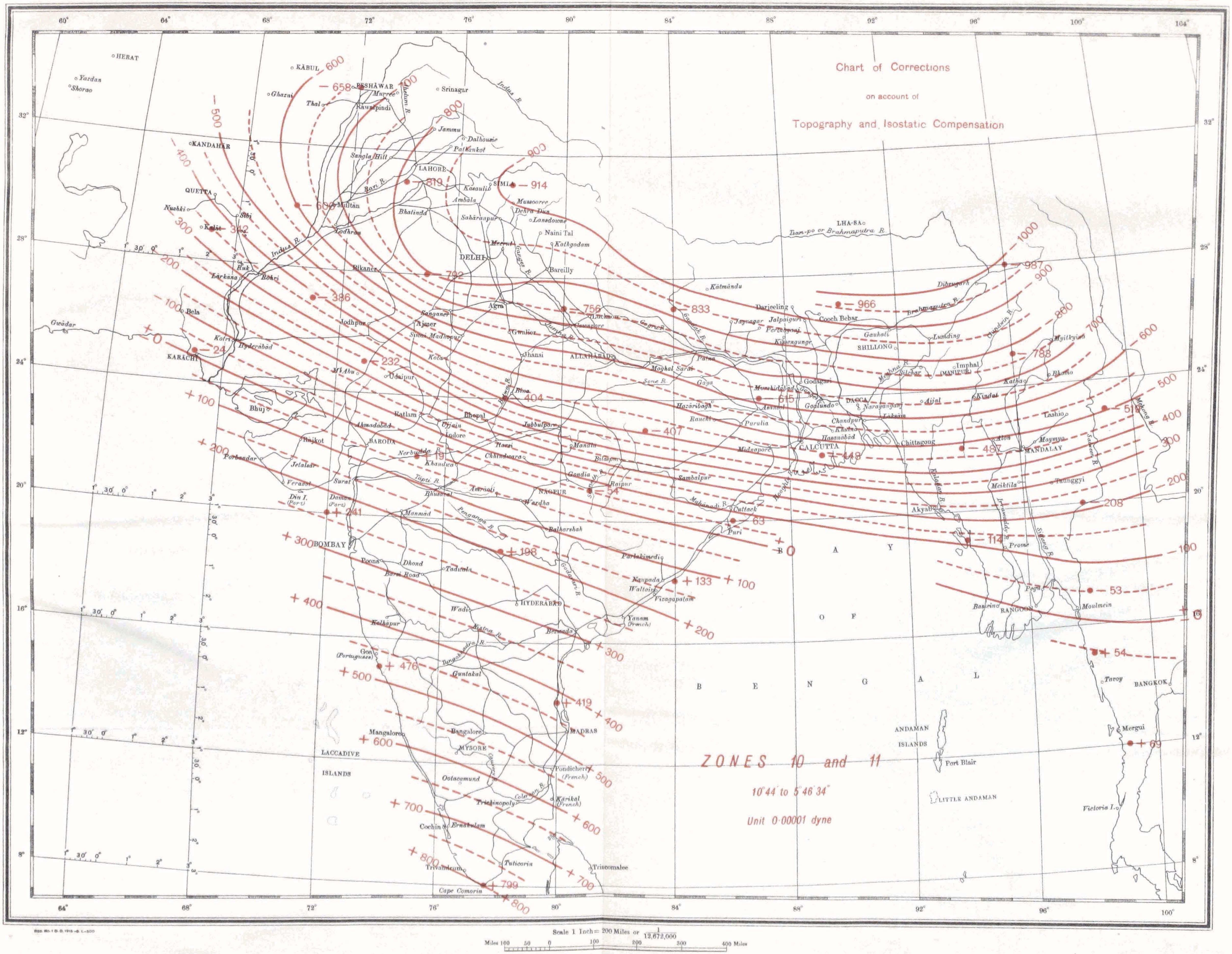
