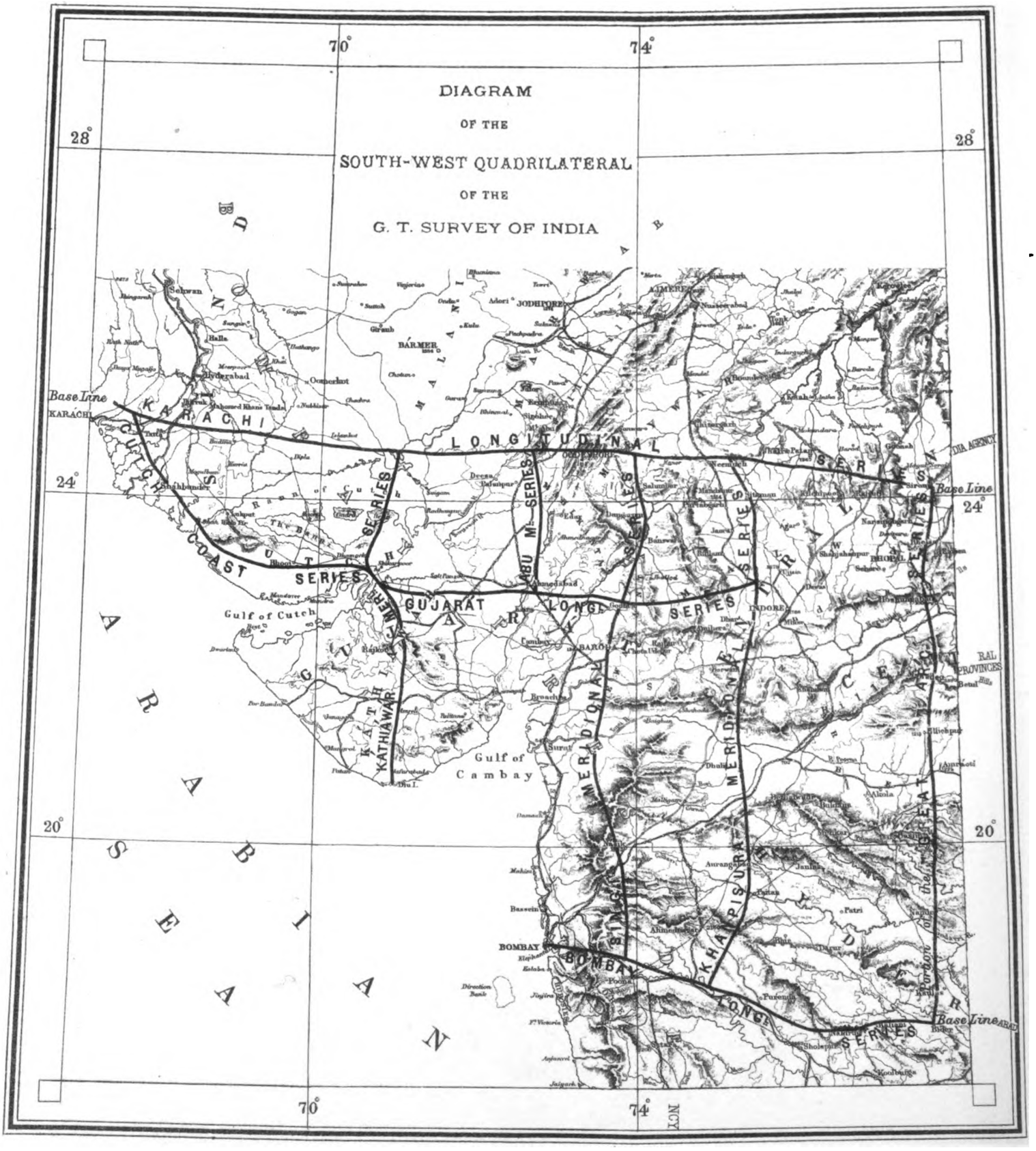

Photozincographed at the Office of the Trigonometrical Branch, Survey of India, Dehra Dún, January 1893.

SYNOPSIS OF THE RESULTS OF THE OPERATIONS OF

THE GREAT TRIGONOMETRICAL SURVEY OF INDIA

VOLUME XXX.

DESCRIPTIONS AND CO-ORDINATES

OF THE

PRINCIPAL AND SECONDARY STATIONS AND OTHER FIXED POINTS OF

THE ABU MERIDIONAL SERIES

OR SERIES I

AND THE GUJARAT LONGITUDINAL SERIES

OR SERIES K

OF THE

SOUTH-WEST QUADRILATERAL.

PREPARED IN THE OFFICE OF THE TRIGONOMETRICAL BRANCH, SURVEY OF INDIA,
COLONEL G. STRAHAN, R.E., DEPUTY SURVEYOR GENERAL, IN CHARGE.

PUBLISHED UNDER THE ORDERS OF
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Price Two Rupees.

CONTENTS.

ABU MERIDIONAL SERIES.

GUJARÁT LONGITUDINAL SERIES.

ERRATA, ADDENDA ET CORRIGENDA.

PAGE				
VI—I.	line 8 from bottom	*for*	71½°	*read* 72½°
VII—I.	lines 30 to 32 from top	*omit*	in April, however, . . .	work of the Abu Series.
VIII—I.	in last column of table	*for*	2·3	*read* — 2·3
2—K.	column 4 and *passim*	„	Vardhadi	„ Vardhari
33—K.	column 3, azimuth at Kukinda VII of Jhábua Hill Mark	„	24 15 22	„ 337 36 18

November, 1892.

J. ECCLES,

In charge of Computing Office.

REFERENCES.

The abbreviations employed in the text are as follows:—

h.s. denotes hill station (secondary),
s. „ station „
t.s. „ tower station „

These abbreviations are only placed after stations where a theodolite has been set up and observations taken to surrounding points.

The latitudes and longitudes of all points shown on the Chart at the end of each Series will be found in the text. The latter exhibits numerical values of triangles only to points of a superior class, to which alone, if exhibited on the Charts, lines are drawn: the lines are either continuous throughout, or dotted for half the length and continuous for the other half: the dots indicate that the bearing was not observed. For other points difficult to identify or of comparatively less accuracy, numerical values of triangles and azimuths are not given.

November, 1892.

J. ECCLES,
In charge of Computing Office.

PREFACE.

The Abu Meridional and the Gujarát Longitudinal Series, the details of which are given in this volume, form two of the internal chains of the South-West Quadrilateral, or that section of the triangulation of India which lies between parallels of 19° and 25° North Latitude and 67° and 76° East Longitude. The general principles of the simultaneous reduction, and the procedure followed in carrying it out, are explained in Volume II of the *Account of the Operations, &c.*; and full details of the whole of the principal triangulation appertaining to the Quadrilateral will be found in Volume XIV of the *Account of the Operations, &c.*

As however the entire contents of the volumes of the principal triangulation are not needed by geographers and surveyors, and moreover as these volumes give no details of the secondary triangulation—which is of considerable value for local requirements—it is obviously desirable that synopses of the final results of the whole of the operations, including the secondary as well as the principal triangulation, should be published for general use in such a form as to be most suitable for convenience of reference. This has already been done as follows :—

For the several Series forming the North-West Quadrilateral,

I.	Great Indus Series.	Already published.
II.	Great Arc, Section 24° to 30°.	
III.	Karáchi Longitudinal Series.	
IV.	Gurhágarh Meridional Series.	
V.	Rahún Meridional Series.	
VI.	Jogí-Tíla and Sutlej Series.	
VII.	North-West Himalaya Series.	
VII A.	Jodhpore and Eastern Sind Meridional Series.	

For those forming the South-East Quadrilateral,

VIII.	Great Arc, Section 18° to 24°.	Already published.
IX.	Jabalpur Meridional Series.	
X.	Bider Longitudinal Series.	
XI.	Biláspur Meridional Series.	
XII.	Calcutta Longitudinal Series.	
XIII.	East Coast Series.	
XIII A.	South Párasnáth and South Malúncha Series.	

For those forming the North-East Quadrilateral,

XIV. Budhon Meridional Series.
XV. Rangír Meridional Series.
XVI. Amua and Karára Meridional Series.
XVII. Gurwáni and Gora Meridional Series.
XVIII. Huríláong and Chendwár Meridional Series.
XIX. North Párasnáth and North Malúncha Meridional Series.
XX. Calcutta and Brahmaputra Meridional Series.
XXI. East Calcutta Longitudinal and Eastern Frontier Series, Section 23° to 26°.
XXII. *Assam Valley Triangulation, E. of Meridian 92°.

} Already published.

And for the following Series of the Southern Trigon, *viz.*,

XXIII. South Konkan Coast Series.
XXIV. Mangalore Meridional Series.
XXV. South-East Coast Series.
XXVI. Bombay Longitudinal Series.
XXVII. Madras Longitudinal Series.
XXVIII. Madras Meridional and Coast Series.
XXIX. Great Arc, Section 8° to 18°. (*In press*).

The present is the 31st Synoptical Volume in order of publication, and the first of those appertaining to the South-West Quadrilateral; it gives the results both of the principal triangulation executed exclusively with a theodolite having azimuthal circle of 18 inches in diameter, read by three micrometer microscopes, and of the secondary triangulation in which other instruments besides this were used.

By the process of reduction which has been followed, the principal triangulation has been rendered perfectly consistent both internally and externally; internally, so that if in any one of the several polygonal figures of which the chains may be composed, calculations are carried from one station to another in every possible direction, the same results will be inevitably deduced; and externally, so that the values of the co-ordinates of any station, when computed from the given co-ordinates of any other station, with the final linear and angular data, will be the same, whether the calculation is carried directly through the Series, or circuitously through any of the other chains of triangles comprising the South-West Quadrilateral. All secondary triangulation emanating from one side of the principal Series and closing on another side thereof, or on a contiguous Series, have also been made consistent throughout.

As regards the general arrangement of this volume, it may be pointed out that the Introduction to each Series was originally prepared for Volume XIV of the *Account of the Operations, &c.*, and when a sufficient number of copies had been printed for that work, additional copies were struck off for this volume. The Introductions give a historical and descriptive sketch of the progress of the whole operations in the field—both principal and secondary—from year to year, mention the Officers by whom they were conducted, the theodolites with which principal angles were measured, and indicate the work done by each of the Assistants. The adjustment of the secondary triangulation was taken in hand in the year 1890, it was put aside for some time, and was completed in 1892 when the printing of the volume was resumed.

The data given in this volume are the following:—

First (pages $1_{-I.}$, $1_{-K.}$), an alphabetical list of the names of the principal stations, showing the numbers assigned to them.

Second (pages $2_{-I.}$, $3_{-K.}$), a numerical list giving the names corresponding to the numbers.

Third (pages $3_{-I.}$, $5_{-K.}$), descriptions of the structure and positions of the principal stations.

Fourth (pages $7_{-I.}$, $14_{-K.}$), the angles and sides of the principal triangles.

Fifth (pages $9_{-I.}$, $18_{-K.}$), the angles and sides of certain secondary triangles. The numbering is here made consecutive to that of the principal triangles, in order to facilitate references which are made in other sections to the place where the length of a side is to be found.

* This is an offshoot of the Assam Longitudinal Series, and falls entirely outside of the limits of the North-East Quadrilateral. The volume is issued in a preliminary form, and therefore only a limited number of copies are available to meet any immediate demand for data: the final publication will be hereafter made on the completion of the triangulation in Burma, into the general reduction of which this Series will enter.

Sixth (pages 11—$_I$, 29—$_K$), the azimuths of surrounding stations and points at principal, principal-auxiliary and secondary stations, the latter arranged in alphabetical order.

Seventh (pages 14—$_I$, 39—$_K$), the co-ordinates and descriptions of all stations and points arranged in alphabetical order.

It has not been considered necessary to publish the whole of the details of the secondary triangulation; the sides and angles of 38 triangles for the Abu Meridional Series and of 212 triangles for the Gujarát Longitudinal Series, which were selected as most likely to be of future use, and the azimuths of all these sides, have been given; but for a few points the co-ordinates only have been given. With the aid of Tables Nos. XXVI, XXVII, XXVIII, XXIX and XXX of the *Auxiliary Tables to facilitate the calculations of the Survey of India*, Dehra Dún, 1887, surveyors, working on a system of rectangular co-ordinates, can readily transform the spheroidal co-ordinates here given to suit their requirements.

The heights above mean sea level of the Gujarát Longitudinal Series were computed from Karsod and Indráwan stations of the Khánpisura Meridional Series, and adjusted on the spirit-levelled value of Poeda station. From Poeda westward the heights of the Principal Series including most of the secondary triangulation dependent thereon are fairly well controlled by lines of spirit-levelling. The heights of the Abu Meridional Series were computed from Mád and Jairáj stations of the Karáchi Longitudinal Series of the North-West Quadrilateral as an origin, the closing error at Mirzápur and Sonáda being dispersed proportionally. All particulars regarding the heights will be found detailed on pages 14—$_I$ and 39—$_K$ as well as in the footnotes to the subsequent pages.

The longitudes depend on an astronomically determined value of the longitude of the Madras Observatory, deduced about the year 1815. The longitude of the Madras Observatory has however been re-determined by the Electro-Telegraphic method, from observations made at Greenwich, Mokattam (in Egypt), Suez, Aden, Bombay and at certain stations of the triangulation in India.

This value of the longitude of the Madras Observatory is equivalent to 80° 14′ 51″ E.; and as the originally adopted value, on which the longitudes of the whole of the stations of this Survey are based, is 80° 17′ 21″ E.—see page 135 of Volume II of the *Account of the Operations, &c.*—the following precept may be accepted with considerable confidence:—

All the values of longitude in this volume require a constant correction, probably of −2′ 30″.

The orthography of Indian names in the present volume is in accordance with the provincial lists of spellings constructed under the immediate orders of the Government of India. The newly authorised spellings were adopted for all names and other words contained in these lists; but for words for which there was no specific authority, the spellings have been framed in accordance with the methods followed in the preparation of the published lists, reference being made in the present instance more particularly to the Gazetted Lists for the Bombay Presidency, Rajputana and Central India Agency. As a general rule the pronunciations of the vowels are as follows:—*a* has a variable sound as in wom*a*n, rur*a*l, p*a*ltry; *á* as in t*a*rtan; *i* as in b*i*t; *í* as in ravine; *u* as in b*u*ll; *ú* as in r*u*ral; *o* as in nóte; *e* as *a* in s*a*y; *au* as *ou* in cl*ou*d; *ai* as *i* in r*i*de. Final vowels and those in well-known terminals are unaccented. When the popular spelling of a name has been accepted by Government, its correct orthography is generally given in parenthesis where the name occurs for the first time.

The charts accompanying this volume show all the principal stations and triangulation, the positions of all secondary points, and those portions of the secondary triangulations of which full details of the angles, sides and azimuths are given. With the aid of the charts it is hoped that little difficulty will be met with in finding out any of the data which may be required. The descriptions of the secondary stations are in some cases not as full and clear as might be desired: this arises from the inadequacy of the information entered on the spot by the surveyors in their field books; every effort has been made to supplement the field books, whenever it was found practicable to do so, in order to facilitate the future identification of the stations, and all the information which is forthcoming has now been given.

The general arrangement of the volume is in accordance with that adopted in previous Synoptical Volumes. The data which it contains have been prepared chiefly under the superintendence of Mr. J. Eccles, M.A., Deputy Superintendent, the Officer in charge of the Computing Office. The Introductions to both the Series were written by Captain S. G. Burrard, Deputy Superintendent. The volume like its predecessors has been printed at the Trigonometrical Branch Office at Dehra; Mr. Peychers and Mr. H. G. Shaw have rendered valuable service in the examination of the press proofs generally, and Mr. Peychers more particularly in regard to the preparation and final revision of the numerical details which require the utmost care, and in this respect from his natural aptitude and experience his assistance has been most valuable.

DEHRA DUN,
November, 1892.

G. STRAHAN, COLONEL, R.E.,
Dy. Surveyor General,
In charge Trigonometrical Surveys.

ABU MERIDIONAL SERIES.

ABU MERIDIONAL SERIES.

INTRODUCTION.

The Abu Meridional Series of the South-West Quadrilateral is the small chain of principal triangles that follows the meridian of $72\frac{3}{4}°$ from the parallel of $24\frac{1}{2}°$ to that of 23°. It starts from Jeráj-Márd, a side of the Karáchi Longitudinal Series, situated immediately south of Mount Abu and it closes near Ahmedabad (Amdávád) on the side Sanoda-Mirzápur of the Guzerat Longitudinal Series: it consists of three hexagons and one single triangle, and extends over a distance of 95 miles.

The Abu Meridional Series was designed in 1850 for two purposes: *firstly*, it was to connect the Karáchi Longitudinal Series with the Gulf of Cambay (Khambhat) and thus furnish an independent check on the heights of the former: and *secondly*, it was to afford a trigonometrical basis for the topographical surveys of Gujarát and the Káthiáwár (Káthiávád) Peninsula, countries not then incorporated in the Indian Atlas. As moreover the accurate delineation of the Coast Line from Cambay southwards was a matter of great importance, it was originally intended to carry the Abu Series not only to the parallel of 23° as has been actually done, but down the Sábarmati river through Kaira (Kheda), and thence along the Coast Line through Cambay and Broach (Bharúch), until it should join a little south of Surat on the side Tarbhán-Dopári* of the Singi Meridional Series.

During the summer of 1850 the Bombay Triangulation Party, then located at Neemuch (Nimach) under Lieutenant Harry Rivers of the Bombay Engineers, received orders to discontinue their work on the Gurhágarh Meridional Series, and to take up instead the triangulation on the meridian of Mount Abu. Captain A. Strange had by this time carried the principal work of the Karáchi Longitudinal Series from Sironj to within a few miles of Mount Abu and the approximate work some 40 miles to the westward beyond, and Lieutenant Rivers had to select a base from the latter.

On receipt of Strange's chart of the approximate work Rivers decided to make his

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* The side Tarbhán-Dopári was in 1850 the northern extremity of the Singi Meridional Series: many unsuccessful efforts had been made to carry the latter further north: it was eventually connected with the Karáchi Longitudinal Series in 1862 by a series running parallel to the Abu Series and 70 miles distant to the east.

new series start from the side Jeráj–Márd of the Gúru Sikkar–Belka Double Pentagon*, both of which stations were on the edge of a range of hills and possessed a commanding view.

Season 1850-51.

PERSONNEL.

Lieutenant H. Rivers, Bombay Engineers, 1st Assistant, G. T. Survey.
Mr. J. Fraser, Senior Sub-Assistant.
„ T. Sanger, Sub-Assistant.
„ J. DaCosta Ditto.
„ John McGill, (Probationer).

On the Singi and Khánpisura Series, Rivers had always worked with Dollond's 15-inch Theodolite, but this had now been discarded; its results had of late been very unsatisfactory and it had become from constant use and occasional accidents thoroughly out of repair. In its stead was to be used an 18-inch theodolite† by Troughton and Simms, which had been employed with considerable success on the Amua and Budhon Series, and which arrived at Neemuch from Dehra Dún in September 1850.

In the middle of October the party set out from Neemuch for the field, but owing to very heavy rain that lasted without intermission from the 20th to the 25th, their progress was much delayed. Rivers himself left Neemuch on November 5th and proceeded to Mount Abu where Captain Strange was passing the recess season.

As no approximate work as yet existed on the Abu Meridian south of his side of origin Rivers had himself to undertake the selection of stations. At the outset he met with but few obstacles, and by December 5th he had constructed a polygon round Gori as a centre. The northern portion of the Series was situated in a mountainous district, where the Sábarmati, Banás, and other Gujarát rivers rise. The few inhabitants that there were were Bheels; they were quite lawless and in fact professional robbers. Individuals if travelling singly were not safe and even parties were liable to be robbed and molested. South of the side Kárdo–Kainátth the country became very difficult and unsuitable for triangulation: it was absolutely flat and covered with trees; towers‡ had to be built at all the stations, and many delays were encountered in clearing the rays: if Rivers could have seen the country before commencing work he would have recommended the adoption of a single series instead of a double one, but now that he was on the ground it was too late to get his instructions changed. The advantages of a double series did not, he thought, compensate for its additional expense; for, owing to the great number of towers that had to be built and to the vast quantities of fruit trees that had to be cleared, triangulation in such a country was most costly. Rivers was very averse to adopting Everest's system of ray-tracing; he regarded it as a slow and laborious process, and, in order to avoid its necessity, he endeavoured to so select his stations that large fires at the two extremities of his rays would serve as sufficient guides for the clearance: this method however involved much loss of time in the choice of the stations, and had consequently to

* The principal angles at Jeráj and Márd which form part of the Gúru Sikkar–Belka Double Pentagon and appertain to the Karáchi Longitudinal Series were observed by Mr. C. Lane in February and March 1851 with Troughton and Simms' 36-inch Theodolite.

† Troughton and Simms' 18-inch Theodolite No. 2: for a full description of this instrument and the work performed by it, see Appendix No. 2 of Volume II of the *Account of the Operations of the Great Trigonometrical Survey of India.*

‡ A tower twenty-five feet high had to be built at each extremity of a twelve mile ray in order to ensure mutual visibility of the heliotropes.

be abandoned: he tried in its stead, in order to obtain the line of a ray, the plan of lighting fires at close intervals over the whole distance between the two stations, but this invariably failed also.

Neither Rivers nor his assistants possessed any experience of systematic ray-tracing, a fact that had greatly increased his reluctance to adopt it, but towards the end of December he decided that he had no alternative but to resort to it. He commenced the new system on the Pára Polygon, all the rays of which with the exception of Kárdo–Kainàth had to be cleared, and the whole of December was spent on this work. The ray-traces, however, proved most unsatisfactory; the country was intersected with ravines which caused errors in the perambulator readings, and the angles of the traverses were not observed with sufficient care: the line first cut invariably had to be altered, and immense loss of time, double expense, and great additional injury to the trees of the country were entailed.

By January 1st, the approximate work had only reached Lakwára, but after that, in spite of the lines laid off from the ray-traces at Rakhiál being far from true, better progress was made: on the eastern flank of the third hexagon there was some rising ground and advantage was taken of this, which obviated the necessity of towers. By the end of January the approximate work, with the exception of the tower-building, had been carried down to the stations of Lakwára–Rakhiál–Amalyára, and the final angles had been commenced.

The first station visited was Wantra and then Moráli, and observations were completed at both. Only the northern angles at Rakhiál and Amalyára were observed, as the stations of Sanoda and Bárdoli were not selected till the following year. At Warsora Rivers was delayed by Dhámanwa not being visible and he eventually had to leave without observing it: several trees had been cut on the line, but the ray had proved untrue. At Pára also Dhámanwa was invisible and remained unobserved. Rivers was unable to waste time in waiting for the successful clearance of the rays, as dust-storms and smoke come on with the hot weather, and he wished to make sure of the northern stations during this season, the more especially as they are dangerous to visit immediately after the rains. During March he completed the observations at Kherwa, Kainàth and Márd, and in April he finished those at Gori and Jeráj: he also visited the stations of Kárdo and Siniána, but at each he was troubled with dust-storms and prevented from observing all the angles.