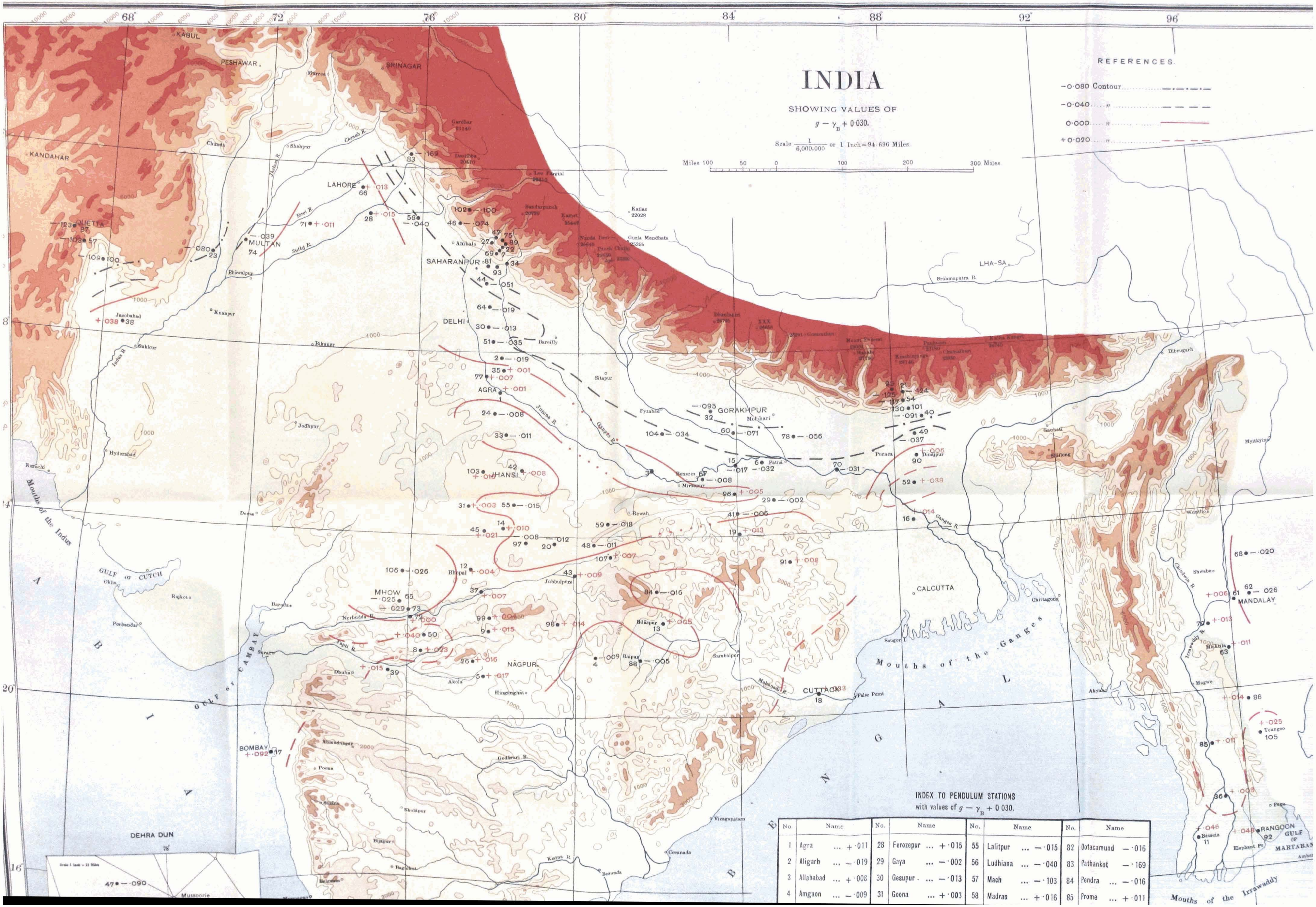