The soil of the country was very sandy and afforded no foundation to such massive structures as the towers. Two of these, the external portion of which consisted of sun-dried mud bricks, fell, and it was found necessary to face them and others with burnt bricks set in lime to a foot in depth.

On the Abu Series, Rivers adopted a slightly different method of changing zero to the one that he had employed before. On the Khánpisura and Gurhágarh Series he had followed the established practice of the Great Trigonometrical Survey in the case of three-

microscope instruments and had worked with the ordinary six pairs of zeros,* *viz.*:—

$$\frac{0^\circ\ 0'}{180^\circ\ 0'},\ \frac{10^\circ\ 0'}{190^\circ\ 0'},\ \frac{20^\circ\ 0'}{200^\circ\ 0'},\ \frac{30^\circ\ 0'}{210^\circ\ 0'},\ \frac{40^\circ\ 0'}{220^\circ\ 0'} \text{ and } \frac{50^\circ\ 0'}{230^\circ\ 0'}.$$

In order to bring the zero of the micrometer over every 10 minutes of the degree and to shift the reading so as to cancel error of "run" he employed the following zeros on this Series:—

$$\frac{0^\circ\ 1'}{180^\circ\ 1'},\ \frac{10^\circ\ 12'}{190^\circ\ 12'},\ \frac{20^\circ\ 20'}{200^\circ\ 20'},\ \frac{30^\circ\ 29'}{210^\circ\ 29'},\ \frac{40^\circ\ 38'}{220^\circ\ 38'} \text{ and } \frac{50^\circ\ 50'}{230^\circ\ 50'}.$$

The party closed the field season towards the beginning of May, and proceeded to Ahmedabad where they established their recess-quarters for the summer.

In August, 1851, Mr. Fraser resigned his appointment: he had entered the Bombay Survey Department in 1822 and had been employed from 1828 to 1834 on the Trigonometrical Survey of the Bombay Presidency, which was being carried out by Lieutenant R. Shortrede under the orders of Captain J. Jopp. On the amalgamation of this Survey in 1834 with the Great Trigonometrical Survey of India, he had been transferred to the latter and had worked for the last seventeen years of his service under Lieutenants W. S. Jacob and H. Rivers. He was succeeded by Mr. McGill, who had been working with the party as a probationer during the field season of 1850-51.

In October, 1851, Mr. J. W. Rossenrode was appointed an additional assistant to the Bombay Party: his services were at the time in much request in Bengal and he was ill-able to be spared, he had had great experience of trigonometrical operations in flat and wooded countries, and was sent at the urgent demand of Lieutenant Rivers to instruct the assistants of the Bombay Party in the ray-trace system and to thus prevent a repetition of the failures of the previous season. He left Calcutta in October, but owing to the immense distance that he had to march, he did not join Lieutenant Rivers till the middle of February, when it was too late for him to be of much use.

Season 1851-52.

PERSONNEL.

Lieutenant H. Rivers, Bombay Engineers, 1st Assistant, G. T. Survey.
Lieutenant D. J. Nasmyth, Bombay Engineers, 2nd Assistant.
Mr. T. Sanger, Senior Sub-Assistant.
„ J. DaCosta, Sub-Assistant.
„ J. W. Rossenrode, Ditto.
„ J. McGill, Ditto.

The main body of the party were not in a fit state to leave Ahmedabad for the field before November, owing to the native portion having suffered so much from fever towards the end of the rainy season. During October, however, Rivers himself succeeded in selecting a few stations of the Guzerat Longitudinal Series in the neighbourhood of Ahmedabad. In November, he regularly took up the approximate work of this latter series and proceeded westward from the meridian of $71\frac{1}{2}^\circ$ along the parallel of 23°. Messrs.

* This method of changing zero was altered in 1860 by Colonel Waugh for reasons which will be found fully explained at pages xii to xvii of the Introduction to the Great Indus Series, *vide* Volume III of the *Account of the Operations of the Great Trigonometrical Survey of India*. Since that date the zero-settings for theodolites, with three microscopes have always been as follows:—

$$\frac{0^\circ\ 0'}{180^\circ\ 0'},\ \frac{70^\circ\ 1'}{250^\circ\ 1'},\ \frac{140^\circ\ 2'}{320^\circ\ 2'},\ \frac{210^\circ\ 3'}{30^\circ\ 3'},\ \frac{280^\circ\ 4'}{100^\circ\ 4'} \text{ and } \frac{350^\circ\ 5'}{170^\circ\ 5'},$$

the changes in the minutes were introduced with a view to cancelling the effects of any errors in the construction of the threads of the micrometers.

Sanger and DaCosta were left behind on the Abu Series north of Ahmedabad clearing the lines by the ray-trace system. They were the only two assistants with the party available for work, but as the nature of the country was such that every line required a ray-trace survey, and numerous fruit trees of great value had to be cut, Rivers considered it advisable to place them both on this duty. Rivers returned to the Abu Series on December 15th, in the hopes of finding sufficient rays cleared to allow him to commence the observations of the final angles, but he was disappointed, as only a few were ready.

On December 22nd, he went to Sanoda as being the station at which the Meridional Series of Abu and the Longitudinal Series of Guzerat meet, and observed δ Ursæ Minoris for azimuth. He was joined here on December 29th, by Lieutenant Nasmyth, a young Officer of the Bombay Engineers, who had been appointed to the Great Trigonometrical Survey of India a few weeks previously. At the beginning of January, Rivers proceeded to the head of the Gulf of Cambay to make arrangements for connecting the heights of the stations of the Guzerat Series and thence those of the Abu and Karáchi Longitudinal Series with mean sea level: his plan was to erect a tidal station near the mouth of the Sábarmati river and to then connect it by levelling with the nearest principal station of the Guzerat Longitudinal Series: he found however afterwards that such operations would occupy him entirely to the exclusion of trigonometrical work, and as, too, he had much difficulty in obtaining a level capable of such accurate observations as were required, he abandoned the enterprise and substituted for his line of levels a minor series of triangulation, the approximate work of which Mr. DaCosta proceeded to take up*. On his return from Cambay he took up the final angles of the Abu Series: his progress was again much impeded by finding lines not properly cleared and by having to set to work and do it himself: the result was that by the end of January he had been only able to observe at the two stations of Kárdo and Warsora. During February he succeeded in completing the observations at all the stations of the series with the exception of Siniána, notwithstanding that the height of the towers at several had to be increased on his arrival because the effect of refraction on which he depended for the visibility of his stations was less in April than it was in November when they were built. From the 1st of March to the end of the field season he was employed in observing the final angles of the Guzerat Longitudinal Series: in April, however, an opportunity offered, and he visited Siniána and observed the two angles at that station, thus finishing the principal work of the Abu Series. Mr. Rossenrode had joined him in February, but the clearance of the rays, the special work for which he had been sent, had by that time been carried out with much annoyance and trouble in the most difficult parts of the country, and so he was detached on approximate work to the western extremity of the Guzerat Longitudinal Series. The party established their recess quarters for the summer of 1852 at Ahmedabad.

When the results of the past season came to be computed out it was found that the geometrical conditions of the Pára Hexagon could not be satisfied† unless a correction exceeding 3″ in amount was applied to the angle Kárdo–Dhámanwa–Pára.

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* *Vide* Introduction to the Guzerat Longitudinal Series.

† The geometrical conditions of the figures of the triangulation were in these days satisfied by Colonel Everest's method of successive approximations, *vide* page 103, Volume II of the *Account of the Operations, &c.*

On this account Lieutenant Rivers decided to re-visit the station of Dhámanwa, and observe the faulty angle again. He left cantonments accompanied by Nasmyth on November 1st, 1852, and completed the observations on November 4th. The final angle Kárdo–Dhámanwa–Pára as derived from the observations taken on the former occasion was 55° 15′ 29″·59, a value that had been shewn by the computations to be somewhat over 3″ in defect. The result of the second visit to Dhámanwa was to make the angle 55° 15′ 32″·96 which agreed within a quarter of a second of arc with the computed value. Rivers however did not feel justified in rejecting the earlier result *in toto*, and he therefore combined the two. The concluded angle finally adopted was equal to

$$55^\circ\ 15' + \frac{0\cdot58 \times 29''\cdot59 + 2\cdot01 \times 32''\cdot96}{0\cdot58 + 2\cdot01} = 55^\circ\ 15'\ 32''\cdot23,$$

the quantities 0·58 and 2·01 being the respective weights of the two observed results.

By November 6th the party had returned to Ahmedabad, and were preparing to start for the Káthiáwár Peninsula to commence the triangulation there. As Rivers had applied for furlough, and had every expectation of its being granted, he handed the party over to Nasmyth, and when they left for the field he remained behind: on November 22nd, however, he received official intimation that his furlough had been refused; he left Ahmedabad the same evening for Káthiáwár, and on overtaking Nasmyth some weeks later he again resumed charge of the work.

The closing errors at Mirzápur in latitude, longitude, azimuth and side may be exhibited as follows:—

Values.	Latitude.	Longitude.	Azimuth†.	Side in feet†.
When calculated from the side Jeráj–Márd of the Karáchi Longitudinal Series *vid* the Abu Series.	22° 59′ 17″·859	72° 52′ 34″·694	154° 36′ 50″·047	53857·2
When calculated from the side Tána–Lakarwás of the Karáchi Longitudinal Series *vid* the northern section of the Singi Series and the central section of the Guzerat Longitudinal Series.	22° 59′ 17″·708	72° 52′ 34″·708	154° 36′ 47″·090	53859·5
Closing errors ...	+ 0·″151*	− 0″·014*	+ 2″·957	2·3

* To determine the error of the geographical position of Mirzápur in feet it should be noted that 1 foot = 0″·01 approximately both on meridian and parallel.

† The side Mirzápur–Sanoda.

On the completion of the Simultaneous Reduction of the South-West Quadrilateral, it was found that the portions of the corrections which had actually fallen to the Abu Meridional Series were:—

In Latitude of Mirzápur (XVI)	... ...	− 0″·070
„ Longitude of „	... ...	+ 0 ·005
„ Azimuth of Mirzápur (XVI)—Sanoda (XIX)		+ 0 ·843
In side { Logarithm of feet	... ...	+ 0 ·000,0101,5
giving a ratio of about 1·48 inches per mile.		

Astronomical observations for azimuth have never been taken at any of the stations of the Abu Meridional Series: Sanoda, where Rivers observed δ Ursæ Minoris, now appertains to the Guzerat Longitudinal Series.

Secondary Triangulation.

So many difficulties were encountered in selecting the stations and clearing the rays for the principal triangulation of the Abu Series, that Rivers had been obliged to employ all his Assistants on that work, and consequently there had never been any one available for secondary operations. The result was that not nearly so many points were laid down trigonometrically as was desirable: this was the more to be regretted as the Topographical Survey of the country had yet to be carried out.

In the Gori Hexagon some half-dozen hill peaks, a few temples, and a dome in Pálanpur were fixed, and the position of a point in the large town of Ídar near the principal station of Kainάth was determined. In the Pára Hexagon the Harsol Residency and four or five trees were laid down: a point in a village two miles from Ahmednagar (Ahmadnagar) was intersected from two principal stations, but neither in this important town nor in the great fort of Bijápur* was any secondary station established: these omissions are probably due to the Rajput chiefs refusing to allow the Surveyors to enter their strongholds. Between the principal side Warsora–Moráli of the Abu Series and the Guzerat Longitudinal Series, though seven principal triangles intervened, no secondary station was established and no intersected point laid down.

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* The principal station of Pára was only two miles distant from Bijápur.

June, 1889.

S. G. BURRARD.

ABU MERIDIONAL SERIES.

PRINCIPAL TRIANGULATION. ALPHABETICAL LIST OF STATIONS.

The orthography of the names in columns 1 and 4 is based, as far as practicable, on the pamphlet of names entitled *Bombay Places and Common Official Words* (1879) and on the list of *Spelling of Names in the Central India Agency* (1877). As some of the names have thus been considerably altered, it has been thought advisable for easy reference and identification to give in columns 2 and 5 the spellings employed in the original angle books. The orthography in columns 1 and 4 is hereafter only employed in this volume.

Orthography		Number	Orthography		Number
Adopted	From Original Angle Books		Adopted	From Original Angle Books	
Ámliyára	Amalyára	XII	Khedva	Kherwa	II
Bárdoli	Bárdoli	XIV	Lakhváda	Lakwára	XIII
Chaniána	Siniána	III	Mád	Márd	XL*
Devpura	Pára	VI	Mirzápur	Mirzápur	XVI†
Dhámanva	Dhámanwa	VIII	Moráli	Moráli	IX
Ghodi	Gori	I	Rakhiál	Rakhiál	XI
Jairáj	Jeráj	XLIII*	Sonáda	Sanoda	XIX†
Kaináth	Kaináth	IV	Vántra	Wantra	VII
Kárdo	Kárdo	V	Varsoda	Warsora	X

* Of the Karáchi Longitudinal Series. † Of the Gujarát Longitudinal Series.

ABU MERIDIONAL SERIES.

PRINCIPAL TRIANGULATION. NUMERICAL LIST OF STATIONS.

XL (Of the Karáchi Longitudinal Series).	Mád.	VIII	Dhámanva.
XLIII (Of the Karáchi Longitudinal Series).	Jairáj.	IX	Moráli.
I	Ghodi.	X	Varsoda.
II	Khedva.	XI	Rakhiál.
III	Chaniána.	XII	Ámliyára.
IV	Kainátḥ.	XIII	Lakhváda.
V	Kárdo.	XIV	Bárdoli.
VI	Devpura.	XVI (Of the Gujarát Longitudinal Series).	Mirzápur.
VII	Vántra.	XIX (Of the Gujarát Longitudinal Series).	Sonáda.

ABU MERIDIONAL SERIES.

DESCRIPTION OF PRINCIPAL STATIONS.

Of the 14 Principal Stations of this Series those numbered I to V and VII, IX and XII, as well as XL and XLIII of the Karáchi Longitudinal Series from which this triangulation emanates, are situated on hills. All these except XLIII consist of solid, circular and isolated pillars of masonry, from 3 to 10 feet in height, having marks engraved either on the rock *in sitú* or on stones imbedded at about the ground level, and one or more other marks cut on stones inserted vertically above the former marks. Around the pillars and level with their surfaces, platforms of loose stone masonry or of sun-dried bricks and mud were constructed for the observatory tent to rest on. At Station XLIII, where the rock rises above the surface of the hill, there is no pillar, and the only mark is that on the rock. The remaining stations, together with the two of the Gujarát Longitudinal Series on which this triangulation terminates, are situated in the plains and it was found necessary on account of the curvature of the earth to construct towers. These are solid structures—either circular or square, built of sun-dried bricks, faced with kiln-burnt bricks—18 to 32 feet in height, enclosing central, solid pillars of masonry which carry marks at top, bottom and intermediately, the upper portion of each pillar being circular and isolated.

The following descriptions have been compiled from those given by the officers who executed the series, supplemented as regards adjacent villages and places from the Topographical Survey maps of the country traversed, and corrected, so far as the local sub-divisions in which the several stations are situated, from the latest annual reports furnished by the district officers to whose charge the stations were committed.

XL.—(*Of the Karáchi Longitudinal Series*). Mád or Márd Hill Station, lat. 24° 24′, long. 73° 0′—observed at in 1851—is situated on one of a group of hills forming a portion of the southern face of the Aravalli range, about 12 miles S.E. by E. of the Abu Road Railway Station of the Rájputána-Malwa (Málwa) Line, and 5½ miles W.N.W. of the large village of Posina. It is in the lands of the village of Posina, Ídar State, Mahi Kántha Agency.

The station, as built for the Karáchi Longitudinal Series, consists of a platform, 3·75 feet in height, enclosing a solid, circular and isolated pillar of masonry which has a mark-stone at the level of the foundation, another 2 feet above and a third at the top 2 feet above the former. When visited in March 1851 for originating the Abu Meridional Series, no alteration appears to have been made in the construction of the station. The directions and distances of the circumjacent villages are:—Jamburi S.W., miles 2¼; and Bhamoria N.N.W., miles 2.

XLIII.—(*Of the Karáchi Longitudinal Series*). Jairáj Hill Station, lat. 24° 25′, long. 72° 32′—observed at in 1851—is situated on an extensive hill, on the boundary between the Sirohee (Sirohi) and Pálanpur States, about 5 miles N.N.W. of Sarotri Railway Station on the Rájputána-Malwa Line. It is in the lands of the village of Bhatána, sub-division Madar, Sirohee State.

The station is denoted by a mark engraved on a large rock crowning the hill. The directions and distances of the circumjacent villages are:—Amodra N. by E., miles 2¼; Dibri N. W., miles 3¼; Sarotra E.S.E., miles 5¼; and Dheri S. by E., miles 4¼.

I. Ghodi Hill Station, lat. 24° 10′, long. 72° 51′—observed at in 1851—is situated on a high peak of a mountain range running S.W. and N.E., and is about 3½ miles E.S.E. of the large village of Dánta, and 1¼ miles N.W. by N. of the hamlet of Navánagar. It is in the lands of the village of Khaivád, Dánta State, Mahi Kántha Agency.

The station consists of a platform enclosing a solid, circular and isolated pillar of masonry: there are two marks, one engraved on the rock *in situ* and the other 2·75 feet above it in the upper surface of the pillar. The directions and distances of the circumjacent villages are:—Pánudra W. by S., miles 2; Khaivád W., miles 1¼; and Vadveda N. by W., miles 1¼.

II. Khedva Hill Station, lat. 24° 7′, long. 73° 8′—observed at in 1851—is situated on a small, round hill, the southernmost of a small group, about 6¼ miles N.N.E. of the large village of Khed-brahma on the right bank of the Harnáv river, and a mile W. of the straggling village of Khedva. It is in the lands of the village of Khedva, Ídar State, Mahi Kántha Agency.

The station consists of a platform enclosing a solid, circular and isolated pillar of masonry: there are two marks, one engraved on the rock *in situ* and the other 3 feet above it in the upper surface of the pillar.. The directions and distances of the circumjacent villages are:—Vártol S.S.W., miles 3¼; Motora W. by S., miles 4¾; and Jhanjva W. by S., miles 2.

III. Chaniána Hill Station, lat. 24° 7′, long. 72° 35′—observed at in 1852—is situated on a small hill capped with large masses of rock, about 5 miles S. by W. of the large village of Dhánda, and 3½ miles S.W. by W. of that of Jálotra. It is in the lands of the village of Chaniána, pargana and State Pálanpur.

The station consists of a platform enclosing a solid, circular and isolated pillar of masonry: there are two marks, one engraved on the rock *in situ* and the other 3·92 feet above it in the upper surface of the pillar. The directions and distances of the circumjacent villages are:—Chaniána N.W. by W., mile 1; Gola N. by W., miles 2; Vansol E. by N., miles 2; Dhota S., miles 2¼; and Varvádia S.W., miles 2.

IV. Kainath, locally known as Kulnáth, Hill Station, lat. 23° 51′, long. 73° 1′—observed at in 1851—is situated on a large, flat-topped hill composed of granite and porphyry, and is called Kainath from its being dedicated to a deity of that name. The station is about 1⅔ miles W.N.W. of the town of Ídar on the main road from Ahmednagar (Ahmadnagar) to Khed-brahma, and 6¾ miles S.W. by S. of the large village of Vaidáli on the same road. It is in the lands of the town of Ídar, Ídar State, Mahi Kántha Agency.

The station consists of a platform of loose stones and earth enclosing a solid, circular and isolated pillar of masonry: there are two marks, one engraved on the rock *in situ* and the other 2·92 feet above it in the upper surface of the pillar. The directions and distances of the circumjacent villages are:—Lembhoi E.N.E., mile 1; Surpur S., miles 2; Barváu S.W., miles 1¼; and Bhávangad N. W. by N., miles 2¾.

V. Kárdo Hill Station, lat. 23° 57′, long. 72° 46′—observed at in 1851 and 1852—is situated on the western extremity of a small, steep hill of this name which is crowned with large masses of rock; the hill though detached, forms part of the range known as Táranga on which are several temples. The station is about 4⅓ miles W. of Hadol a little W. of the Sábarmati river. It is in the lands of the village of Dabhoda, sub-division Kherálu, Baroda (Vadodra) State.

The station consists of a platform enclosing a solid, circular and isolated pillar of masonry: there are two marks, one engraved on the rock *in situ* and the other 3·75 feet above it in the upper surface of the pillar. The directions and distances of the circumjacent villages are:—Ánandpur Bhákdi N.W. by N., miles 2; Kájipura S. by E., mile 1; Kuda Rájpur S.S.W., miles 2¼; and Dabhoda W. by S., miles 2¼.

VI. Devpura Tower Station, lat. 23° 35′, long. 72° 50′—observed at in 1851 and 1852—stands on rising ground, N. of and close to the small village of this name, about 2⅓ miles E.N.E. of the town of Vijápur, and 3¼ miles W.S.W. of Derol village on the left bank of the Sábarmati river. It is in the lands of the village of Devpura, sub-division Kadi, Baroda State.

The station consists of a tower of sun-dried bricks, faced with burnt bricks, enclosing a solid pillar of masonry, 20 feet in height of which the upper 4 feet is circular and isolated. The directions and distances of the circumjacent villages are:—Ganeshpura N., mile ¾; Hirpura N.N.E., miles 1¾; and Rámpur Kuvaida S., mile 1.

VII. Vántra Hill Station, lat. 23° 37′, long. 73° 7′—observed at in 1851—is situated towards the western part of a detached, flat-topped hill, about 2¼ miles E.N.E. of the large village of Virávada, and 7½ miles E. by N. of the town of Ahmednagar. It is in the lands of the village of Vántra, Ídar State, Mahi Kántha Agency.

The station consists of a square platform, 4 feet in height, enclosing a solid, circular and isolated pillar of masonry: there are two marks, one engraved on the rock *in sitú* and the other 2·92 feet above it in the upper surface of the pillar. The directions and distances of the circumjacent villages are:—Vántra (at foot of the hill) S.S.E., mile ½; Lálpur N.E. by E., mile 1; Vávdi E. by N., miles 2½; Karanpur S., miles 1¾; and Kump N.W. by N., miles 1¼.

VIII. Dhámanva Tower Station, lat. 23° 32′, long. 72° 33′—observed at in 1852—is situated on a low sandy ridge, about 2½ miles S.W. by W. of the large village of Dábhla, and 3 miles W. of that of Vasái. It is in the lands of the village of Dhámanva, Baroda State.

The station consists of a tower of sun-dried bricks, faced with burnt bricks, enclosing a solid pillar of masonry, the upper 5 feet of which is circular and isolated: it has a mark-stone at the ground level, another at the top 32 feet above it, and five others placed intermediately. Four small pillars, with marks thereon, are built close to the tower, and the intersection of lines joining these marks indicates the position of the mark-stone at the summit. The directions and distances of the circumjacent villages are:—Kámalpur N. by W., miles 2; Padhária S.E. by E., mile ¾; Mevu S., miles 2½; Mulsan S.W. by W., miles 2½; Dhárusen W. by N., miles 2; and Dhámanva W., mile ½.

IX. Moráli Hill Station, lat. 23° 25′, long. 73° 0′—observed at in 1851—is situated on a small piece of rising ground full of iron ore, about 2¾ miles N.E. by E. of the village of Rupál Mevási, ¼ of a mile S. of the road from Parántíj to Harsol, and 7 miles E. by S. of the former place. It is in the lands of the village of Moráli, táluka Parántíj, district Ahmedabad.

The station consists of a platform of sun-dried bricks enclosing a solid pillar of masonry having a foundation 1½ feet deep: the pillar, of which the upper 5 feet is circular and isolated, contains three marks, one at the top and the others at 5·25 and 10·0 feet below it respectively. The directions and distances of the circumjacent villages are:—Moráli N. by W., mile ¾; Jenpur W., mile 1; Ánjna and Gola S.S.W., miles 2; Ghadi N. by E., miles 1½; and Motesar E.S.E., miles 2½.

X. Varsoda Tower Station, lat. 23° 25′, long. 72° 47′—observed at in 1852—stands at the southern extremity of the village of this name, on rising ground where a large building formerly stood of which no trace now remains above the ground. The station is about 7 miles W. by S. of the town of Parántíj on the main road from Ahmedabad to Ahmednagar. The land in the neighbourhood is much cut up with deep ravines draining into the Sábarmati river which flows about a mile S. of the station. It is in the lands of the village of Varsoda, sub-division Sábar Kántha, Mahi Kántha Agency.

The station consists of a tower of sun-dried bricks, faced with burnt bricks, enclosing a solid pillar of masonry 25 feet in height of which the upper 4 feet is circular and isolated. The directions and distances of the circumjacent villages are:—Badpura W.N.W., miles 1¾; Ámbod W.S.W., miles 2; Poada Mota S.S.E., miles 1½; and Sitváda E.S.E., miles 2¾.

XI. Rakhiál Tower Station, lat. 23° 16′, long. 72° 57′—observed at in 1852—stands on rising ground about 5 furlongs N.N.W. of the village of this name, and ¼ of a mile N. of the road from Ahmedabad to Modása. It is in the lands of the village of Rakhiál, sub-division Bávisi, Mahi Kántha Agency.

The station consists of a tower of sun-dried bricks, faced with burnt bricks, 18 feet square at the base and 13 feet at the top, which encloses a solid pillar of masonry, 22 feet in height, tapering from 4½ feet square at the base to 3½ feet square near the summit, the upper 4 feet being circular and isolated: the pillar has a foundation of 5 feet, and contains mark-stones at 6, 12, 18 and 22 feet respectively above the one at the ground level. Four small pillars with marks thereon are built around the tower at 20 yards from the central pillar, and the intersection of lines joining these marks indicates the position of the upper mark. The directions and distances of the circumjacent villages are:—Navánagar W.N.W., miles 2; Karmipura N.W. by N., miles 1¾; Undan N. by W., miles 2½; Jasáji N.N.E., miles 1¾; and Sámetra S. by W., miles 1¾.

XII. Ámliyára Hill Station, lat. 23° 14′, long. 73° 6′—observed at in 1852—is situated on rising ground, about 1¾ miles N.E. of the large village of the same name on the left bank of the Májam river, and 3½ miles N.W. by W. of Dábha on the left bank of the Vátrak river. It is in the lands of the village of Ámliyára, sub-division Vátrak Kántha, Mahi Kántha Agency.

The station consists of a platform of sun-dried bricks enclosing a solid, circular and isolated pillar of masonry, which contains two marks, one at the ground level and the other 5 feet above it in its upper surface. The directions and distances of the circumjacent villages are:—Chandrál E.N.E., miles 1¾; Jitpura S.E. by S., miles 1¾; Amiápura S., miles 3½; Tenpur W.S.W., miles 3½; and Untarda W. by N., miles 2½.

XIII. Lakhváda Tower Station, lat. 23° 16, long. 72° 44′—observed at in 1852—stands close to the left bank of the Sábarmati river, about a mile E. of the town of Pethápur on the opposite bank, and 200 yards N.E. of the village of Lakhváda, sub-division Dehgám, Baroda State.

The station consists of a tower 22 feet in height (most probably built in a manner similar to those at the adjacent stations) enclosing a solid pillar of masonry. Four small pillars, with marks thereon, are built close to the tower, and the intersection

of lines joining these marks indicates the position of the mark at the ground level. The directions and distances of the circumjacent villages are:—Bhundia N.N.E., mile 1; Álampur S.E., miles 1¼; Pálej S., miles 3; Ádiváda W.S.W., miles 2¾; and Rándheja W.N.W., miles 4.

XIV. Bárdoli Tower Station, lat. 23° 5′, long. 72° 58′—observed at in 1852—stands on rising ground, about 1⅝ miles W. of the village of this name on the right bank of the Vátrak river, and 8¾ miles S.E. of the town of Dehgám on the road from Ahmedabad to Modása. It is in the lands of the village of Atarsumba, sub-division Atarsumba, Baroda State.

The station consists of a tower of sun-dried bricks, faced with burnt bricks, enclosing a solid pillar of masonry, 22 feet in height, which contains mark-stones at every 5 feet. The directions and distances of the circumjacent villages are:—Isanpur Doria N.N.W., miles 1¼; Nármia S.S.E., mile ¾; Apruji S., miles 2½; Kamalband Vásna S.W., miles 3¼; and Bahiel W. by S., miles 2¾.

XVI.—(*Of the Gujarát Longitudinal Series*). Mirzápur Tower Station, lat. 22° 59′, long. 72° 53′—observed at in 1852 and 1858—is situated on a sandy hill, about a mile W. by S. of the village of this name, and 4 miles N.W. by N. of the large village of Haldharvás on the right bank of the Vátrak river. It is in the lands of the village of Chandivel Bhátpura, táluka Daskroi, district Ahmedabad.

The station consists of a tower enclosing a solid pillar of masonry, 18 feet in height, which has a mark-stone at the top and others at 3, 8, 13 and 18 feet respectively below it. There is nothing in the records to show that any alteration was made in the construction of the station when it was visited in 1858 in connection with the Gujarát Longitudinal Series. The directions and distances of the circumjacent villages are:—Chandivel Bhátpura W.N.W., mile ¾; Várod (on the left bank of the Meshva river) W.S.W., miles 2¾; Kániel S. by E., miles 1¼; and Patávat (on the W. bank of the Vátrak) S.E. by E., miles 3¼.

XIX.—(*Of the Gujarát Longitudinal Series*). Sonáda Tower Station, lat. 23° 7′, long. 72° 48′—observed at in 1852—stands on rising ground covered with large trees, about a mile S.E. by E. of Sonáda village on the E. bank of the Khári river, and 4¾ miles S.W. of the town of Dehgám on the road from Ahmedabad to Modása. It is in the lands of the village of Sonáda, sub-division Dehgám, Baroda State.

The station consists of a tower (most probably built like those at the adjacent stations) enclosing a solid pillar of masonry, which has a mark-stone in its upper surface and others below at every 5 feet. Four small pillars, with marks thereon, are built around the tower, and the intersection of lines joining these marks indicates the position of the upper mark on the central pillar. The directions and distances of the circumjacent villages are:—Galudan N.W. by N., miles 1¼; Vadodra N. by W., miles 2¾; Rathoda Vásna E. by N., miles 2¾; Jalundra Mota S.E., miles 1¼; and Jhánk S.W. by S., miles 2.

December, 1891.

J. ECCLES,
In charge Computing Office.

ABU MERIDIONAL SERIES.

PRINCIPAL TRIANGULATION. TRIANGLES.

No. of Triangle	Station	Spherical Excess	Corrected Plane Angle	Distance		
				Log. feet	Feet	Miles
		"	° ′ ″			
	Mád, XL	1·04	63 29 6·46	5·1424569	138821·6	26·292
1	Jairáj, XLIII	1·04	38 58 10·01	4·9893076	97568·0	18·479
	Ghodi, I	1·05	77 32 43·53	5·1803796	151488·5	28·691
	Mád, XL	·67	51 34 27·77	4·9629542	91823·6	17·391
2	Ghodi, I	·68	72 4 36·73	5·0473572	111521·1	21·121
	Khedva, II	·67	56 20 55·50	4·9893076	97568·0	18·479
	Jairáj, XLIII	·83	42 41 38·52	4·9761914	94665·4	17·929
3	Ghodi, I	·83	53 23 17·22	5·0494584	112062·0	21·224
	Chaniána, III	·84	83 55 4·26	5·1424569	138821·6	26·292
	Ghodi, I	·73	53 18 46·76	5·0080204	101863·9	19·292
4	Khedva, II	·73	80 23 42·37	5·0977631	125245·8	23·721
	Kaináth, IV	·72	46 17 30·87	4·9629542	91823·6	17·391
	Ghodi, I	·59	46 7 16·13	4·9560453	90374·4	17·116
5	Kaináth, IV	·59	41 13 58·71	4·9171925	82640·4	15·652
	Kárdo, V	·59	92 38 45·16	5·0977631	125245·8	23·721

NOTE.—1. The value of the side is given in the same line with the opposite angle.
2. Stations Mád, XL and Jairáj, XLIII appertain to the Karáchi Longitudinal Series of the North-West Quadrilateral.

No. of Triangle	Station	Spherical Excess	Corrected Plane Angle	Distance		
				Log. feet	Feet	Miles
		"	° ′ ″			
	Ghodi, I	·52	57 33 15·23	4·9345184	86004·0	16·289
6	Chaniána, III	·52	54 11 0·61	4·9171925	82640·4	15·652
	Kárdo, V	·52	68 15 44·16	4·9761914	94665·4	17·929
	Kaináth, IV	·85	80 1 23·82	5·1398442	137988·9	26·134
7	Kárdo, V	·85	59 48 30·15	5·0831504	121101·8	22·936
	Devpura, VI	·85	40 10 6·03	4·9560453	90374·4	17·116
	Kaináth, IV.	·70	53 30 1·92	4·9970515	99323·4	18·811
8	Devpura, VI	·70	47 56 32·38	4·9625493	91738·0	17·375
	Vántra, VII	·71	78 33 25·70	5·0831504	121101·8	22·936
	Kárdo, V	·99	33 4 10·95	4·9620342	91629·3	17·354
9	Devpura, VI	1·00	91 40 17·52	5·2249280	167852·6	31·790
	Dhámanva, VIII	1·00	55 15 31·53	5·1398442	137988·9	26·134
	Devpura, VI	·51	52 40 4·72	4·9124014	81733·7	15·480
10	Vántra, VII	·50	52 15 34·08	4·9100223	81287·2	15·395
	Moráli, IX	·51	75 4 21·20	4·9970515	99323·4	18·811
	Devpura, VI	·32	59 24 50·14	4·8573476	72002·5	13·637
11	Moráli, IX	·32	44 12 25·68	4·7658033	58318·1	11·045
	Varsoda, X	·33	76 22 44·18	4·9100223	81287·2	15·395
	Devpura, VI	·39	68 8 5·44	4·9465125	88412·3	16·745
12	Dhámanva, VIII	·39	37 44 46·28	4·7658033	58318·1	11·045
	Varsoda, X	·39	74 7 8·28	4·9620342	91629·3	17·354
	Moráli, IX	·33	72 42 0·11	4·8995183	79344·8	15·027
13	Varsoda, X	·33	47 15 20·69	4·7855507	61031·0	11·559
	Rakhiál, XI	·33	60 2 39·20	4·8573476	72002·5	13·637
	Moráli, IX	·24	40 36 20·08	4·6955861	49611·9	9·396
14	Rakhiál, XI	·24	86 12 6·90	4·8811515	76059·2	14·405
	Ámliyára, XII	·24	53 11 33·02	4·7855507	61031·0	11·559
	Varsoda, X	·32	60 50 10·94	4·8585993	72210·3	13·676
15	Rakhiál, XI	·32	45 31 27·51	4·7708930	59005·6	11·175
	Lakhváda, XIII	·33	73 38 21·55	4·8995183	79344·8	15·027
	Rakhiál, XI	·29	47 2 40·13	4·7549607	56880·2	10·773
16	Lakhváda, XIII	·29	64 39 16·82	4·8465646	70236·8	13·302
	Sonáda, XIX	·30	68 18 3·05	4·8585993	72210·3	13·676
	Rakhiál, XI	·25	72 25 53·55	4·8392820	69068·8	13·081
17	Ámliyára, XII	·24	64 20 56·71	4·8149672	65308·1	12·369
	Bárdoli, XIV	·24	43 13 9·74	4·6955861	49611·9	9·396
	Rakhiál, XI	·27	48 45 11·01	4·7491445	56123·5	10·629
18	Sonáda, XIX	·27	61 2 7·92	4·8149672	65308·1	12·369
	Bárdoli, XIV	·28	70 12 41·07	4·8465646	70236·8	13·302
	Sonáda, XIX	·18	49 51 1·22	4·6666128	46410·1	8·790
19	Bárdoli, XIV	·18	62 31 48·17	4·7312541	53858·5	10·200
	Mirzápur, XVI	·19	67 36 10·61	4·7491445	56123·5	10·629

NOTE.—Stations Mirzápur, XVI and Sonáda, XIX appertain to the Gujarát Longitudinal Series.

December, 1891.

J. ECCLES,
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ABU MERIDIONAL SERIES.

SECONDARY TRIANGULATION. TRIANGLES.

INTERSECTED POINTS.

Differences between the common sides of two triangles to points, are shown by the small figures in the column for "Distance in Feet" between the data of the two triangles, the earlier of which in order has supplied the greater value.

No. of Triangle	Station	Corrected Plane Angle	Distance			Theodolite used
			Log. feet	Feet	Miles	
		° ′ ″				Inch
	Ghodi, I	72 54 27	4·936915	86480	16·379	18
20	Kárdo, V	41 6 49	4·774465	59493	11·268	„
	Dandarmál Hill Mark		4·917193	82640	15·652	
				10		
	Chaniána, III	77 4 49	4·936915	86480	16·379	„
21	Kárdo, V	27 8 56	4·607306	40486	7·668	„
	Dandarmál Hill Mark		4·934518	86004	16·289	
	Chaniána, III	143 16 13	4·977363	94921	17·977	„
22	Kárdo, V	3 55 10	4·035395	10849	2·055	„
	Gola Hill		4·934518	86004	16·289	
	Ghodi, I	2 29 50	4·374074	23663	4·482	„
23	Chaniána, III	7 32 28	4·852935	71275	13·499	„
	Karnála Hill Math		4·976191	94665	17·929	
	Khedva, II	52 15 3	4·915915	82398	15·606	„
24	Kainath, IV	49 55 35	4·901689	79742	15·103	„
	Mandongri Hill Peak		5·008020	101864	19·292	

No. of Triangle	Station	Corrected Plane Angle	Distance			Theodolite used
			Log. feet	Feet	Miles	
		° ′ ″				Inch
	Ghodi, I	25 3 41	4·612425	40966	7·759	18
25	Chaniána, III	76 44 47	4·973755	94136	17·829	„
	Bhalgám Hill Temple		4·976191	94665	17·929	
				0		
	Ghodi, I	32 29 35	4·704779	50673	9·597	„
26	Kárdo, V	86 19 59	4·973755	94136	17·829	„
	Bhalgám Hill Temple		4·917193	82640	15·652	
	Ghodi, I	31 4 42	4·676863	47519	9·000	„
27	Kárdo, V	85 3 28	4·962419	91711	17·369	„
	Bhalgám Hill		4·917193	82640	15·652	
				4		
	Ghodi, I	26 28 34	4·631205	42776	8·102	„
28	Chaniána, III	72 54 23	4·962419	91711	17·369	„
	Bhalgám Hill		4·976191	94665	17·929	
	Ghodi, I	43 27 35	4·815072	65324	12·372	„
29	Chaniána, III	51 7 22	4·868836	73933	14·002	„
	Khilod Hill		4·976191	94665	17·929	

NOTES.—1. Names followed by Roman numerals are those of Principal Stations.
2. The value of the side is given in the same line with the opposite angle.

No. of Triangle	Station	Corrected Plane Angle	Distance			Theodolite used
			Log. feet	Feet	Miles	
		° ′ ″		5		Inch
	Ghodi, I	14 5 41	4·323547	21064	3·989	18
30	Kárdo, V	58 43 52	4·868836	73933	14·002	„
	Khilod Hill		4·917193	82640	15·652	
	Kaináth, IV	85 44 59	5·157639	143760	27·227	„
31	Devpura, VI	37 6 10	4·939330	86962	16·470	„
	Táranga Temple No. 1		5·083150	121102	22·936	
				10		
	Ghodi, I	42 50 47	4·939330	86962	16·470	„
32	Kaináth, IV	35 30 25	4·870826	74272	14·067	„
	Táranga Temple No. 1		5·097763	125246	23·721	
	Ghodi, I	4 38 8	3·937287	8655	1·639	„
33	Kárdo, V	45 51 55	4·885726	76865	14·558	„
	Táranga Temple No. 2		4·917193	82640	15·652	
				3		
	Ghodi, I	41 29 9	4·927795	84683	16·038	„
34	Kaináth, IV	36 57 41	4·885726	76865	14·558	„
	Táranga Temple No. 2		5·097763	125246	23·721	
	Kárdo, V	82 3 43	5·135672	136670	25·884	„
35	Devpura, VI	7 33 52	4·259245	18165	3·440	„
	Hadol Hill Peak No. 1		5·139844	137989	26·134	
	Kárdo, V	81 4 16	5·134651	136349	25·824	„
36	Devpura, VI	7 41 11	4·266243	18460	3·496	„
	Hadol Hill Peak No. 2		5·139844	137989	26·134	
	Kárdo, V	55 10 27	5·062354	115440	21·864	„
37	Devpura, VI	23 42 37	4·752416	56548	10·710	„
	Mahíváda Hill Peak		5·139844	137989	26·134	
				8		
	Kaináth, IV	72 22 21	5·062354	115440	21·864	„
38	Devpura, VI	16 27 30	4·535515	34317	6·500	„
	Mahíváda Hill Peak		5·083150	121102	22·936	
	Kaináth, IV	16 46 38	4·616284	41332	7·828	„
39	Kárdo, V	22 21 29	4·736143	54468	10·316	„
	Umedpura Hill Peak		4·956045	90374	17·116	
	Kaináth, IV	33 59 14	4·789131	61536	11·655	„
40	Kárdo, V	21 11 45	4·599889	39801	7·538	„
	Ora Hill Peak		4·956045	90374	17·116	

No. of Triangle	Station	Corrected Plane Angle	Distance			Theodolite used
			Log. feet	Feet	Miles	
		° ′ ″				Inch
	Kárdo, V	61 2 32	5·096967	125017	23·677	18
41	Devpura, VI	43 59 33	4·996683	99239	18·795	„
	Ídar Hill Temple		5·139844	137989	26·134	
				5		
	Devpura, VI	44 7 7	4·942280	87555	16·582	„
42	Vántra, VII	83 43 20	5·096967	125017	23·677	„
	Ídar Hill Temple		4·997052	99323	18·811	
	Khedva, II	6 51 34	4·098394	12543	2·376	„
43	Kaináth, IV	97 13 10	5·017809	104186	19·732	„
	Ídar Hill Peak No. 1		5·008020	101864	19·292	
	Kaináth, IV	99 10 29	5·086139	121938	23·094	„
44	Devpura, VI	2 10 37	3·671351	4692	0·889	„
	Ídar Hill Peak No. 2		5·083150	121102	22·936	
				4		
	Devpura, VI	45 45 56	4·947059	88524	16·766	„
45	Vántra, VII	80 43 48	5·086139	121938	23·094	„
	Ídar Hill Peak No. 2		4·997052	99323	18·811	
	Kaináth, IV	6 48 9	4·577416	37793	7·158	„
46	Vántra, VII	9 54 24	4·739530	54895	10·397	„
	Sábli Hill Temple		4·962549	91738	17·375	
	Kaináth, IV	44 30 37	4·952541	89648	16·979	„
47	Devpura, VI	26 45 9	4·760145	57563	10·902	„
	Likhi Hill		5·083150	121102	22·936	
	Devpura, VI	63 2 51	4·878303	75562	14·311	„
48	Moráli, IX	43 25 55	4·765507	58278	11·038	„
	Pánpur Tree		4·910022	81287	15·395	
				0		
	Vántra, VII	66 17 45	4·878303	75562	14·311	„
49	Moráli, IX	31 38 27	4·636404	43292	8·199	„
	Pánpur Tree		4·912401	81734	15·480	
	Devpura, VI	8 43 42	4·640386	43690	8·275	„
50	Vántra, VII	11 27 8	4·757130	57165	10·827	„
	Pánpur House		4·997052	99323	18·811	
	Varsoda, X	1 50 25	4·480388	30227	5·725	„
51	Lakhváda, XIII	1 45 14	4·459514	28808	5·456	„
	Sádra Flag-staff		4·770893	59006	11·175	

January, 1892.

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ABU MERIDIONAL SERIES.

AZIMUTHS OF SURROUNDING STATIONS AND INTERSECTED POINTS AT PRINCIPAL STATIONS.

The following table contains, in the first column, the name of each Principal Station, at which azimuths of surrounding Points have been measured; immediately followed by those azimuths. The second column contains the number of the triangle which gives the distance between the Station and the Point.

Name of Station with Azimuths of surrounding Points	° ′ ″	No. of Triangle giving Distance
Ámliyára, XII		
Bárdoli, XIV	38 15 52·22	17
Rakhiál, XI	102 36 49·17	14
Moráli, IX	155 48 22·43	14
Bárdoli, XIV		
Mirzápur, XVI	42 15 12·39	19
Sonáda, XIX	104 47 0·74	18
Rakhiál, XI	174 59 42·09	17
Ámliyára, XII	218 12 52·07	17
Chaniána, III		
Gola Hill	168 20 42	22
Jairáj, XLIII	173 30 48·87	3
Dandarmál Hill Mark	234 32 6	21
Ghodi, I	257 25 53·97	3
Karnála Hill Math	264 58 22	23
Khilod Hill	308 33 16	29
Kárdo, V	311 36 55·10	6
Bhalgám Hill	330 20 17	28
Bhalgám Hill Temple	334 10 41	25
Devpura, VI		
Varsoda, X	12 37 33·44	11
Dhámanva, VIII	80 45 39·27	9
Kárdo, V	172 25 57·79	7
Táranga Temple No. 1	175 29 55	31
Hadol Hill Peak No. 1	179 59 50	35
Hadol Hill Peak No. 2	180 7 9	36

Name of Station with Azimuths of surrounding Points	° ′ ″	No. of Triangle giving Distance
Devpura, VI—(*Continued.*)		
Mahiváda Hill Peak	196 8 35	37
Kaináth, IV	212 36 4·67	7
Ídar Hill Peak No. 2	214 46 42	44
Ídar Hill Temple	216 25 31	41
Likhi Hill	239 21 14	47
Pánpur Tree	250 9 52	48
Pánpur House	251 48 56	50
Vántra, VII	260 32 37·75	8
Moráli, IX	313 12 42·98	10
Dhámanva, VIII		
Kárdo, V	205 23 38·30	9
Devpura, VI	260 39 10·83	9
Varsoda, X	298 23 57·50	12
Ghodi, I		
Táranga Temple No. 2	15 21 18	33
Táranga Temple No. 1	16 42 57	32
Kárdo, V	19 59 26·27	5
Khilod Hill	34 5 7	29
Bhalgám Hill	51 4 8	27
Bhalgám Hill Temple	52 29 1	25
Karnála Hill Math	75 2 52	23
Chaniána, III	77 32 42·02	3
Dandarmál Hill Mark	92 53 53	20
Jairáj, XLIII	130 56 0·07	1
Mád, XL	208 28 44·65	1
Khedva, II	280 33 22·06	2
Kaináth, IV	333 52 9·55	4

NOTES.—Stations Mirzápur, XVI and Sonáda, XIX appertain to the Gujarát Longitudinal Series. Stations Mád, XL and Jairáj, XLIII appertain to the Karáchi Longitudinal Series of the North-West Quadrilateral.