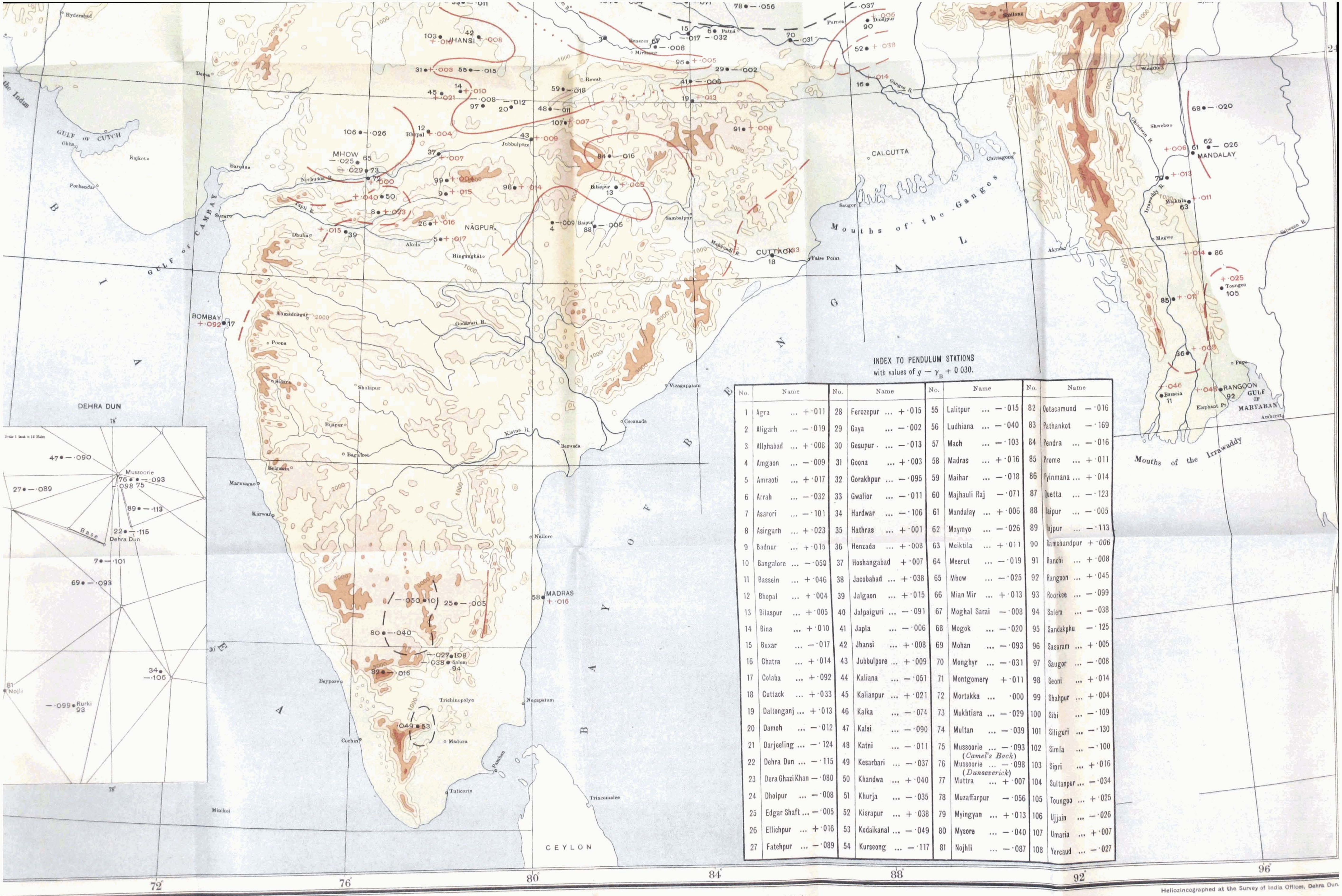


Chart of Corrections
on account of
Topography and Isostatic Compensation
ZONES 10 and 11
10°44' to 5°46'34"
Unit 0·00001 dyne
BAY OF BENGAL
Scale 1 Inch = 200 Miles or 1/12,672,000
Miles 100 50 0 100 200 300 400 Miles



INDEX TO PENDULUM STATIONS
with values of $g - \gamma_B + 0{\cdot}030.$

No.	Name	No.	Name	No.	Name	No.	Name
1	Agra ... + ·011	28	Ferozepur ... + ·015	55	Lalitpur ... − ·015	82	Ootacamund − ·016
2	Aligarh ... − ·019	29	Gaya ... − ·002	56	Ludhiana ... − ·040	83	Pathankot − ·169
3	Allahabad ... + ·008	30	Gesupur ... − ·013	57	Mach ... − ·103	84	Pendra ... − ·016
4	Amgaon ... − ·009	31	Goona ... + ·003	58	Madras ... + ·016	85	Prome ... + ·011



INDEX TO PENDULUM STATIONS
with values of $g - \gamma_B + 0\ 030$.

No.	Name		No.	Name		No.	Name		No.	Name	
1	Agra ...	+ ·011	28	Ferozepur ...	+ ·015	55	Lalitpur ...	− ·015	82	Ootacamund	− ·016
2	Aligarh ...	− ·019	29	Gaya ...	− ·002	56	Ludhiana ...	− ·040	83	Pathankot	− ·169
3	Allahabad ...	+ ·008	30	Gesupur ...	− ·013	57	Mach ...	− ·103	84	Pendra ...	− ·016
4	Amgaon ...	− ·009	31	Goona ...	+ ·003	58	Madras ...	+ ·016	85	Prome ...	+ ·011
5	Amraoti ...	+ ·017	32	Gorakhpur ...	− ·095	59	Maihar ...	− ·018	86	Pyinmana ...	+ ·014
6	Arrah ...	− ·032	33	Gwalior ...	− ·011	60	Majhauli Raj	− ·071	87	Quetta ...	− ·123
7	Asarori ...	− ·101	34	Hardwar ...	− ·106	61	Mandalay ...	+ ·006	88	Raipur ...	− ·005
8	Asirgarh ...	+ ·023	35	Hathras ...	+ ·001	62	Maymyo ...	− ·026	89	Rajpur ...	− ·113
9	Badnur ...	+ ·015	36	Henzada ...	+ ·008	63	Meiktila ...	+ ·011	90	Ramchandpur	+ ·006
10	Bangalore ...	− ·050	37	Hoshangabad	+ ·007	64	Meerut ...	− ·019	91	Ranchi ...	+ ·008
11	Bassein ...	+ ·046	38	Jacobabad ...	+ ·038	65	Mhow ...	− ·025	92	Rangoon ...	+ ·045
12	Bhopal ...	+ ·004	39	Jalgaon ...	+ ·015	66	Mian Mir ...	+ ·013	93	Roorkee ...	− ·099
13	Bilaspur ...	+ ·005	40	Jalpaiguri ...	− ·091	67	Moghal Sarai	− ·008	94	Salem ...	− ·038
14	Bina ...	+ ·010	41	Japla ...	− ·006	68	Mogok ...	− ·020	95	Sandakphu	− ·125
15	Buxar ...	− ·017	42	Jhansi ...	+ ·008	69	Mohan ...	− ·093	96	Sasaram ...	+ ·005
16	Chatra ...	+ ·014	43	Jubbulpore ...	+ ·009	70	Monghyr ...	− ·031	97	Saugor ...	− ·008
17	Colaba ...	+ ·092	44	Kaliana ...	− ·051	71	Montgomery	+ ·011	98	Seoni ...	+ ·014
18	Cuttack ...	+ ·033	45	Kalianpur ...	+ ·021	72	Mortakka ...	·000	99	Shahpur ...	+ ·004
19	Daltonganj ...	+ ·013	46	Kalka ...	− ·074	73	Mukhtiara ...	− ·029	100	Sibi ...	− ·109
20	Damoh ...	− ·012	47	Kalsi ...	− ·090	74	Multan ...	− ·039	101	Siliguri ...	− ·130
21	Darjeeling ...	− ·124	48	Katni ...	− ·011	75	Mussoorie ... (*Camel's Back*)	− ·093	102	Simla ...	− ·100
22	Dehra Dun ...	− ·115	49	Kesarbari ...	− ·037	76	Mussoorie ... (*Dunseverick*)	− ·098	103	Sipri ...	+ ·016
23	Dera Ghazi Khan	− ·080	50	Khandwa ...	+ ·040	77	Muttra ...	+ ·007	104	Sultanpur ...	− ·034
24	Dholpur ...	− ·008	51	Khurja ...	− ·035	78	Muzaffarpur	− ·056	105	Toungoo ...	+ ·025
25	Edgar Shaft ...	− ·005	52	Kisrapur ...	+ ·038	79	Myingyan ...	+ ·013	106	Ujjain ...	− ·026
26	Ellichpur ...	+ ·016	53	Kodaikanal ...	− ·049	80	Mysore ...	− ·040	107	Umaria ...	+ ·007
27	Fatehpur ...	− ·089	54	Kurseong ...	− ·117	81	Nojhli ...	− ·087	108	Yercaud ...	− ·027