Name of Station with Asimuths of surrounding Points	° ′ ″	No. of Triangle giving Distance
Jairáj, XLIII		
Mád, XL	271 50 2·18	1
Ghodi, I	310 48 13·23	1
Chaniána, III	353 29 52·58	3
Kaináth, IV		
Devpura, VI	32 40 47·41	7
Ora Hill Peak	78 42 58	40
Umedpura Hill Peak	95 55 34	39
Mahíváda Hill Peak	105 3 8	38
Kárdo, V	112 42 12·08	5
Táranga Temple No. 2	116 58 30	34
Táranga Temple No. 1	118 25 46	31
Mandongri Hill Peak	150 18 8	24
Ghodi, I	153 56 11·38	4
Khedva, II	200 13 42·97	4
Ídar Hill Peak No. 2	293 30 18	44
Ídar Hill Peak No. 1	297 26 53	43
Sábli Hill Temple	332 22 36	46
Vántra, VII	339 10 44·79	8
Likhi Hill	348 10 10	47
Kárdo, V		
Dhámanva, VIII	25 28 50·78	9
Bhalgám Hill Temple	113 37 23	26
Bhalgám Hill	114 53 54	27
Chaniána, III	131 41 37·41	6
Gola Hill	135 36 47	22
Khilod Hill	141 13 30	30
Dandarmál Hill Mark	158 50 33	20
Ghodi, I	199 57 22·09	5
Táranga Temple No. 2	245 49 17	33
Hadol Hill Peak No. 1	270 20 56	35
Hadol Hill Peak No. 2	271 20 23	36
Ídar Hill Temple	291 22 7	41
Kaináth, IV	292 36 7·84	5
Mahíváda Hill Peak	297 14 12	37
Ora Hill Peak	313 47 53	40
Umedpura Hill Peak	314 57 37	39
Devpura, VI	352 24 38·84	7
Khedva, II		
Ídar Hill Peak No. 1	13 24 44	43
Kaináth, IV	20 16 17·55	4
Mandongri Hill Peak	72 31 21	24
Ghodi, I	100 40 0·65	2
Mád, XL	157 0 56·82	2
Lakhváda, XIII		
Varsoda, X	197 3 42·00	15
Sádra Flag-staff	198 48 56	51
Rakhiál, XI	270 42 3·88	15
Sonáda, XIX	335 21 20·99	16

Name of Station with Asimuths of surrounding Points	° ′ ″	No. of Triangle giving Distance
Mád, XL		
Ghodi, I	28 32 11·67	1
Jairáj, XLIII	92 1 19·17	1
Khedva, II	336 57 43·23	2
Mirzápur, XVI		
Sonáda, XIX	154 36 50·89	19
Bárdoli, XIV	222 13 1·69	19
Moráli, IX		
Rakhiál, XI	16 22 30·21	13
Varsoda, X	89 4 30·65	11
Devpura, VI	133 16 56·65	10
Pánpur Tree	176 42 51	48
Vántra, VII	208 21 18·36	10
Ámliyára, XII	335 46 9·89	14
Rakhiál, XI		
Sonáda, XIX	43 44 29·32	16
Lakhváda, XIII	90 47 9·74	15
Varsoda, X	136 18 37·57	13
Moráli, IX	196 21 17·10	13
Ámliyára, XII	282 33 24·24	14
Bárdoli, XIV	354 59 18·04	17
Sonáda, XIX		
Lakhváda, XIII	155 23 1·07	16
Rakhiál, XI	223 41 4·42	16
Bárdoli, XIV	284 43 12·61	18
Mirzápur, XVI	334 35 14·01	19
Vántra, VII		
Moráli, IX	28 24 4·97	10
Devpura, VI	80 39 39·55	8
Pánpur House	92 6 48	50
Pánpur Tree	94 41 50	49
Kaináth, IV	159 13 5·96	8
Ídar Hill Peak No. 2	161 23 28	45
Ídar Hill Temple	164 23 0	42
Sábli Hill Temple	169 7 30	46
Varsoda, X		
Sádra Flag-staff	15 14 31	51
Lakhváda, XIII	17 4 55·66	15
Dhámanva, VIII	118 29 30·20	12
Devpura, VI	192 36 38·87	11
Moráli, IX	268 59 23·38	11
Rakhiál, XI	316 14 44·40	13

NOTES.—Stations Mád, XL and Jairáj, XLIII appertain to the Karáchi Longitudinal Series of the North-West Quadrilateral. Stations Mirzápur, XVI and Sonáda, XIX appertain to the Gujarát Longitudinal Series.

January, 1892.

J. ECCLES,
In charge Computing Office.

TRIANGLES.

No. of Triangle	Station		Corrected Plane Angle	Distance			Theodolite used
				Log. feet	Feet	Miles	
			° ′ ″				Inch
	Jairáj, XLIII		76 53 32	5·184041	152771	28·934	10
52	Bargaon, XLV		49 49 28	5·078640	119851	22·699	„
	Deesa Telegraph Office	s.	53 17 0	5·099465	125738	23·814	„
					4		
	Jairáj, XLIII		34 42 38	4·834792	68358	12·947	„
53	Birona, XLVI		93 16 38	5·078640	119851	22·699	„
	Deesa Telegraph Office	s.	52 0 44	4·975956	94614	17·919	„
	Jairáj, XLIII		77 22 58	5·179128	151053	28·608	„
54	Bargaon, XLV		48 17 43	5·062823	115564	21·887	„
	Deesa Hospital	s.	54 19 19	5·099465	125738	23·814	„
					0		
	Jairáj, XLIII		35 12 4	4·823585	66617	12·617	„
55	Birona, XLVI		89 50 34	5·062823	115564	21·887	„
	Deesa Hospital	s.	54 57 22	4·975956	94614	17·919	„
	Jairáj, XLIII		6 50 51	4·201532	15905	3·012	„
56	Deesa Telegraph Office	s.	57 6 17	5·049263	112012	21·214	„
	Mahádevi	„	116 2 52	5·078640	119851	22·699	„
					0		
	Jairáj, XLIII		7 20 17	4·175759	14989	2·839	„
57	Deesa Hospital	s.	72 38 56	5·049263	112012	21·214	„
	Mahádevi	„	100 0 47	5·062823	115564	21·887	„

AZIMUTHS.

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Bargaon, XLV			
Deesa Hospital	s.	6 29 7	54
Deesa Telegraph Office	„	8 0 52	52
Jairáj, XLIII		318 11 24·48	52
Birona, XLVI			
Deesa Hospital	s.	5 50 20	55
Deesa Telegraph Office	„	9 16 24	53
Jairáj, XLIII		275 59 46·22	53
Deesa Hospital s.			
Mahádevi	s.	168 8 16	57
Birona, XLVI		185 49 50	55
Bargaon, XLV		186 27 53	54
Jairáj, XLIII		240 47 12	54

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Deesa Telegraph Office s.			
Mahádevi	s.	184 10 2	56
Bargaon, XLV		187 59 19	52
Birona, XLVI		189 15 35	53
Jairáj, XLIII		241 16 19	52
Jairáj, XLIII			
Deesa Hospital	s.	60 54 43	54
Deesa Telegraph Office	„	61 24 9	52
Mahádevi	„	68 15 0	56
Birona, XLVI		96 6 47·32	53
Bargaon, XLV		138 17 41·26	52
Mahádevi s.			
Deesa Telegraph Office	s.	4 10 7	56
Jairáj, XLIII		248 7 15	56
Deesa Hospital	„	348 8 2	57

NOTE.—Stations Jairáj, XLIII, Bargaon, XLV and Birona, XLVI appertain to the Karáchi Longitudinal Series of the North-West Quadrilateral.

April, 1892.

J. ECCLES,
In charge Computing Office.

ABU MERIDIONAL SERIES.

CO-ORDINATES AND DESCRIPTIONS OF ALL STATIONS AND POINTS.

The following table gives the co-ordinates of all stations and other fixed points, arranged in alphabetical order, also the descriptions of the secondary and intersected (or unvisited) points, and references to the preceding pages where the descriptions of the principal stations are given.

NOTE.—Principal stations are followed by the Roman numerals I, II, &c., secondary stations by the letter s. The year or season in which a station or point was originally fixed is usually given after its description.

For visited stations and points of superior accuracy, the values of latitude and longitude are given to two places of decimals, for well determined objects to one place, and for the remaining points to the nearest second.

The Trigonometrical heights in general refer to the upper surface of the pillar or to the mark engraved on top of pillar, building, &c. In a few cases, where Trigonometrical heights do not exist, but values have been found on the Topographical Survey maps, these values have been reduced to the same terms as the Trigonometrical heights and enclosed in brackets, thus [1212]; the surface to which they refer may be assumed to be the ground level. In the column of heights, the upper numeral gives the height of the station above mean sea-level and the lower is that of the structure itself above ground level.

The numerals in the last column indicate the triangles given on pages 7—I. to 10—I. and 13—I., by which the station or point has been fixed; when these numerals are omitted it is to be understood that no triangles are given.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station / Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Ámliyára, XII	Mahi Kántha Agency	*Vide* page 5—I.	23 13 55·83	73 5 46·86	375 / 5	14
Bárdoli, XIV	Baroda State	*Vide* page 6—I.	23 4 58·28	72 58 8·71	303 / 22	17, 18
Bargaon, XLV*	Jodhpore State	On the highest point of a conspicuous, isolated hill, about ½ a mile S.W. of the town of Bargaon. The approximate azimuths and distances of the adjacent villages are:—Jaitpura 289°, miles 2; Matan 323°, miles 2½; and Bapla 347°, miles 5. It is marked by a circle and dot engraved on the naked rock; no pillar could be built. On revisiting the station in October 1875, no trace of the mark could be found; its position, however, was clearly indicated by the ruins of the platform, a portion of which fortunately had been built paka and was found in existence. The present mark was placed as near to the position of the former one as could be judged and is probably within a foot of the old one. 1850-51.	24 40 29·02	72 17 22·84	1809 / 0	52, 54

* Of the Karáchi Longitudinal Series of the North-West Quadrilateral.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Bhalgám Hill	Pálanpur Agency	About 1½ miles E.S.E. of Bhákri village on the left bank of the Sarasvati river, ½ a mile W. of Sendni village, and ¾ of a mile E. of Bhalgám Hill Temple: táluka Pálanpur. 1850-51.	24 0 28	72 38 35	[1212]	27, 28
Bhalgám Hill Temple ...	„	About ¾ of a mile S.E. by E. of Bhákri village on the Sarasvati river, 5½ miles S.E. by E. of Mahmadpur large village, and 6 miles W. of Sudasna village: táluka Pálanpur. 1850-51.	24 0 31·3	72 37 59·3	...	25, 26
Birona, XLVI*	„	On the summit of a gentle swell of ground, about 1 mile N.W. of Birona, 1½ miles S.W. of Virola, and 2½ miles E. of Vitoda village: pargana Deesa. It is marked by a pillar 9 feet high, with four mark-stones, one at bottom, the others 5, 8 and 9 feet respectively above it. When visited in October 1875, the upper mark-stone was found intact, and the pillar in good preservation. 1850-51.	24 26 38·64	72 15 31·69	$\frac{673}{9}$	53, 55
Chaniána, III	„	*Vide* page 4—I.	24 6 36·64	72 34 46·84	$\frac{953}{3·9}$	3
Dandarmál Hill Mark ...	„	On the highest part of the precipitous-topped hill of the same name, about 5 miles E. by S. of Dhánda village, and 5½ miles N.N.W. of Maria village on the Arjuni river: táluka Pálanpur. 1850-51.	24 10 29·26	72 40 42·97	[2547]	20, 21
Deesa Hospital s. ...	„	In the compound of the European Regimental Hospital, N. of the Meteorological Observatory. The azimuths and distances of the following are:—No. 1 pillar of observatory 25° 17′, feet 19½; E. corner of cook-room 104°, feet 206½; and gate 241°, feet 92½. It is marked by an isolated, circular pillar of paka masonry 2½ feet high and 2½ feet in diameter, with two mark-stones, one at foundation and the other at upper surface of the pillar, which is 6 inches below the ground level: the upper mark-stone is 4 feet 4½ inches below the barometer cistern and 20 feet distant from it at an azimuth of 25° 17′. 1875-76.	24 15 42·07	72 14 18·45	470	54, 55
Deesa Telegraph Office s. ...	„	In the northern portion of the Telegraph Office Compound. The azimuths and distances of the following are:—E. corner of the office building 44°, feet 111; No. 1 gate 158°, feet 207; and No. 2 gate 250°, feet 164. It is marked by a square isolated pillar of masonry with two mark-stones, one at bottom and the other on the surface of the pillar 2 feet above the first and 6 inches below the ground level. The Longitude station is 89 feet S. and 56 feet W. 1875-76.	24 15 30·23	72 13 32·64	443	52, 53
Devpura, VI	Baroda State	*Vide* page 4—I.	23 34 35·02	72 49 35·98	$\frac{459}{20}$	7
Dhámanva, VIII	„	*Vide* page 5—I.	23 32 8·41	72 33 24·00	$\frac{429}{32}$	9
Ghodi, I	Mahi Kántha Agency	*Vide* page 4—I.	24 9 59·83	72 51 24·66	$\frac{2817}{2·8}$	1
Gola Hill	Pálanpur Agency	Close E. of the village so called, about 3½ miles S.W. by S. of Dhánda village, and 5 miles N.E. by N. of Vadgám village: táluka Pálanpur. 1850-51.	24 8 22	72 34 23	[965]	22

* Of the Karáchi Longitudinal Series of the North-West Quadrilateral.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Hadol Hill Peak No. 1 ...	Mahi Kántha Agency	A prominent rock on the western of two peaks, about 7 furlongs W. by N. of the village of the same name ¼ a mile W. of the Sábarmati river, and 2 miles S.E. by E. of Táranga hill fort. This point is close N.W. of Hadol Hill Peak No. 2: táluka Hadol. 1850-51.	23 57 9	72 49 36	...	35
Hadol Hill Peak No. 2 ...	„	The higher and eastern of two peaks, close S.E. of Hadol Hill Peak No. 1: táluka Hadol. 1850-51.	23 57 6	72 49 39	...	36
Ídar Hill Peak No. 1 ...	„	About ½ a mile E.S.E. of the town so called, and the same distance S.S.W. of Gambhirpura village: táluka Ídar. 1850-51.	23 50 28	73 3 19	...	43
Ídar Hill Peak No. 2 ...	„	About ½ of a mile N.W. of the town so called, and 1 mile S. of Lembhoi village: táluka Ídar. 1850-51.	23 51 7	73 2 5	[1517]	44, 45
Ídar Hill Temple	„	On the most eastern peak of some hills, about ½ a mile N. of the town of the same name: táluka Ídar. 1850-51.	23 51 11·2	73 2 55·7	[1524]	41, 42
Jairáj, XLIII*	Sirohee State	*Vide* page 3—I.	24 24 59·77	72 32 29·86	$\frac{3575}{0}$	1, 8
Kainátth, IV	Mahi Kántha Agency	*Vide* page 4—I.	23 51 25·42	73 1 18·93	$\frac{1615}{2·9}$	4
Kárdo, V	Baroda State	*Vide* page 4—I.	23 57 10·29	72 46 20·06	$\frac{1214}{3·8}$	5, 6
Karnála Hill Math ...	Pálanpur Agency	About ¼ of a mile S.E. of the village of the same name, 2½ miles S.E. of Jalotra large village, and 4½ miles S.W. of Dandarmál hill: táluka Pálanpur. 1850-51.	24 6 57·1	72 39 1·3	[1002]	28
Khedva, II	Mahi Kántha Agency	*Vide* page 4—I.	24 7 12·30	73 7 39·15	$\frac{1045}{3}$	2
Khilod Hill	„	About ¼ mile and 4½ miles respectively N.W. by W. of the village so called and of the well known hill fort of Táranga: táluka Sudásna. 1850-51.	23 59 53	72 43 58	...	29, 30
Lakhváda, XIII	Baroda State	*Vide* page 5—I.	23 15 52·23	72 44 13·21	$\frac{298}{22}$	15
Likhi Hill	Mahi Kántha Agency	One of a number of peaks, about ¾ of a mile W.S.W. of the village so called, 3½ miles S. by W. of Bhadresar town, and 2¾ miles E. of the road leading from Ahmednagar to Ídar: táluka Ídur. 1850-51.	23 42 7	73 3 26	...	47
Mád, XL*	„	*Vide* page 3—I.	24 24 9·27	72 59 48·01	$\frac{3080}{4}$	1, 2

* Of the Karáchi Longitudinal Series of the North-West Quadrilateral.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Mahádevi s.	Pálanpur Agency	On the N. bank of the Western Banás river, 3 miles N. by E. of the Telegraph Office, about 1½ miles N.E. of Mahádevi village, and 200 yards S. of the telegraph line to Abu. The spot of the ground is known as Khimvala: táluka Pálanpur. The station is marked by a circular isolated pillar of paka masonry 2½ feet in diameter, with two mark-stones, one at foundation and the other 2½ feet above it flush with the ground level. It is protected by a paka pillar and covered as in the cases of principal stations. 1875-76.	24 18 7·40	72 13 45·14	474	56, 57
Mahíváda Hill Peak ...	Mahi Kántha Agency	About ¼ of a mile W. by N. of the village of Mahíváda, 7 miles N.E. by E. of Valásna large village on the right bank of the Sábarmati river, and 3¼ miles E.S.E. of Golváda large village: táluka Ídar. 1850-51.	23 52 54	72 55 22	...	37, 38
Mandongri Hill Peak ...	„	One of a group of hills, about 4¼ miles E.N.E. of Satlásna large village, 2 miles N. of Malna, and 3¼ miles E. of Ghantodi village, the two last named villages being on the right bank of the Sábarmati river: táluka Dánta. 1850-51.	24 3 14	72 53 58	[1790]	24
Mirzápur, XVI*	Ahmedabad	*Vide* page 6—I.	23 59 17·79	72 52 34·70	238/18	19
Moráli, IX	„	*Vide* page 5—I.	23 25 23·18	73 0 12·14	466/10	10
Ora Hill Peak	Mahi Kántha Agency	Close S. of the village so called, and about 5 miles E. by N. of Valásna large village on the right bank of the Sábarmati river: táluka Ídar. 1850-51.	23 50 8	72 54 19	...	40
Pánpur House	„	In the village of the same name, about 1¾ miles N.N.W. of Ahmednagar City on the left bank of the Háthmati river: táluka Ídar. 1850-51.	23 37 31·5	72 59 20·1	...	50
Pánpur Tree	„	On one of several mounds, about ¼ a mile N. by E. of the village of the same name, and 1¾ miles N. by W. of Ahmednagar City on the Háthmati river: táluka Ídar. 1850-51.	23 37 51	72 59 26	...	48, 49
Rakhiál, XI	„	*Vide* page 5—I.	23 15 42·94	72 57 7·61	347/22	13
Sábli Hill Temple	„	On a small hill, about ¼ of a mile S. of the large village of the same name, ¼ of a mile from the Ghuvái river, and 10½ miles E.N.E. of Ahmednagar City: táluka Ídar. 1850-51.	23 43 23·5	73 5 52·9	[779]	46
Sádra Flag-staff	„	At the Residency in the town of the same name, on the left bank of the Sábarmati river. 1850-51.	23 20 35·7	72 45 57·8	...	51
Sonáda, XIX*	Baroda State	*Vide* page 6—I.	23 7 19·89	72 48 27·32	250/†	16
Táranga Hill Mark ...	Mahi Kántha Agency	On the highest part of the precipitous-topped hill of the same name, about a mile due W. of the temple at the N. end of the well known Táranga fort: táluka Gadváda. 1850-51.	23 58 17·53	72 46 53·78	...	...

* Of the Gujarát Longitudinal Series.
† Not forthcoming.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Táranga Temple No. 1 ...	Mahi Kántha Agency	On a hill peak at the N. end of Táranga fort: táluka Gadváda. 1850-51.	23 58 15·0	72 47 34·3	...	31, 32
Táranga Temple No. 2 ...	„	On a hill peak at the southernmost point of Táranga fort: táluka Gadváda. 1850-51.	23 57 45·4	72 47 45·2	...	33, 34
Umedpura Hill Peak ...	„	About ¾ of a mile E. by N. of the village so called, and 3½ miles N.E. by N. of Valásna large village, both on the Sábarmati river, and 2½ miles S.S.W. of Golváda large village: táluka Idar. 1850-51.	23 52 21	72 51 35	[698]	39
Vántra, VII	„	*Vide* page 4—I.	23 37 15·71	73 7 9·60	$\frac{789}{2·9}$	8
Varsoda, X	„	*Vide* page 5—I.	23 25 11·13	72 47 19·10	$\frac{398}{25}$	11, 12

April, 1892.

J. ECCLES,
In charge Computing Office.

Discrepancies per mile in common side of triangles
Feet
2·7
1·5
7·9
2·6
2·9
1·5
0·8
13·5
0·5
1·0
7·6
7·3
0·5
2·3
...

DEGREE SHEET No. 28, *between Lats.* 28°—29° *and Longs.* 96°—97°.

Name or Designation of Station or Point	Description, State or District, and Season of Observation	Latitude N.	Longitude E. of Greenwich	Height in feet above mean sea level	No. of Rays determining		Discrepancies per mile in common side of triangles
					Position	Height	
		° ′ ″	° ′ ″				*Feet*
Mishmi Hills, No. 1 Peak ... ... [Dibrugarh Church S., Nári H.S., Saenga Ján Post S.]	About 10 miles E. by N. of Atini, and the same distance N.E. of Akaia village. 1876-77.	28 32 15	96 1 50	13730	3	2	2·7
Mishmi Hills, No. 2 Peak ... ... [Dibrugarh Church S., Dutia post s., Kerwa Post S.]	A little N.E. of No. 1 Peak. 1876-77.	32 18	1 53	...	3	...	1·5
Mishmi Hills, No. 3 Peak ... ... [Dutia post s., Dibrugarh Church S., Kerwa Post S., Nári H.S., Paba Post S.]	About 8 miles N.E. of Akaia village. 1876-77.	30 25	2 36	14050	5	2	7·9
Mishmi Hills, No. 4 Peak ... ... [Dibrugarh Church S., Nári H.S., Saenga Ján Post S.]	About 15 miles N.E. of Adupoia village. 1876-77.	32 8	9 52	15430	3	1	2·6
Mishmi Hills, No. 5 Peak ... ... [Dibrugarh Church S., Dutia post s., Mekhla Mukh Post S., Paba Post S.]	A little S.W. of No. 4 Peak. 1876-77.	32 3	9 48	15480	4	2	2·9
Mishmi Hills, No. 6 Peak ... ... [Dibrugarh Church S., Dutia post s., Kerwa Post S., Nári H.S., Sadiya Quarter Guard Post S., Saenga Ján Post S.]	On the main spur, about 15 miles N.E. of Adupoia village. 1876-77.	30 26	10 13	15670	6	2	1·5
Mishmi Hills, No. 7 Peak ... ... [Dibrugarh Church S., Kerwa Post S., Nári H.S.]	About 3 miles S. of No. 6 Peak. 1876-77.	27 36	10 7	14540	3	1	0·8
Mishmi Hills, No. 8 Peak ... ... [Dibrugarh Church S., Kerwa Post S., Nári H.S.]	About 1½ miles S.W. of No. 7 Peak. 1876-77.	26 25	9 47	...	3	...	13·5
Mishmi Hills, No. 9 Peak ... ... [Mekhla Mukh Post S., Dibrugarh Church S., Saenga Ján Post S.]	Also called Inchengoma, about 25 miles E. of Adupoia village. 1876-77.	22 48	21 29	15210	3	1	0·5
Mishmi Hills, No. 10 Peak ... ... [Mekhla Mukh Post S., Paropora Post S., Sadiya Quarter Guard Post S.]	About 4½ miles S.W. of No. 9 Peak. 1876-77.	19 36	18 45	15040	3	1	1·0
Mishmi Hills, No. 11 Peak ... ... [Dibrugarh Church S., Dutia post s., Nári H.S., Paropora Post S., Sadiya Quarter Guard Post S.]	Also called Sapuja or Sajuba Peak, on a spur at the head of the Dikrang river, about 13 miles E. of Nizam Ghát, and 12 miles N. by W. of Bishemnagar old City and Tea Gardén. 1876-77.	13 16	0 21	11660	5	4	7·6
Mishmi Hills, No. 12 Peak ... ... [Dibrugarh Church S., Dutia post s., Líbong Post S., Paropora Post S., Sadiya Quarter Guard Post S., Saenga Ján Post S.]	About 15 miles N.E. of Bishemnagar old City and Tea Garden. 1876-77.	14 38	13 50	13200	6	1	7·3
Mishmi Hills, No. 13 Peak ... ... [Dibrugarh Church S., Líbong Post S., Sadiya Quarter Guard Post S.]	About a mile S.E. of No. 12 Peak. 1876-77.	14 13	14 56	13580	3	1	0·5
Mishmi Hills, No. 14 Peak ... ... [Dibrugarh Church S., Dutia post s., Paropora Post S., Sadiya Quarter Guard Post S., Saenga Ján Post S.]	About 2 miles S.E of No. 12 Peak. 1876-77.	13 39	15 33	13350	5	2	2·3
Mishmi Hills, No. 15 Peak ... ... [Paropora Post S., Sadiya Quarter Guard Post S.]	About 3 miles E. of No. 14 Peak. 1876-77.	13 54	18 48	13080	2	1	...
Mishmi Hills, No. 16 Peak ... ... [Paropora Post S., Sadiya Quarter Guard Post S.]	About 20 miles N.E. of Bishemnagar old City and Tea Garden. 1876-77.	10 31	19 23	...	2	...	...

DEGREE SHEET No. 28, *between Lats.* 28°—29° *and Longs.* 96°—97°, (Continued).

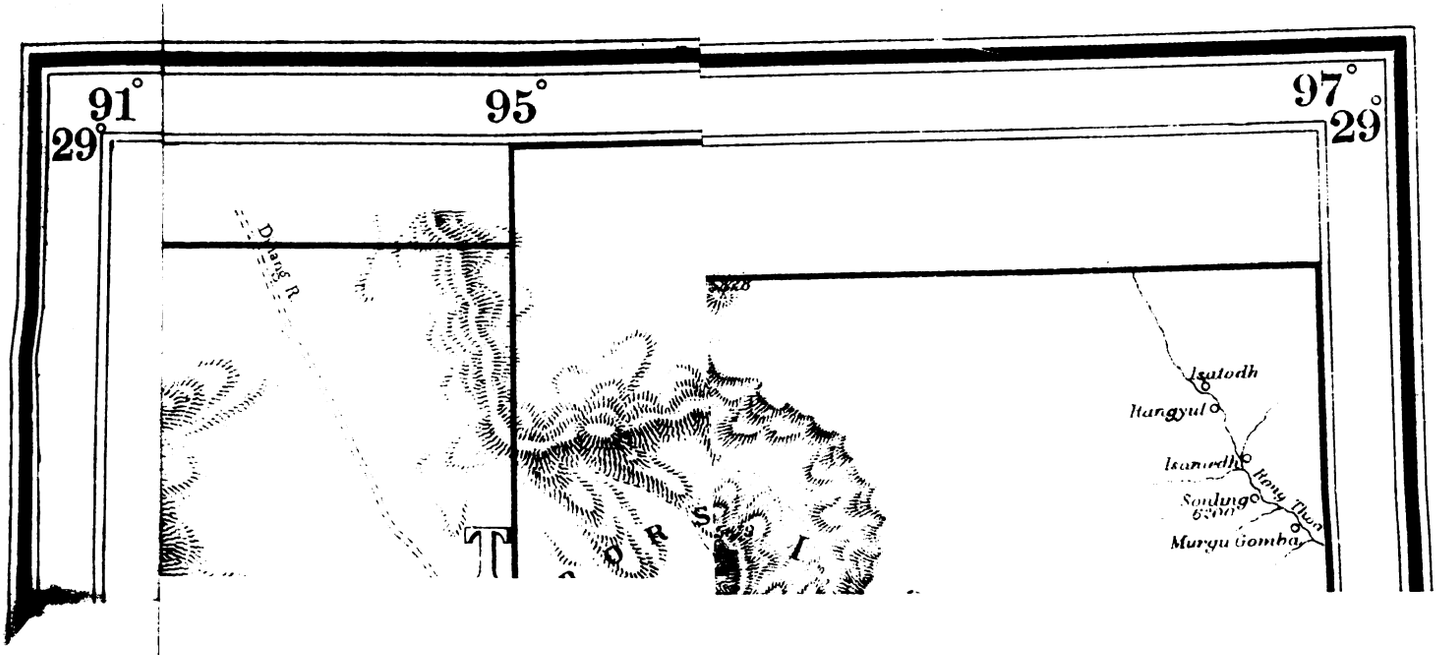
Name or Designation of Station or Point	Description, State or District, and Season of Observation	Latitude N.	Longitude E. of Greenwich	Height in feet above mean sea level	No. of Rays determining		Discrepancies per mile in common side of triangles
					Position	Height	
		° ′ ″	° ′ ″				*Feet*
Mishmi Hills, No. 17 Peak ... ... [Paropora Post S., Sadiya Quarter Guard Post S.]	A little S.E. of No. 16 Peak. 1876-77.	28 10 23	96 19 41	...	2	...	...
Mishmi Hills, No. 18 Peak ... ... [Mánábum h.s., Sadiya Quarter Guard Post S.]	About 14 miles N.E. of Bishemnagar old City and Tea Garden. 1877-78.	9 25	15 11	...	2	...	...
Mishmi Hills, No. 19 Peak ... ... [Dibrugarh Church S., Paba Post S., Saenga Ján Post S.]	About 13 miles N.W. of Kapuling village. 1876-77.	8 35	20 13	11730	3	2	3·4
Mishmi Hills, No. 20 Peak ... ... [Dibrugarh Church S., Líbong Post S., Paba Post S., Saikua Post S.]	About 10½ miles N.N.W. of Kapuling village. 1876-77.	9 9	26 5	12660	4	2	6·2
Mishmi Hills, No. 21 Peak ... ... [Mánábum h.s., Sadiya Quarter Guard Post S.]	About 7 miles N.E. of Bishemnagar old City and Tea Garden. 1877-78.	5 6	9 44	...	2	...	...
Mishmi Hills, No. 22 Peak ... ... [Mánábum h.s., Sadiya Quarter Guard Post S.]	About 9 miles E. of Bishemnagar old City and Tea Garden. 1877-78.	3 42	12 42	...	2	...	...
Mishmi Hills, No. 23 Peak ... ... [Mánábum h.s., Sadiya Quarter Guard Post S.]	About 6 miles E. by S. of No. 22 Peak. 1877-78.	2 6	17 58	6970	2	1	...
Mishmi Hills, No. 24 Peak ... ... [Mánábum h.s., Sadiya Quarter Guard Post S.]	On the right bank of the Tidong stream, about 9½ miles N.W. of Ghalums village. 1877-78.	0 27	19 44	6810	2	1	...
Mishmi Hills, No. 25 Peak ... ... [Dibrugarh Church S., Nári H.S., Sadiya Quarter Guard Post S.]	On the left bank of the Tidong stream, about 7 miles N.W. of Kapuling village. 1876-77.	5 28	24 20	11720	3	2	1·1
Mishmi Hills, No. 26 Peak ... ... [Dibrugarh Church S., Líbong Post S.]	On the left bank of the Tidong stream, about 4½ miles N.W. by N. of Kapuling village. 1876-77.	3 32	26 12	10910	2	1	...
Mishmi Hills, No. 27 Peak ... ... [Dibrugarh Church S., Nári H.S.]	On a spur near the head of the Um stream, about 4 miles W.N.W. of Uddong village. 1876-77.	5 49	29 35	11780	2	1	...
Mishmi Hills, No. 28 Peak ... ... [Mánábum h.s., Sadiya Quarter Guard Post S.]	On a spur in the great bend of the Brahmaputra, about 2 miles S.E. of Krolung village, and the same distance S. by W. of Ghetong village. 1877-78.	1 50	33 48	9450	2	1	...
Mishmi Hills, No. 29 Peak ... ... [Mánábum h.s., Sadiya Quarter Guard Post S.]	About 1½ miles S.E. of No. 28 Peak. 1877-78.	0 51	34 35	10050	2	1	...
Mishmi Hills, No. 30 Peak ... ... [Sadiya Quarter Guard Post S., Saikua Post S.]	Close to and E. of No. 29 Peak. 1876-77.	0 53	34 47	...	2	...	...
Mishmi Hills, No. 31 Peak ... ... [Nári H.S., Siláni Mukh Post S.]	On the right bank of the Halli stream, about 5 miles E. of Malu Pulung village. 1876-77.	0 13	44 27	...	2	...	...
Mishmi Hills, No. 32 Peak ... ... [Siláni Mukh Post S., Nári H.S.]	About 4 miles N. of No. 31 Peak. 1876-77.	3 54	44 29	...	2	...	...

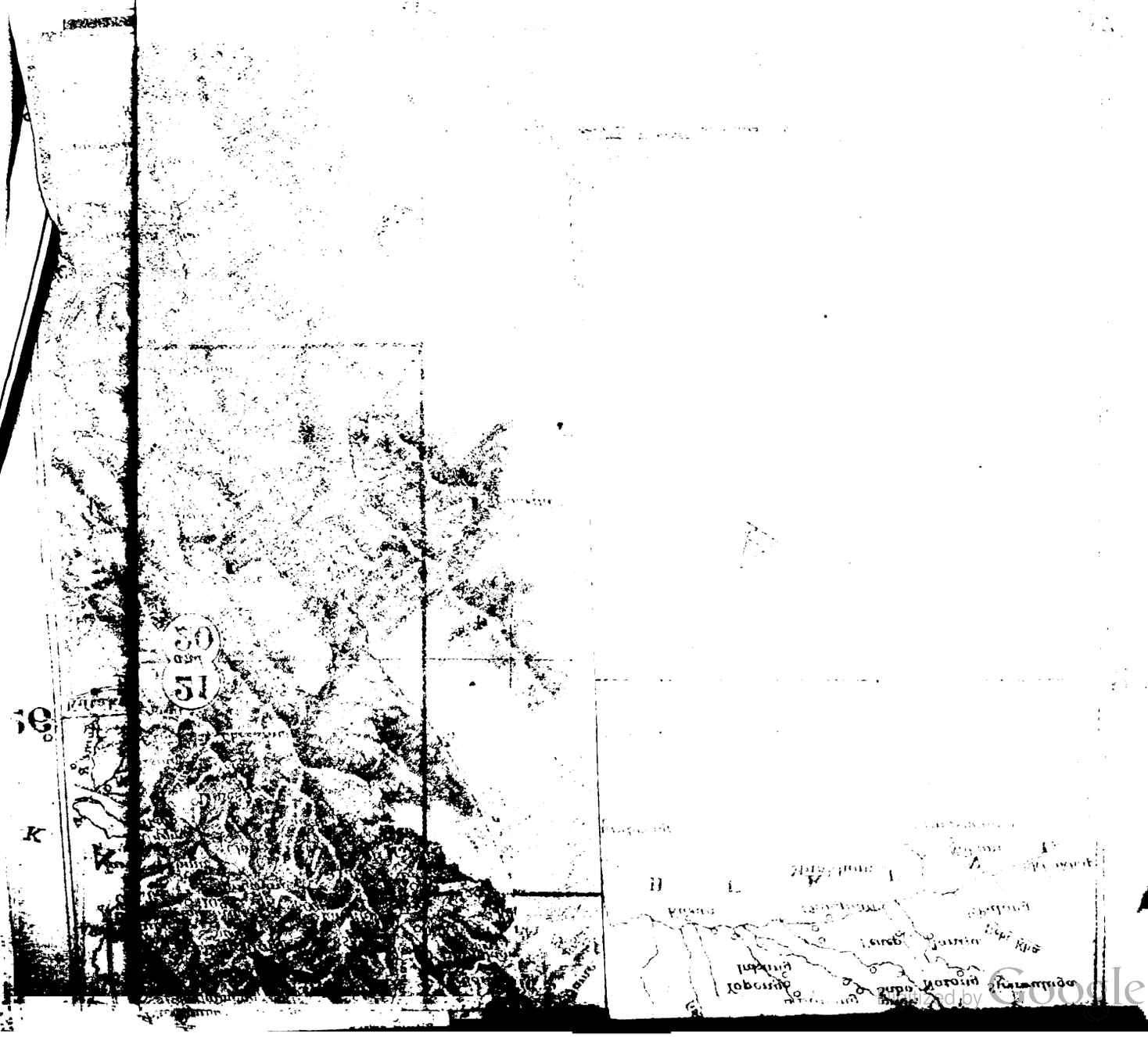
DEGREE SHEET No. 28, *between Lats.* 28°—29° *and Longs.* 96°—97°, (Continued).

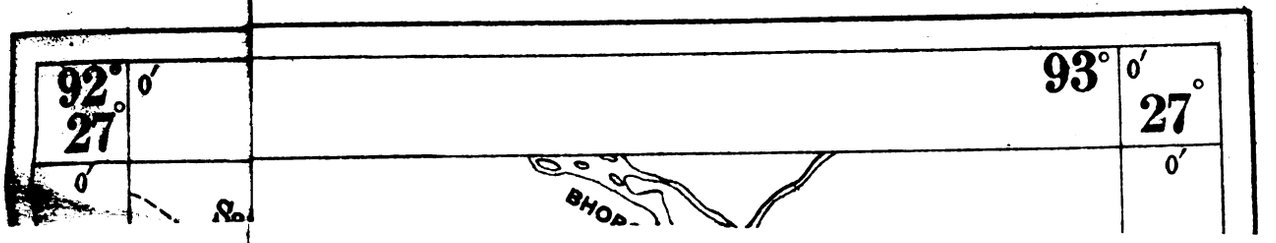
Name or Designation of Station or Point	Description, State or District, and Season of Observation	Latitude N.	Longitude E. of Greenwich	Height in feet above mean sea level	No. of Rays determining		Discrepancies per mile in common side of triangles
					Position	Height	
		° ′ ″	° ′ ″				*Feet*
Mishmi Hills, No. 33 Peak ... ... [Dibrugarh Church S., Líbong Post S., Nári H.S., Sadiya Quarter Guard Post S.]	About 7 miles N.E. of No. 32 Peak. 1876-77.	28 7 46	96 50 17	15220	4	2	7·1
Unexplored, No. 1 Peak ... ... [Dibrugarh Church S., Dutia post s., Kerwa Post S.]	In Zyul. 1876-77.	49 14	7 43	15090	3	1	3·5
Unexplored, No. 2 Peak ... ... [Dibrugarh Church S., Dutia post s., Kerwa Post S.]	In Zyul. 1876-77.	49 7	7 49	15030	3	2	0·9
Unexplored, No. 3 Peak ... ... [Dibrugarh Church S., Kerwa Post S., Nári H.S., Saenga Ján Post S.]	In Zyul. 1876-77.	48 49	9 1	15320	4	2	2·7
Unexplored, No. 4 Peak ... ... [Dibrugarh Church S., Kerwa Post S., Nári H.S.]	In Zyul. 1876-77.	48 49	9 26	...	3	...	9·4

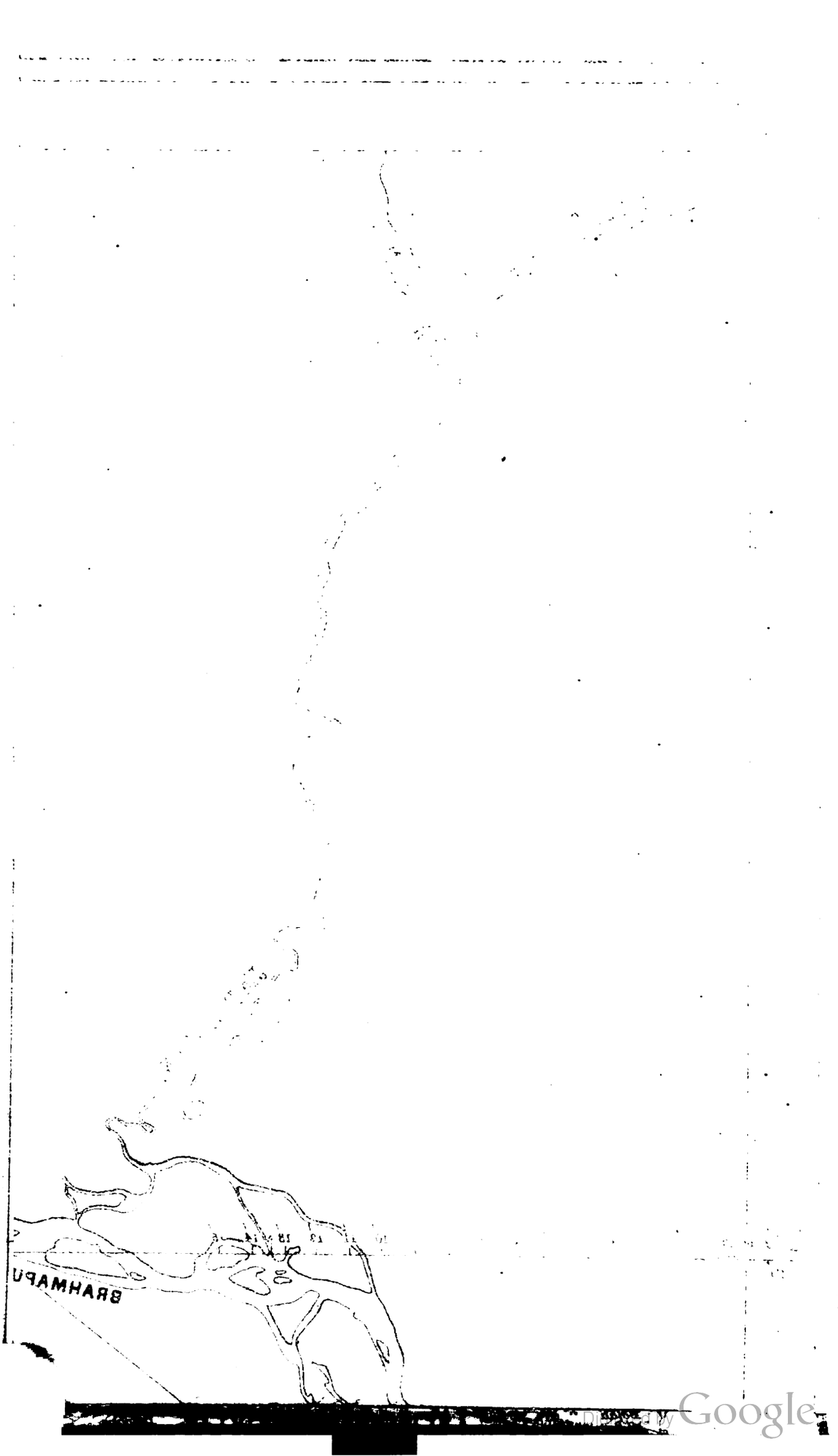
July, 1891.