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1915

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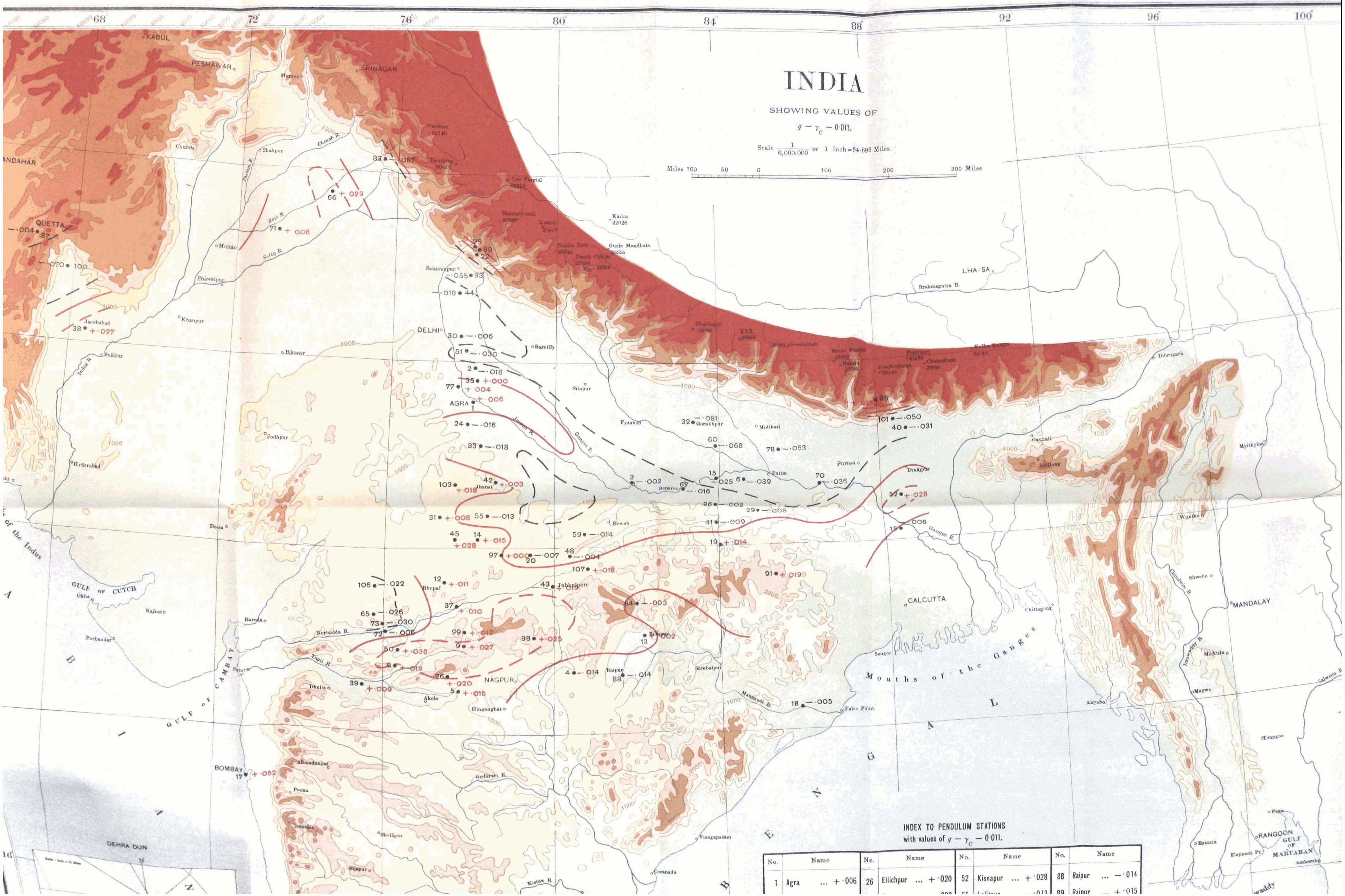
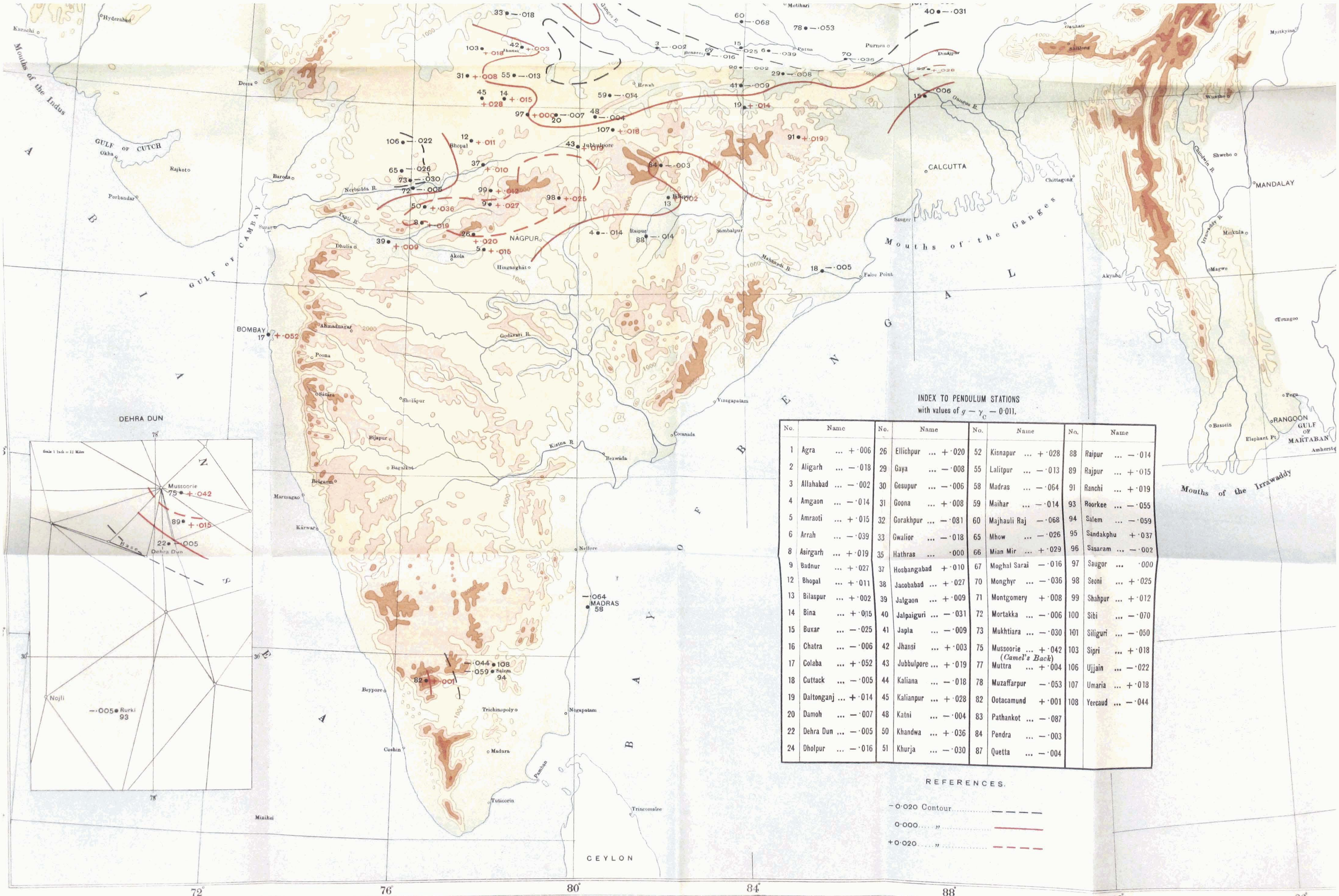
Chart