J. ECCLES,
In charge of Computing Office.









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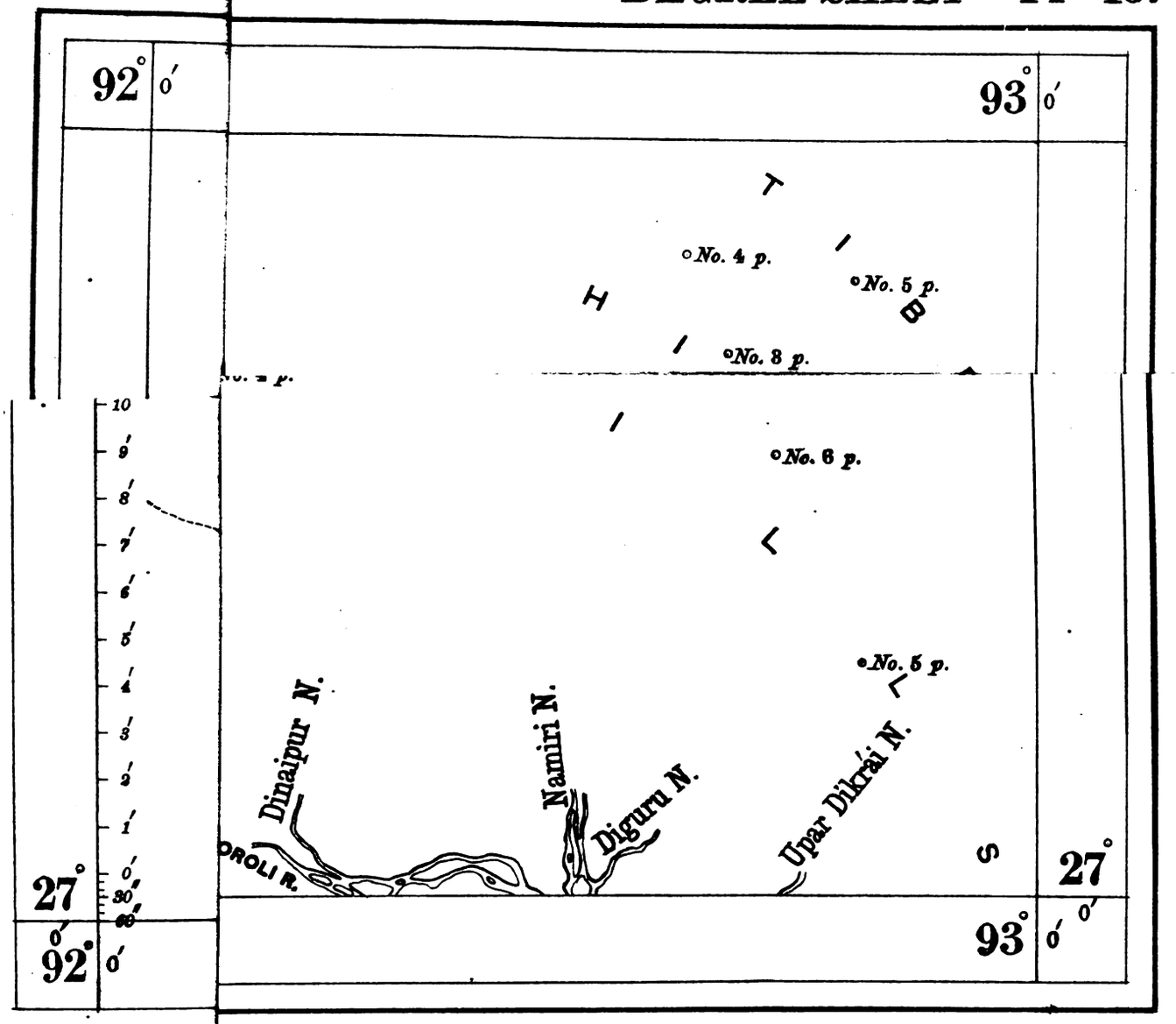

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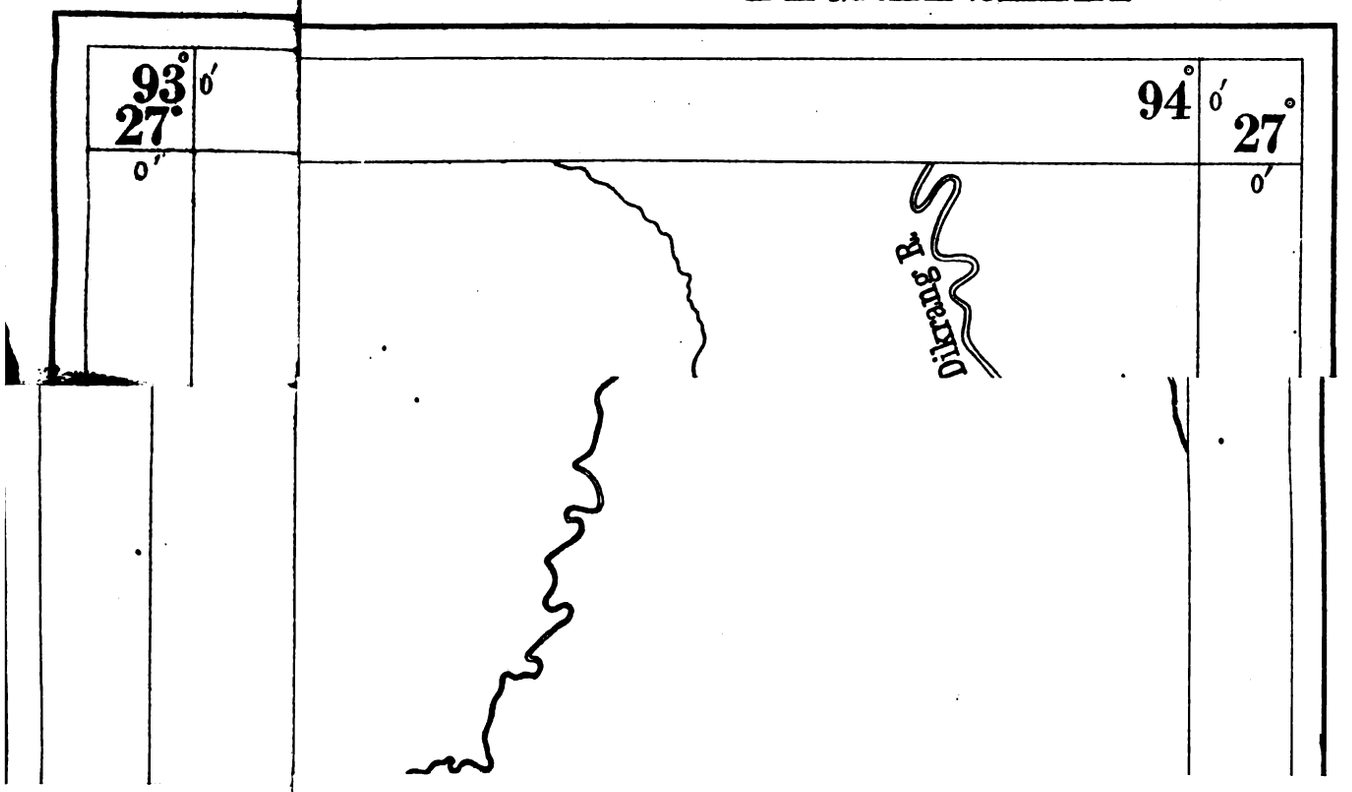
DEGREE SHEET 16 –17.



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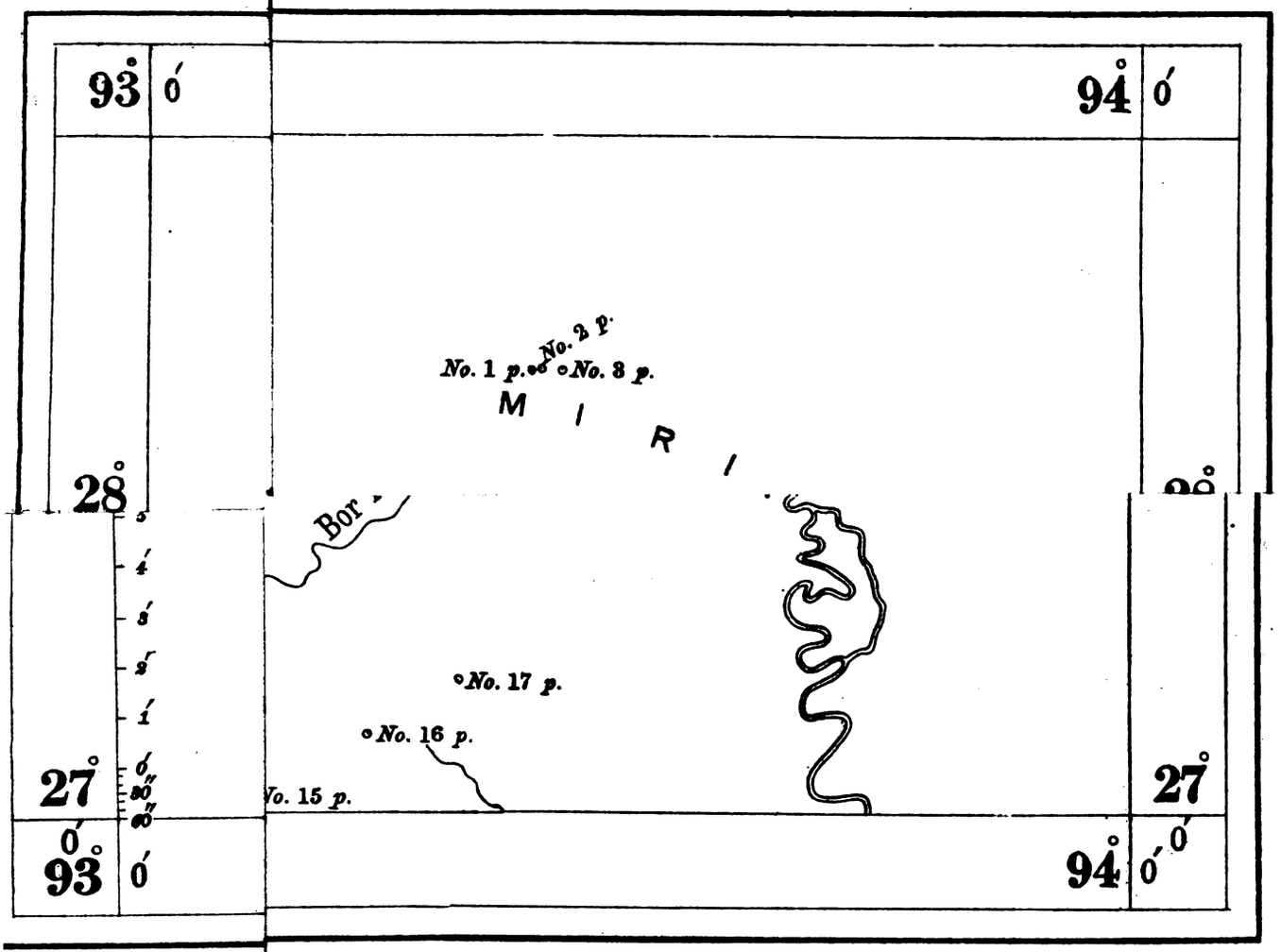


Photozincographed at the Trigonometrical Branch, Survey of India Office, Dehra Dún.

94° 0′
27°

95° 0′ 27°

15′ 14′ 13′ 12′ 11′ 10′ 9′ 8′ 7′ 6′ 5′ 4′ 3′ 2′ 1′ 0′

30″ 60″

TION OF SYMBOLS USED ON THIS CHART.

Signifies Station (Principal, in the plains)
" Do. (Secondary, in the plains)
" Tower Station (Principal)
" Building
" Bungalow
" Hill Peak
" House
" Temple
" Eastern
" Western
" Peak
" River

No. 3 p.

Scale 1 Inch = 4 Miles or $\frac{1}{253440}$

0 10 Miles

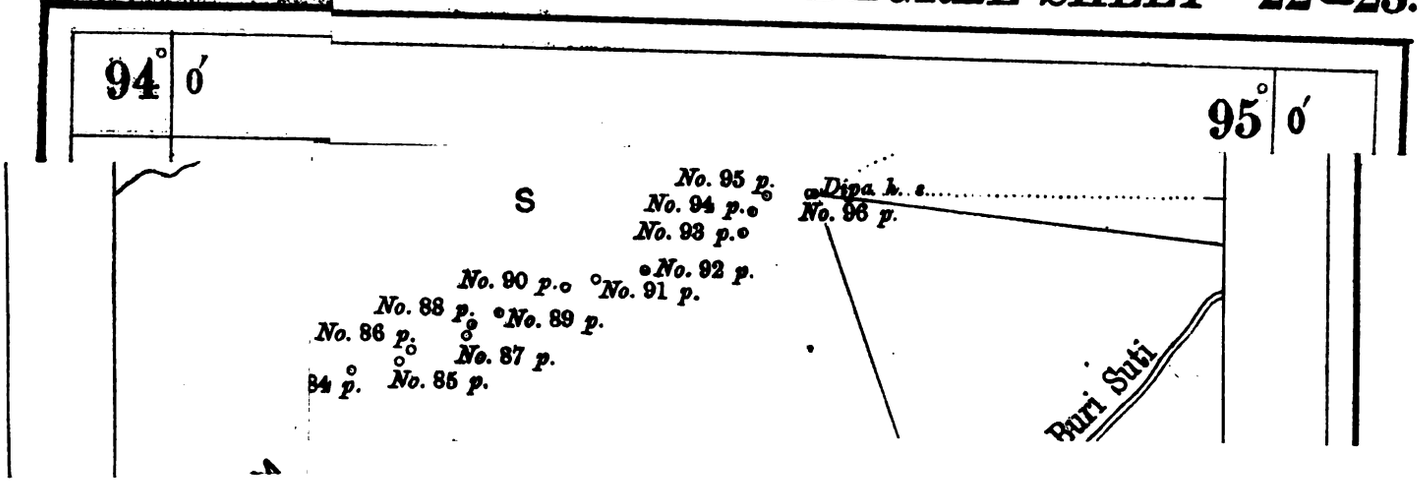
25°

25°

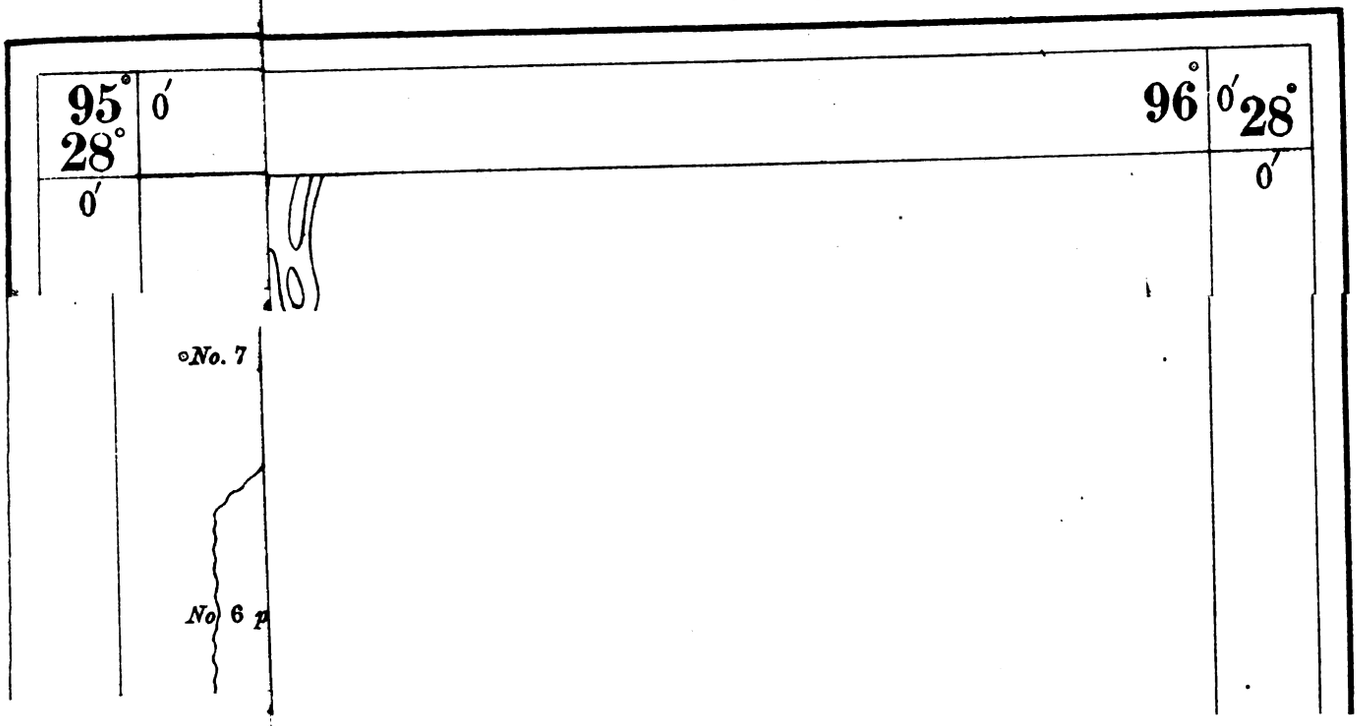
30′
94° 0

95° 0′ 30′

Photozincographed at the Trigonometrical Branch, Survey of India, Office Dehra Dún,



DEGREE SHEET 24—25.



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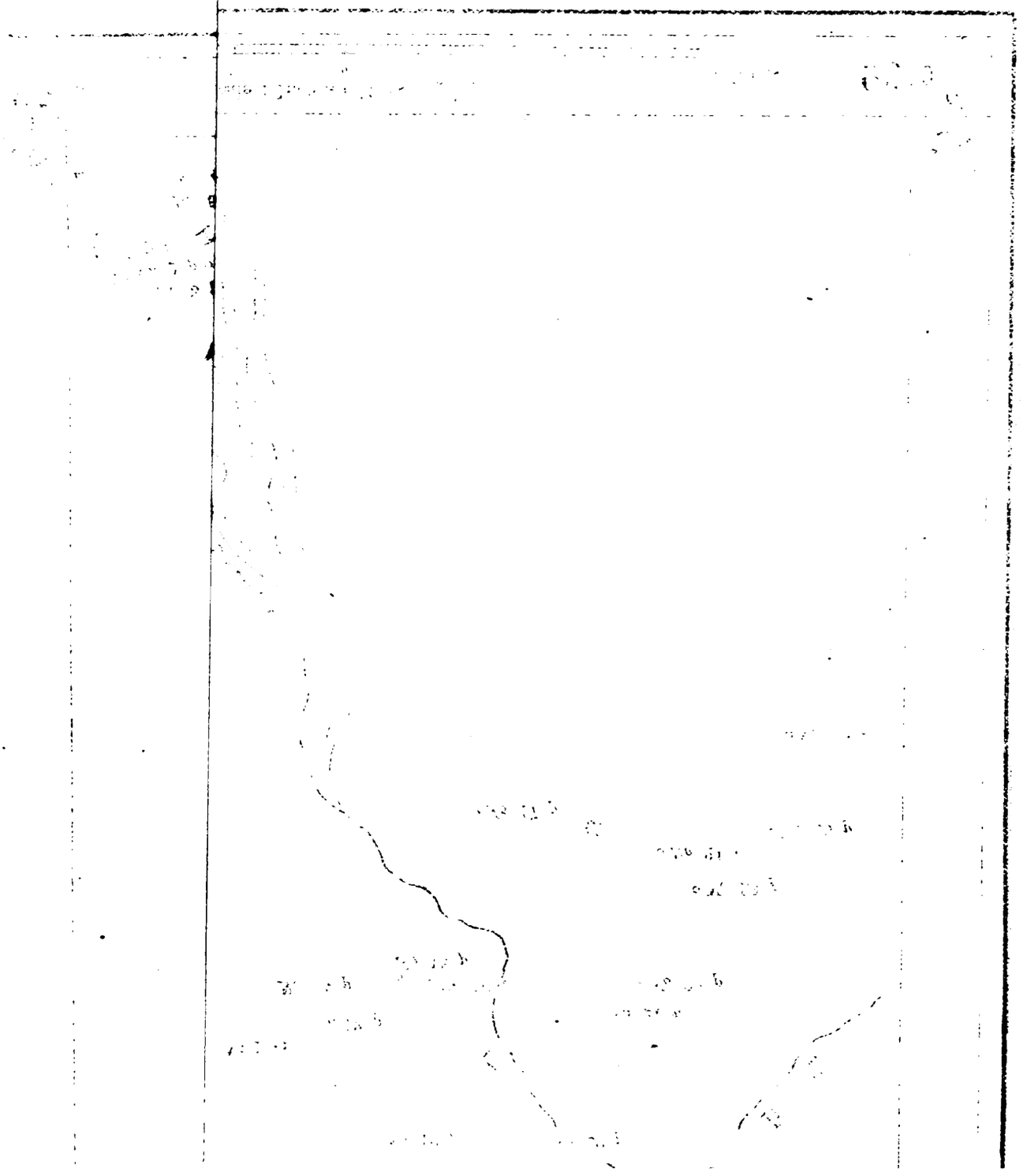

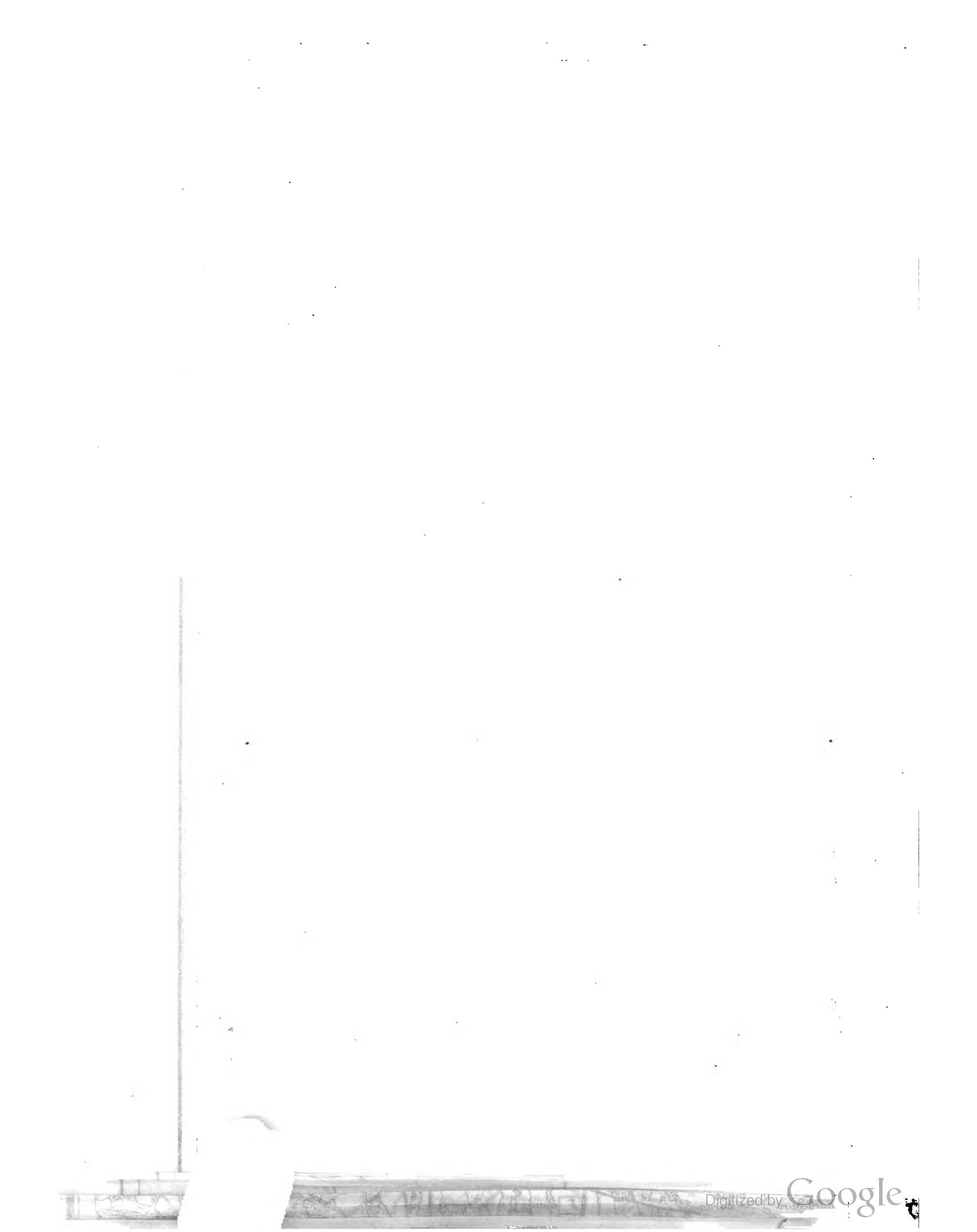

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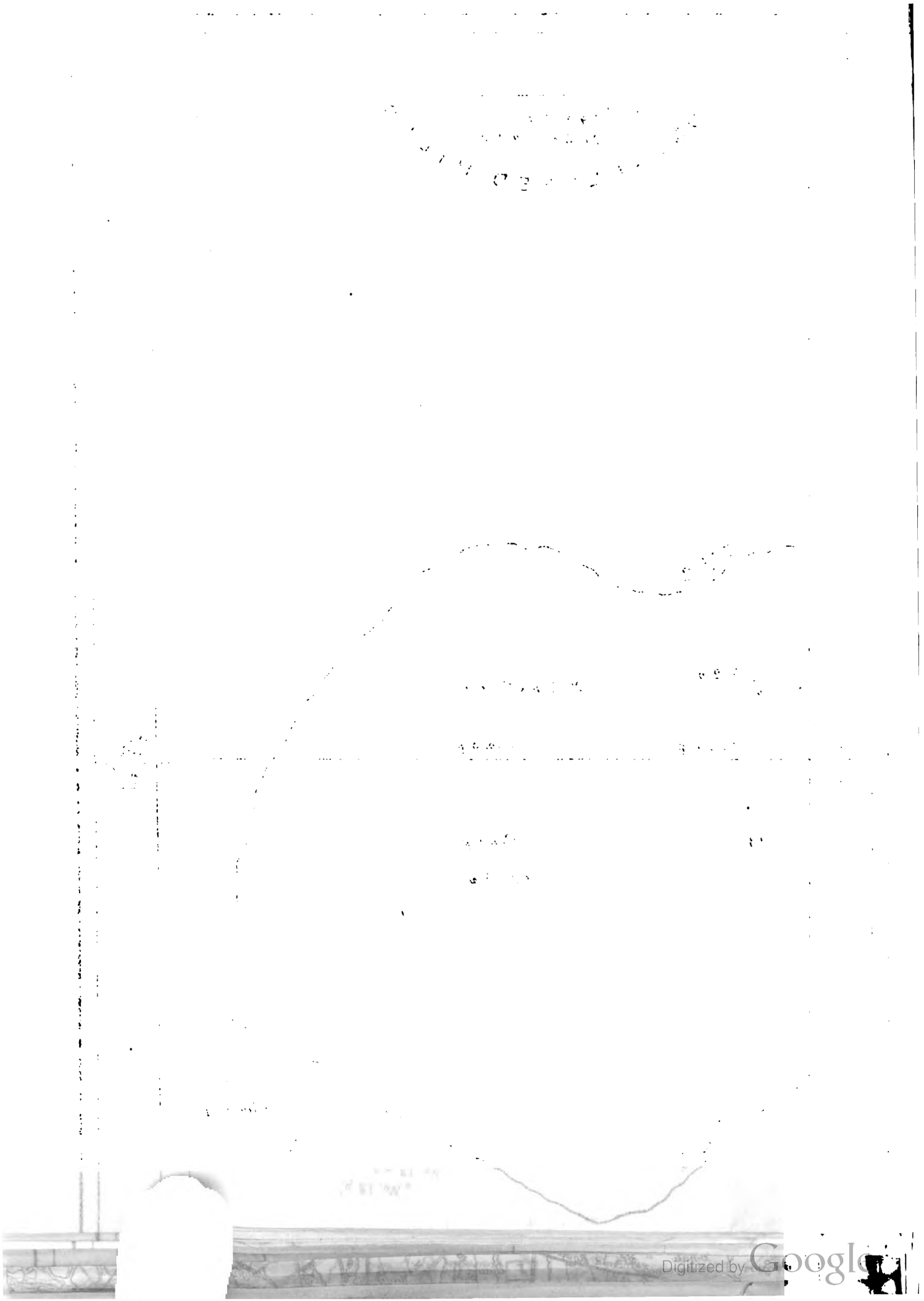

List of Published Works of the Great Trigonometrical Survey of India.

An Account of the Measurement of an Arc of the meridian between the parallels of 18° 3′ and 24° 7′, being a continuation of the Grand Meridional Arc of India as detailed by the late Lieutenant-Colonel Lambton in the Volumes of the Asiatic Society of Calcutta. By Captain George Everest, of the Bengal Artillery, F.R.S., &c. London, 1830. (*Out of print*).

An Account of the Measurement of two Sections of the Meridional Arc of India, bounded by the parallels 18° 3′ 5″; 24° 7′ 11″; and 29° 30′ 18″. By Lieutenant-Colonel Everest, F.R.S., &c., late Surveyor General of India, and his Assistants. London, 1847. (*Out of print*).

Account of the Operations of the Great Trigonometrical Survey of India.

Price Rupees 10-8 per volume.

Volume I. The Standards of Measure and the Base-Lines, also an Introductory Account of the early Operations of the Survey, during the period of 1800-1830. By Colonel J. T. Walker, R.E., F.R.S., &c., &c., Superintendent of the Survey. Dehra Dún, 1870.

Do. II. History and General Description of the Principal Triangulation and of its Reduction. By Colonel J. T. Walker, C.B., R.E., F.R.S., &c., &c., Surveyor General of India and Superintendent of the Survey, and his Assistants. Dehra Dún, 1879.

Do. III. The Principal Triangulation, the Base-Line Figures, the Karáchi Longitudinal, N.W. Himalaya, and the Great Indus Series of the North-West Quadrilateral. By Colonel J. T. Walker, R.E., F.R.S., &c., &c., Superintendent of the Survey, and his Assistants. Dehra Dún, 1873.

Do. IV. The Principal Triangulation, the Great Arc (Section 24°-30°), Rahún, Gurhágarh and Jogí-Tíla Meridional Series, and the Sutlej Series of the North-West Quadrilateral. By Colonel J. T. Walker, R.E., F.R.S., &c., &c., Superintendent of the Survey, and his Assistants. Dehra Dún, 1876.

Do. IVA. The Principal Triangulation of the North-West Quadrilateral, including the Reduction and Details of the Jodhpore and Eastern Sind Meridional Series. Prepared in the Office of the Trigonometrical Branch, Survey of India, Colonel C. T. Haig, R.E., Offg. Deputy Surveyor General, in charge, and published under the orders of Colonel G. C. DePrée, S.C., Surveyor General of India. Dehra Dún, 1886.

Do. V. Details of the Pendulum Operations by Captains J. P. Basevi, R. E., and W. J. Heaviside, R.E., and of their Reduction. Prepared under the directions of Major-General J. T. Walker, C.B., R.E., F.R.S., &c., &c., Surveyor General of India and Superintendent of the Trigonometrical Survey. Dehra Dún and Calcutta, 1879.

Do. VI.* The Principal Triangulation of the South-East Quadrilateral, including the Great Arc—Section 18° to 24°, the East Coast Series, the Calcutta and the Bider Longitudinal Series, the Jabalpur and the Biláspur Meridional Series, and the Details of their Simultaneous Reduction. Prepared under the directions of Major-General J. T. Walker, C.B., R.E., F.R.S., &c., &c., Surveyor General of India and Superintendent of the Trigonometrical Survey. Dehra Dún, 1880.

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* No copies available at the Trigonometrical Branch Office, Dehra Dún.

List of Published Works of the Great Trigonometrical Survey of India.

Account of the Operations of the Great Trigonometrical Survey of India—(*Continued*).

Volume VII. General Description of the Principal Triangulation of the North-East Quadrilateral, including the Simultaneous Reduction and the Details of five of the component Series, the North-East Longitudinal, the Budhon Meridional, the Rangír Meridional, the Amua Meridional, and the Karára Meridional. Prepared under the directions of Lieutenant-General J. T. Walker, C.B., R.E., F.R.S., &c., &c., Surveyor General of India and Superintendent of the Trigonometrical Survey. Dehra Dún, 1882.

Do. VIII. Details of the Principal Triangulation of eleven of the component Series of the North-East Quadrilateral, including the following Series; the Gurwáni Meridional, the Gora Meridional, the Huríláong Meridional, the Chendwár Meridional, the North Párasnáth Meridional, the North Malúncha Meridional, the Calcutta Meridional, the East Calcutta Longitudinal, the Brahmaputra Meridional, the Eastern Frontier—Section 23° to 26°, and the Assam Longitudinal. Prepared under the directions of Lieut.-General J. T. Walker, C.B., R.E., F.R.S., &c., &c., Surveyor General of India and Superintendent of the Trigonometrical Survey. Dehra Dún, 1882.

Do. IX. Electro-Telegraphic Longitude Operations executed during the years 1875-77 and 1880-81, by Lieut.-Colonel W. M. Campbell, R.E., and Major W. J. Heaviside, R.E. Prepared under the directions of Lieut.-General J. T. Walker, C.B., R.E., F.R.S., &c., &c., Surveyor General of India and Superintendent of the Trigonometrical Survey. Dehra Dún, 1883.

Do. X. Electro-Telegraphic Longitude Operations executed during the years 1881-82, 1882-83 and 1883-84, by Major G. Strahan, R.E., and Major W. J. Heaviside, R.E. Prepared under the directions of Colonel C. T. Haig, R.E., Deputy Surveyor General, Trigonometrical Branch, and published under the orders of Lieut.-Colonel H. R. Thuillier, R.E., Surveyor General of India. Dehra Dún, 1887.

Do. XI. Astronomical Observations for Latitude made during the period 1805 to 1885, with a General Description of the Operations and Final Results. Prepared under the directions of Lieut.-Colonel G. Strahan, R.E., Deputy Surveyor General, Trigonometrical Branch, and published under the orders of Colonel H. R. Thuillier, R.E., Surveyor General of India. Dehra Dún, 1890.

Do. XII. General Description of the Principal Triangulation of the Southern Trigon, including the Simultaneous Reduction and the Details of two of the component Series, the Great Arc Meridional—Section 8° to 18°, and the Bombay Longitudinal. Prepared under the directions of Lieut.-Colonel G. Strahan, R.E., Deputy Surveyor General, Trigonometrical Branch, and published under the orders of Colonel H. R. Thuillier, R.E., Surveyor General of India. Dehra Dún, 1890.

Do. XIII. Details of the Principal Triangulation of five of the component Series of the Southern Trigon, including the following Series; the South Konkan Coast, the Mangalore Meridional, the Madras Meridional and Coast, the South-East Coast, and the Madras Longitudinal. Prepared under the directions of Lieut.-Colonel G. Strahan, R.E., Deputy Surveyor General, Trigonometrical Branch, and published under the orders of Colonel H. R. Thuillier, R.E., Surveyor General of India. Dehra Dún, 1890.

Do. XIV. General Description of the Principal Triangulation of the South-West Quadrilateral, including the Simultaneous Reduction and the Details of its component Series. Prepared under the directions of W. H. Cole, Esq., M.A., Offg. Deputy Surveyor General, Trigonometrical Branch, and published under the orders of Colonel H. R. Thuillier, R.E., Surveyor General of India. Dehra Dún, 1890.

GUZERAT LONGITUDINAL SERIES.

GUZERAT LONGITUDINAL SERIES.

INTRODUCTION.

The Guzerat (Gujarát) Longitudinal Series of the South-West Quadrilateral is the chain of Principal Triangles that follows the parallel of 23° from the meridian of 75° to that of 71°. It starts in the Vindhyáchal Mountain Range, some thirty miles west of Indore (Indor) and Mhow (Mau), traverses the plains of Gujarát by way of Ahmedabad (Amdávád), and ends in the Káthiáwár (Káthiávád) peninsula near the southern edge of the Ran of Cutch (Kachh). It emanates from Karsod–Indráwan, a side of the Khánpisura Meridional Series, and it closes 260 miles to the westward on the side Chalarwa–Sápakra of the Kattywar (Káthiávád) Meridional Series. In longitude 73° 50′ it is cut at right angles by the Singi Meridional Series, and in longitude 72° 50′ it is met from the north, but not crossed, by the Abu Meridional Series, the side of junction being Sanoda–Mirzápur.

At the junction of the Guzerat Longitudinal and the Singi Meridional Series is situated the Kágarol compound figure: this figure has been allotted to the latter series, and the stations have been numbered accordingly; but in order to avoid a hiatus, the figure and all details connected with it are included in this Series. A pentagon round the station of Wastrál has been constructed where the Abu Meridional Series meets the Guzerat: it has been apportioned to the latter. A pentagon, with one central angle wanting, exists on the Guzerat Longitudinal Series in longitude 74° 40′ round the station of Mehwása: its existence was unintentional and was due to an unsuccessful attempt to make Indráwan–Gumánpur the side of junction of the Khánpisura and Guzerat Series. With the exception of the Kágarol compound figure and the Wastrál and Mehwása pentagons, the Series under review consists of single triangles throughout, thirty-one in number.

The Guzerat Longitudinal Series was designed in 1850, in conjunction with the Abu Meridional Series, for the purpose of affording a trigonometrical basis for the topographical surveys of Gujarát and the Káthiáwár peninsula, countries not then incorporated in the Indian Atlas.

During the summer of 1850 the Bombay Triangulation Party, then located at Neemuch (Nimach) under Lieutenant Harry Rivers of the Bombay Engineers, received orders to discontinue their work on the Gurhágarh Meridional Series, and were directed instead to carry a series down the meridian of Mount Abu and on reaching Ahmedabad to change its

direction and follow the parallel of 23° both to the east and west. Captain A. Strange had by this time carried the principal work of the Karáchi Longitudinal Series from Sironj to within a few miles of Mount Abu and the approximate work some 40 miles to the westward beyond, and Lieutenant Rivers had to select a base from the latter.

During the Field Season of 1850-51 the approximate work of the Abu Meridional Series was completed as far south as the stations of Lakwára, Rakhiál and Amalyára, and several of the final angles had been observed, but nothing was done on the Guzerat Longitudinal Series. South of the side Kárdo–Kainâth of the Abu Series, the country had proved very difficult and unsuitable for triangulation: it was absolutely flat and covered with trees, and towers had to be built at all the stations: many delays were encountered in clearing the rays and every line required a distinct ray-trace survey. If Rivers could have seen this country before commencing work he would have recommended the adoption of a chain of single triangles for the Abu Series instead of polygons, but now that he was on the ground it was too late to get his instructions changed. He asked leave, however, to make the Guzerat Longitudinal into a single series, and to this the Surveyor General assented: as high towers were required at all the stations and great numbers of valuable fruit trees had to be cut down on every ray, a double series would undoubtedly have entailed enormous additional expenditure.

Season 1851-52.

PERSONNEL.

Lieutenant H. Rivers, Bombay Engineers, 1st Assistant.
Lieutenant D. J. Nasmyth, Bombay Engineers, 2nd Assistant.
Mr. T. Sanger, Senior Sub-Assistant.
„ J. DaCosta, Sub-Assistant.
„ J. W. Rossenrode, Ditto.
„ J. McGill, Ditto.

The Bombay Party passed the summer of 1851 at Ahmedabad. Towards the end of the rainy season the native portion suffered so much from fever, that they were not in a fit state to take the field before November. During October, however, Rivers himself succeeded in selecting a few stations of the Guzerat Longitudinal Series in the vicinity of Ahmedabad. In November he regularly took up its approximate work, working westwards from the meridian of 72½° along the parallel of 23°. Messrs. Sanger and DaCosta were left behind on the Abu Series clearing the rays. They were the only two assistants with the party available for work, Mr. McGill having only lately joined the survey; but as the nature of the country was such that every line required a ray-trace survey and numerous fruit trees of great value had to be cut, Rivers considered it advisable to place them both on this duty. Rivers returned to the Abu Series on December 15th, in the hopes of finding sufficient rays cleared to allow him to commence the observations of the final angles, but he was disappointed as only a few were ready.

On December 22nd he went to Sanoda, as being the station at which the Abu Meridional and the Guzerat Longitudinal Series meet, and observed δ Ursæ Minoris for azimuth. He was joined here on December 29th by Lieutenant D. Nasmyth, a young officer of the Bombay Engineers, who had been appointed to the Great Trigonometrical Survey of India a few weeks previously. Towards the beginning of January Rivers proceeded to the head of the Gulf of Cambay (Khambhat) to make arrangements for connecting the heights

of the stations of the Guzerat Longitudinal Series and thence those of the Abu Meridional and Karáchi Longitudinal Series with mean sea level. His plan was to erect a tidal station near the mouth of the Sábarmati river and to then connect it by levelling with the nearest principal station of the Guzerat Longitudinal Series: he afterwards found, however, that such operations would occupy him entirely to the exclusion of trigonometrical work; as too he had much difficulty in obtaining a level capable of such accurate observations as were required, he abandoned the enterprise, and substituted for his line of levels a minor series of triangulation, the approximate work of which Mr. DaCosta proceeded to take up. This latter series is known as the Sábarmati Minor Series; it appertains to the principal Series under review, and is described in detail at the end of this Introduction.

On Rivers's return from Cambay he took up the final angles of the Abu Series; and during February he succeeded in completing the observations at all the stations with the exception of Siniána. In December he observed for azimuth at Sanoda station to δ Ursæ Minoris. He then took up the principal work of the Guzerat Longitudinal Series, commencing in longitude 72° 50′ and working westwards: the stations of Jhinjhar, Bhagwánji and Rundan had not yet been selected and were therefore not now observed from Mirzápur, Wastrál or Pálri. It would in fact appear that the Wastrál pentagon as afterwards constructed by Nasmyth was foreign to the original intention of Rivers, who probably purposed to extend the Guzerat Longitudinal Series eastward from the side Bárdoli–Mirzápur: this explanation too would account for the one single triangle, that exists on the Abu Series of hexagons. By the end of March Rivers had carried a principal Series of single triangles from Mirzápur and Sanoda as far west as the side Hasalpur–Kárigángar. In April he added two more stations, Por and Ingrori, and at the latter observed an astronomical azimuth of verification to α Ursæ Minoris: he then returned to his recess quarters at Ahmedabad, which he reached about the middle of May.

In October, 1851, at the urgent request of Lieutenant Rivers, Mr. J. W. Rossenrode, who had had great experience in trigonometrical operations in flat and wooded countries, was withdrawn from Bengal, and appointed an additional assistant to the Bombay Party to instruct the assistants in the ray-trace system. Unfortunately, however, owing to the immense distance that he had to travel, he did not join Lieutenant Rivers till February 15th, when the clearance of the rays, the special work for which he had been sent, had with much labour and trouble been carried out in the most difficult parts of the country. He was therefore on arrival despatched to the southern edge of the Ran of Cutch and was employed up to the first of May in selecting stations, clearing rays and building towers both for the western extremity of the Guzerat Longitudinal Series and the central portion of the Kattywar Meridional Series. He rejoined Lieutenant Rivers at Ahmedabad on May 15th.

The section of the Guzerat Longitudinal Series, situated between the meridians of 71° and 73°, runs through a perfectly flat country, for the most part covered with trees: towers of twenty-five feet high were required to command sides of 12 miles, and after mutual visibility had been obtained between two stations in November, three or four additional feet

had to be added in order to allow for the decreased effect of refraction in April. In the rocky table-land of Káthiáwár, where the western end of the Series had now arrived, bricks were unknown, and the pillars had to be constructed of stone.

Season 1852-53.

PERSONNEL.

Lieutenant H. Rivers, Bombay Engineers, 1st Assistant.
Lieutenant D. J. Nasmyth, Bombay Engineers, 2nd Assistant.
Mr. T. Sanger, Sub-Assistant.
„ J. DaCosta, Ditto.
„ J. McGill, Ditto.

When the party again took the field, Rivers having applied for furlough, and having every expectation of its being granted, handed the party over to Nasmyth, who at once set out for the Káthiáwár peninsula to resume operations on the Guzerat Longitudinal Series, Rivers remaining behind. The *personnel* was further weakened by the return of Mr. Rossenrode to Bengal and by the absence of Mr. Sanger on sick-leave: the only assistants that remained for duty were Mr. DaCosta and Mr. McGill, the latter of whom had been but one year in the Department. During the previous season Mr. Rossenrode had selected stations as far west as Rangpur*, and had built the towers up to Kuária and Nárechána; but the hexagon that he had constructed round Rangpur was, owing to the smallness of the sides, not considered suitable for inclusion in a principal series, the more especially as the country in that part was comparatively open and no real necessity had existed for curtailing the lengths of the rays. On arrival at Ingrori, the first station visited, careful examination shewed that nothing less than adding 20 feet to the Degám tower and 10 feet to that of Ingrori would render the stations mutually visible, and the work of raising the towers was therefore commenced at once. Nasmyth decided, whilst this was being done, to make a reconnaissance of the country to the westward to see whether he could not improve Rossenrode's approximate series and especially the hexagon round Rangpur, the stations of which were only some 5 or 6 miles apart; he was engaged on this work when he was rejoined by Rivers, who had in the meantime learnt that his application for furlough had been refused and who had, on receipt of the unwelcome news, set out post-haste in no easy frame of mind to resume charge of the triangulation. The result of the revision of the approximate series was that the triangles were made more symmetrical, and but seven stations were required to get over the same extent of country as under the original arrangement had taken ten. By December 1st the towers at all the stations of the Guzerat Longitudinal Series, west of the meridian of 72°, were in readiness for the final observations.

The main body of the party with Rivers and Nasmyth now returned to Ingrori to take up the final angles, whilst Mr. DaCosta was detached to conduct the approximate work of the Kattywar Meridional Series. During December, 1852, five stations of the Guzerat Series were visited and observed from, and in January, 1853, the principal angles of its western section were completed. The party then took up the final work of the Kattywar Meridional Series.

In November, 1854, Mr. Sanger was detached from the main body of the party,

* Rangpur is one of the centres of a compound figure situated at the junction of the Guzerat Longitudinal and the Kattywar Meridional Series, which belongs to the latter.

then employed in Káthiáwár, with orders to carry the approximate work of the Guzerat Longitudinal Series eastwards from Ahmedabad: he began at Wastrál, and before the season was over had selected all the stations as far east as Kágarol: during the latter half of the field season of 1856-57, Mr. McGill followed over the same ground, building the pillars at Mr. Sanger's stations and clearing the rays.

Season 1858-59.

PERSONNEL.

Lieutenant D. J. Nasmyth, Bombay Engineers, 2nd Assistant.
Mr. J. DaCosta, Sub-Assistant.
„ J. McGill, Ditto.
„ C. McGill, Ditto.