No.	Name	No.	Name	No.	Name	No.	Name
1	Agra ... + ·006	26	Ellichpur ... + ·020	52	Kisnapur ... + ·028	88	Raipur ... − ·014



INDEX TO PENDULUM STATIONS
with values of $g - \gamma_c - 0{\cdot}011$.

No.	Name	No.	Name	No.	Name	No.	Name
1	Agra ... + ·006	26	Ellichpur ... + ·020	52	Kisnapur ... + ·028	88	Raipur ... − ·014
2	Aligarh ... − ·018	29	Gaya ... − ·008	55	Lalitpur ... − ·013	89	Rajpur ... + ·015
3	Allahabad ... − ·002	30	Gesupur ... − ·006	58	Madras ... − ·064	91	Ranchi ... + ·019
4	Amgaon ... − ·014	31	Goona ... + ·008	59	Maihar ... − ·014	93	Roorkee ... − ·055
5	Amraoti ... + ·015	32	Gorakhpur ... − ·081	60	Majhauli Raj − ·068	94	Salem ... − ·059
6	Arrah ... − ·039	33	Gwalior ... − ·018	65	Mhow ... − ·026	95	Sandakphu + ·037
8	Asirgarh ... + ·019	35	Hathras ... ·000	66	Mian Mir ... + ·029	96	Sasaram ... − ·002
9	Badnur ... + ·027	37	Hosbangabad + ·010	67	Moghal Sarai − ·016	97	Saugor ... ·000
12	Bhopal ... + ·011	38	Jacobabad ... + ·027	70	Monghyr ... − ·036	98	Seoni ... + ·025
13	Bilaspur ... + ·002	39	Jalgaon ... + ·009	71	Montgomery + ·008	99	Shahpur ... + ·012
14	Bina ... + ·015	40	Jalpaiguri ... − ·031	72	Mortakka ... − ·006	100	Sibi ... − ·070
15	Buxar ... − ·025	41	Japla ... − ·009	73	Mukhtiara ... − ·030	101	Siliguri ... − ·050
16	Chatra ... − ·006	42	Jhansi ... + ·003	75	Mussoorie ... + ·042 (*Camel's Back*)	103	Sipri ... + ·018
17	Colaba ... + ·052	43	Jubbulpore ... + ·019	77	Muttra ... + ·004	106	Ujjain ... − ·022
18	Cuttack ... − ·005	44	Kaliana ... − ·018	78	Muzaffarpur − ·053	107	Umaria ... + ·018
19	Daltonganj ... + ·014	45	Kalianpur ... + ·028	82	Ootacamund + ·001	108	Yercaud ... − ·044
20	Damoh ... − ·007	48	Katni ... − ·004	83	Pathankot ... − ·087		
22	Dehra Dun ... − ·005	50	Khandwa ... + ·036	84	Pendra ... − ·003		
24	Dholpur ... − ·016	51	Khurja ... − ·030	87	Quetta ... − ·004		

REFERENCES.

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+0·020 ...... " .... — — —

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