By May, 1858, the Kattywar Meridional Series and the Cutch Coast Series were both fully completed, and the only principal triangulation of the South-West Quadrilateral that still remained to be done was the portion of the Series under review that lies between the meridians of 73° and 75°. In October, 1858, as the Political Agents in Gujarát reported that the country had quieted down from the excitement of the mutiny, Nasmyth, who had succeeded to the charge of the party, considered it a favorable opportunity to take up the final observations of the central section of the Guzerat Longitudinal Series, *i.e.*, the portion that is situated between the stations of Mirzápur and Kágarol. The mutiny had not yet died out in Malwa (Málwa), and so the approximate work on the eastern section of the Series between Kágarol and Indráwan had to be left in abeyance. Ground was broken in Gujarát on October 25th, and as Mr. Sanger's approximate work appeared in parts defective, Nasmyth began by revising it: having definitely settled on the first two or three triangles in the vicinity of Mirzápur he returned to Pálri to commence the final observations, leaving the revision of the approximate series to Mr. DaCosta. Early in November he received notice of a disturbance that had broken out among the Náikrás at Nárukot, and shortly after he learnt that the Rao Sahib and Tantia Topi had appeared on the frontiers of Gujarát: armed bands of plunderers were often now to be met traversing the country, and the operations of detached surveyors became unsafe. Mr. DaCosta, who was on in advance at Kágarol received warning from the Political authorities to retire at once to Baroda (Vadodra), which he succeeded in reaching in safety: he had been, though unaware of it, within 14 miles of the ubiquitous Tantia's camp. By the end of December, 1858, the final work had been completed as far as the side Rundan–Bhagwánji, and in January five more stations were observed at, bringing the Series up to Ghoráráo–Wardhari. News then arrived that the Bhíls were rising, and the Political officers warned Lieutenant Nasmyth not to cross the Mahi. He had, therefore, no alternative but to leave off at Ghoráráo and to withdraw to Cutch where he took up some minor triangulation.

On the rays Poera–Rámesri and Poera–Gohilia the signals were not visible till sunset, and it therefore became necessary to determine the relative heights of those stations by simultaneous vertical observations to lamp signals from the two extremities of each ray: this was done on the former by Lieutenant Nasmyth and Mr. DaCosta and on the latter by Messrs. DaCosta and McGill who were both equipped with 12-inch theodolites.

On December 31st, 1858, some severe shocks of earthquake were felt all over Gujarát,

in consequence of which Nasmyth thought it advisable to check the position of the upper mark-stones at all stations which had high towers: these stones had been plumbed over the lower buried marks by Mr. J. McGill. Nasmyth examined three towers, and found that Poera, Rámesri and Golïilia had all slightly deflected. New marks were accordingly established to which all observations have been referred.

The Bombay Triangulation Party passed the summer of 1859 at Rájkot, where they were joined in October by Lieutenant (now Major-General) Charles Haig of the Royal Engineers, an officer of the Bombay Engineers, who had lately been appointed to the Great Trigonometrical Survey. For two months both Captain Nasmyth and Lieutenant Haig were employed as Military Engineers at the siege of Dwárka (Dvárka); but at the fall of that place in December, 1859, they resumed the trigonometrical operations, and the remainder of the field season 1859-60 was spent in extending the minor triangulation of Cutch and Káthiáwár. On March 10th, 1860, Captain Nasmyth proceeded on furlough and Lieutenant Haig assumed charge of the work: on April 19th, the party marched under Mr. DaCosta to their recess quarters at Rájkot, and Lieutenant Haig set out for Murree (Mari) where he joined Major J. T. Walker's Party.

Season 1860-61.

PERSONNEL.

Lieutenant C. T. Haig, Bombay Engineers, 2nd Assistant.
Mr. J. DaCosta, Civil 2nd Assistant.
„ J. McGill, Senior Sub-Assistant.
„ G. A. Anding, 3rd Class Sub-Assistant.

The programme of work laid down for the Bombay Party, during this field season, was to take up the Guzerat Longitudinal Series at the side Wardhari–Ghoráráo, carry it eastward until it met the Khánpisura Meridional Series, and then to return and work southwards from a side of this new work down the meridian of $73\frac{1}{2}°$ to meet the southern unfinished portion of the Singi Meridional Series. The head-quarters of the party quitted Rájkot on November 15th, and reached Wardhari on the 30th. Mr. McGill had taken the field about a month previously to lay out the approximate work. Up to the middle of January, Mr. DaCosta was employed on the secondary triangulation in Káthiáwár: he then left for the Deccan to take up the approximate work of the Mangalore (Mangalúr) Meridional Series, on which he remained employed till the close of the field season.

At the beginning of the season the progress of the party met with some serious checks. The stations of Játhrábhor, Kágarol and Rencha, which are situated at the junction of the Singi and Guzerat Series, had been selected some years previously. In the approximate chart furnished to Lieutenant Haig the ray between Játhrábhor and Ghoráráo was laid down, but after several days had been spent in felling trees it was found to be impracticable. Another delay was caused by a mistake of the mason who instead of repairing the old Rencha station, built a new station at another village also called Rencha, and the signal-man shewed his heliotrope to Ghoráráo from this latter. Lieutenant Haig himself too went to this new station and did not find out his mistake until he had put up his instrument.

On arriving at Bhor Lieutenant Haig found the ray Bhor–Patángri impossible owing

to a large hill intervening: having observed all the other rays he went to Patángri and selected a new station there: whilst the pillar was being built he visited Játhrábhor and Kágarol, and then went back to Ghorárão and observed there the correct ray to Rencha: Kágarol, Patángri, and Bhor were then revisited, and on January 20th, 1861, the Kágarol compound figure at the junction of the two Principal Series was finished.

In the meanwhile Mr. McGill, who had been carrying the approximate series southwards on the Singi meridian, made excellent progress until he reached Kesarwa, when he and all his party were prostrated with jungle fever and had to retire to Broach (Bharúch): he was unable to resume his work during the field season. Mr. McGill's absence necessitated a change of programme; for he was the only officer available for the approximate work and it had been expected that he would be able to select all the stations of the Singi Meridional Series and also make considerable progress with the approximate work of the Guzerat Longitudinal Series to the east of the Singi meridian before Lieutenant Haig had finished the observations of the Kágarol compound figure, as he would have done, if all had gone right. Lieutenant Haig thus found no approximate work ready for him on the Guzerat Longitudinal Series and had to commence selecting his stations himself; but his progress proved so slow, that towards the end of January he gave it up and returned to Bhor with the object of observing at the new stations of the Singi Meridional Series already selected. On this work he remained employed for the remainder of the season of 1860-61.

It may be mentioned that the cause of McGill's party being prostrated was due to his entering a tract of country which, earlier than the middle of February, is most deadly; but this fact was unknown to Lieutenant Haig or Mr. McGill till after the unfortunate experience.

Season 1861-62.

PERSONNEL.

Lieutenant C. T. Haig, Bombay Engineers, 1st Assistant.
Mr. J. DaCosta, Civil 2nd Assistant.
„ J. McGill, Junior Civil 2nd Assistant.
„ G. A. Anding, 3rd Class Sub-Assistant.

The party passed the recess season of 1861 at Poona (Puna), and in October following again took the field. The first stations visited were Játhrábhor and Patángri of the Kágarol compound figure, and an attempt was made to prolong the Guzerat Longitudinal Series eastwards from the side that joined them. The plan, however, was found impracticable, and the side Patángri–Bhor had to be substituted. At first Lieutenant Haig himself took up the approximate work and carried it eastwards to the meridian of $74\frac{1}{2}^{\circ}$, where he left it in charge of Mr. McGill, and returned to Patángri to observe δ Ursæ Minoris for azimuth; and shortly after Christmas he commenced the observations of the final angles of the Series. By the end of January, 1862, he had carried the principal work eastwards to the side Samohi–Kukinda, and on February 22nd at Karsod he completed the Guzerat Longitudinal Series. During this season a verificatory azimuth at the station of Patángri was observed to δ Ursæ Minoris.

Lieutenant Haig had instructed Mr. McGill, when carrying on the approximate work, to maintain the series single throughout and to close on the side Indráwan–Gumánpur of the Khánpisura Meridional Series, and he had accordingly made the northern flank of his series

run *viâ* the stations Kukinda, Mehwása, Tharkheri, and Indráwan, and had chosen Samohi and Pípliabán on the southern flank. When Haig had observed the angles at Pípliabán he learnt from Mr. McGill that he was unable to close on the side Indráwan–Gumánpur; for the station of Gumánpur had been selected during the progress of the Khánpisura Meridional Series solely with a view to its suitability for the Mograba hexagon, and without any regard to exterior use, it being concealed from the north and west by a ridge that rendered the rays Pípliabán–Gumánpur and Tharkeri–Gumánpur impracticable.

On hearing of this check Haig decided to try and close on the side Kaula-ka-Máta–Indráwan of the Khánpisura Meridional Series, and to attain this object he added the station of Kuwása; thus unintentionally constructing a pentagon round Mehwása. But Kaula-ka-Máta like Gumánpur had been selected with regard to its own series only and was situated on the roof of a temple, the spire of which intercepted all view from the west. It therefore became necessary to build a new station on the same hill,* which was the only one available in the vicinity, and to make the side Karsod–Indráwan the closing side of the Guzerat Longitudinal Series, for which it proved admirably suited.

The Mehwása pentagon is incomplete, the angle at Mehwása between Samohi and Pípliabán being wanting. When the observations at Mehwása were being taken, the surrounding stations were observed in the following order, Samohi, Kukinda, Kuwása, Tharkheri, Pípliabán, and the mistake was made of not re-observing Samohi and of completing the round at Pípliabán. When the station of observation is at the centre of a polygon, a round of intersections is incomplete, and consequently no central equation can be formed, unless the first station in the round is intersected again at the end of the round.

All the angles of the Guzerat Longitudinal Series, were observed with Troughton and Simms' 18-inch Theodolite No. 2†, and were taken on 6 pairs of zeros. Rivers's method of changing zeros on the western section of the Series was one that he had introduced himself and first employed on the Abu Meridional Series: the zeros he used were as follows:—

$$\frac{0^\circ\ 1'}{180^\circ\ 1'},\ \frac{10^\circ\ 12'}{190^\circ\ 12'},\ \frac{20^\circ\ 20'}{200^\circ\ 20'},\ \frac{30^\circ\ 29'}{210^\circ\ 29'},\ \frac{40^\circ\ 38'}{220^\circ\ 38'}\text{ and }\frac{50^\circ\ 50'}{230^\circ\ 50'}.$$

Over the ordinary method, usually followed then in the survey, *viz.*:—

$$\frac{0^\circ\ 0'}{180^\circ\ 0'},\ \frac{10^\circ\ 0'}{190^\circ\ 0'},\ \frac{20^\circ\ 0'}{200^\circ\ 0'},\ \frac{30^\circ\ 0'}{210^\circ\ 0'},\ \frac{40^\circ\ 0'}{220^\circ\ 0'}\text{ and }\frac{50^\circ\ 0'}{230^\circ\ 0'},$$

he claimed the advantage for his system that it brought the zero of the micrometer over every 10 minutes of the degree and also so shifted the reading as to cancel error of "run".

Each change of zero was made in fact to fulfil the following conditions:—(1) In the degrees each zero was 10° in excess of the preceding one; (2) At each zero a different 10′

* It therefore ensues that there are now in existence two Principal Stations of the same name, Kaula-ka-Máta, one appertaining to the Khánpisura Meridional Series and the other to the Guzerat Longitudinal Series: they are between 20 and 30 yards apart.

† For a description of this instrument and its performances see Appendix No. 2 of Volume II of the *Account of the Operations of the Great Trigonometrical Survey of India.*

division in the degree was intersected; (3) Each zero was a different number of minutes from the division to be intersected, being in two cases to the right of that division and in three to the left.

Nasmyth on the central section of the Series followed Rivers, as also did Haig in the Kágarol compound figure: in 1860, however, Colonel A. S. Waugh, for reasons which will be found fully explained at pages XII to XVII of the Introduction to the Great Indus Series (*vide* Volume III of the *Account of the Operations of the Great Trigonometrical Survey of India*) ordered the following to be the zero settings of theodolites with three microscopes:—

$$\frac{0^\circ\ 0'}{180^\circ\ 0'},\ \frac{70^\circ\ 1'}{250^\circ\ 1'},\ \frac{140^\circ\ 2'}{320^\circ\ 2'},\ \frac{210^\circ\ 3'}{30^\circ\ 3'},\ \frac{280^\circ\ 4'}{100^\circ\ 4'}\ \text{and}\ \frac{350^\circ\ 5'}{170^\circ\ 5'},$$

the changes in the minutes were introduced with a view to cancelling the effects of any errors in the construction of the threads of the micrometer screws. In consequence of this order Haig worked with the following pairs of zeros, *viz*:—

$$\frac{0^\circ\ 1'}{180^\circ\ 1'},\ \frac{70^\circ\ 11'}{250^\circ\ 11'},\ \frac{140^\circ\ 22'}{320^\circ\ 22'},\ \frac{210^\circ\ 28'}{30^\circ\ 28'},\ \frac{280^\circ\ 39'}{100^\circ\ 39'}\ \text{and}\ \frac{350^\circ\ 50'}{170^\circ\ 50'},$$

on the eastern section of the Series, a system that combined Colonel Waugh's large sweeps in the degrees with Rivers's changes in the ten-minute divisions to be intersected and in the odd minutes.

When the triangulation of the South-West Quadrilateral was completed two values were obtainable for both the latitude and longitude of each of the three stations Patángri, Mirzápur and Monába, and also for both the length and azimuth of each of the three sides Patángri–Bhor, Mirzápur–Wastrál, and Monába–Wándia: the closing errors in all these cases may be exhibited as follows:—

	Patángri.		Patángri–Bhor.	
	Latitude.	Longitude.	Azimuth.	Side in feet.
When calculated from the side Bálágara–Búda of the Karáchi Longitudinal Series *vid* the northern section of the Khánpisura Meridional Series and the eastern section of the Guzerat Longitudinal Series.	22° 52′ 15″·603	73° 55′ 49″·156	16° 47′ 34″·449	80457·2
When calculated from the side Tána–Lakarwás of the Karáchi Longitudinal Series *vid* the northern section of the Singi Meridional Series.	22 52 15 ·671	73 55 49 ·563	16 47 27 ·336	80453·2
Closing errors ...	+ 0·068*	+ 0·407*	− 7·113	− 4·0

* The geographical error in feet is available from these quantities, as 1 foot = 0″·01, both on meridian and parallel.

	Mirzápur.		Mirzápur–Wastrál.	
	Latitude.	Longitude.	Azimuth.	Side in feet.
When calculated from the side Jeráj–Márd of the Karáchi Longitudinal Series *vid* the Abu Meridional Series.	22° 59′ 17″·859	72° 52′ 34″·695	91° 4′ 29″·147	56132·7
When calculated from the side Tána–Lakarwás of the Karáchi Longitudinal Series *vid* the northern section of the Singi Meridional Series and the central section of the Guzerat Longitudinal Series.	22 59 17 ·708	72 52 34 ·708	91 4 26 ·190	56135·1
Closing errors ...	+ 0·151*	− 0·013*	+ 2·957	− 2·4

	Monábat.		Monába–Wándia.	
	Latitude.	Longitude.	Azimuth.	Side in feet.
When calculated from the side Bhilgaon–Akoria of the Karáchi Longitudinal Series *vid* the Kattywar Meridional Series.	23° 16′ 35″·909	70° 51′ 11″·778	80° 25′ 20″·028	67441·4
When calculated from the side Jeráj–Márd of the Karáchi Longitudinal Series *vid* the Abu Meridional Series and the western section of the Guzerat Longitudinal Series.	23 16 35 ·770	70 51 11 ·850	80 25 16 ·982	67442·4
Closing errors ...	+ 0·139†	− 0·072†	+ 3·046	− 1·0

* The geographical error in feet is available from these quantities, as 1 foot = 0″·01, both on meridian and parallel.

† It should be noted that Monába is a station of the Kattywar Meridional Series, and situated some 25 miles north of the junction of that Series with the Guzerat Longitudinal Series. It is selected here as the point of comparison because it was so employed in the Simultaneous Reduction of the South-West Quadrilateral.

On the completion of the simultaneous reduction of the South-West Quadrilateral, it was found that the portions of the errors which had actually fallen to the Guzerat Longitudinal Series were, and had been dispersed on it as follows:—

	In Latitude.	In Longitude.	In Azimuth.	In Side. Log. feet.
On the eastern or Haig's section between Karsod and Patángri, length 75 miles.	" + 0·061	" − 0·331	" − 0·479	+0·000,0045,0 or 0·65 inch per mile.
On the central or Nasmyth's section between Patángri and Mirzápur, length 68 miles.	− 0·050	− 0·037	− 1·453	−0·000,0201,6 or 2·95 inches per mile.
On the western or Rivers's section between Mirzápur and Chalarwa, length 113 miles.	− 0·125	+ 0·134	− 5·048	−0·000,0118,9 or 1·74 inches per mile.

The heights of the Principal Stations of the Guzerat Longitudinal Series depend in the first instance on the values of the stations of Karsod and Indrawán of the Khánpisura Meridional Series; next on the heights of the stations of Poera, Jhinjhar, Wastrál, Sola, Sánand, Khoraj, Hasalpur, and Ingrori determined by spirit-levelling operations executed during the seasons of 1875-76 and 1876-77; and lastly on the heights of the stations of Chalarwa and Sápakra which were fixed in the adjustment of the Kattywar Meridional Series. The intermediate heights, of which the values were obtained trigonometrically, shewed at Poera a cumulative error of + 3 feet and at Jhinjhar and Wastrál a further error of + 2 feet, and on the section Ingrori to Sápakra of − 3 feet: these were dispersed by simple proportion. Between Jhinjhar and Ingrori the spirit-levelled heights are sufficiently numerous to give the heights of the remaining stations directly.

Several stations of the Sábarmati Minor Series were also connected with in the spirit-levelling operations referred to above, and their values of height thus finally fixed.

Secondary Triangulation.

An important secondary chain of triangulation known as the Sábarmati Minor Series appertains to the Guzerat Longitudinal Series. It starts from the side Sánand–Pálri of the latter, 10 miles south-west of Ahmedabad, and follows the Sábarmati River to its mouth at the head of the Gulf of Cambay: from thence it runs along the western edge of the gulf until it joins the Kattywar Minor Meridional Series No. IV at the side Haibatpur–Bharbhír. Some 6 miles north of the town of Cambay, the Guzerat Coast Minor Series, that emanates

near Surat from a principal side of the Singi Meridional Series, meets the Sábarmati Minor Series at the side Rhoni–Omliála of the latter in latitude 22½°.

The Sábarmati Minor Series is 75 miles long, and consists of three quadrilaterals and twenty-one single triangles, the rays averaging 6 miles in length: it was designed by Lieutenant Rivers for the purpose of connecting the heights of the stations of the Guzerat Longitudinal Series and thence those of the Abu Meridional Series and the Karáchi Longitudinal Series with mean sea level.

This connection was originally intended to be made by a line of levels; but a chain of triangulation was ultimately preferred as the more suitable method; no sufficiently accurate instrument could be procured for the levelling operations, and an officer of special training would have been required to conduct them: besides this a great advantage was gained by adopting triangulation, in that the position of the head of the Gulf of Cambay was geographically fixed. The angles were observed on two pairs of zeros, *viz*:— $\frac{0°}{180°}$ and $\frac{30°}{210°}$.

The work of selecting the stations was first taken up by Mr. J. DaCosta in February 1851, who by the end of the field season had carried the approximate work as far as the head of the gulf. In November, 1853, he had, however to return, and do some of his work over again: in the interval trees had grown and obscured a few of the rays, and here and there a platform had been destroyed: in one or two instances too the symmetry of the triangles required improvement. By the middle of December he had performed these duties and crossed the gulf at Gogha to take up the triangulation on the Kattywar Coast.

In January, 1854, Lieutenant Nasmyth having lately completed the Kattywar Minor Longitudinal Series decided to take up the observations of the final angles of the Sábarmati Series. Leaving the establishment to reach Khún Bandar in a larger boat, Nasmyth hurried onward from Gogha in a smaller one to the mouth of the Sábarmati river, and commenced at once a reconnaissance of the locality, having in the meantime wandered over the whole tract of mud, through which the Sábarmati river finds its way to the sea, in search of a suitable spot for the tide gauge. But the party whom he had left behind were forced, owing to the inundation of the spring tides, to make a considerable detour before they could reach Sikotar–Máta, and a week had elapsed before tents, horses and baggage had arrived at their destination. DaCosta had brought the approximate work only as far south as the side Mitli–Rhoni, and had selected Sikotar–Máta as the site for the tide gauge. Nasmyth however, preferred Tarakpur to Sikotar–Máta and built a trigonometrical station there: he then heard that at Tarakpur during the neap tides cattle could drink from the Sábarmati, and fearing therefore that the spot was under the influence of the river and not suitable for tidal observations, he detached Mr. McGill to choose some point nearer the sea. The latter eventually chose the two stations, Pipli and Ambli, of the Sábarmati Series, from which could be fixed a more suitable site and one which Nasmyth approved for the tide gauge, the latter was situated 660 yards south by west of Sikotar–Máta station, on what appeared hard, solid mud, that was unlikely to be washed away by the river. By the end of January Nasmyth had observed all the final angles from Sikotar–Máta as far north as Nandhanpur, and by

February 13th he had joined on the principal side Sánand–Pálri of the Guzerat Longitudinal Series: this completed the minor series from Ahmedabad to the head of the gulf.

Tidal observations were taken by Mr. DaCosta in the early months of 1855 at Miáni Bandar and Diu (Dív) on the Káthiáwár Coast. Sikotar–Máta proved a most ineligible spot for the gauge: sand silted over it, the mud bank on which it stood was gradually shifting, and it was exposed to the whole force of the current of the Sábarmati; it was thereupon decided that no tidal station could be erected nearer to the mouth of the Sábarmati than Gogha. The Kattywar Minor Meridional Series No. IV was designed in 1855 to follow the meridian of 72° and to thus connect the Guzerat Longitudinal and Kattywar Minor Longitudinal Series, but by 1860 the work had not been carried out. The only means therefore of checking the heights of stations of the Abu Meridional Series by means of a tidal station at Gogha was by computing the heights through the Kattywar Minor Longitudinal, Kattywar Meridional and Guzerat Longitudinal Series. This was considered too long a circuit, and consequently in November, 1860, Mr. DaCosta was detached by Lieutenant Haig to Bhávnagar with orders to connect the eastern extremity of the Kattywar Minor Longitudinal with the southern extremity of the Sábarmati Minor Series by means of a small chain of triangles. The stations of the Kattywar Meridional Minor Series No. IV had been previously selected as far north as Haibatpur by Mr. DaCosta, and the pillars both at Haibatpur and Bharbhír, the extremities of his side of origin, had been built. He left Rájkot on November 5th, 1860, and by the 13th of January following he had selected the stations, built the pillars, and observed the angles. He effected a connection with Nasmyth's former work at the side Ambli–Pipli, and this connection completed the triangulation of the Sábarmati Minor Series.

Two Minor Series, known as Kattywar Minor Meridional Series Nos. III and IV, are connected with principal sides of the Guzerat Longitudinal Series near its western extremity, the former with the side Nárechána–Charári, along the meridian of 71½°, the latter with Ingrori–Kárigángar along the meridian of 72°: they close at their southern extremities on sides of the Kattywar Coast Minor Series and Kattywar Minor Longitudinal Series respectively. They were of great value to the topography of Káthiáwár. As they have been apportioned to the Kattywar Meridional Series and not to the Guzerat Longitudinal Series, and have been fully dealt with in the Introduction to the former, no further reference is necessary to them here.

The Guzerat Longitudinal Series running as it does throughout its whole length through a flat and densely wooded country, had to be made a single chain owing to the great expenses of tower-building and ray-clearing: on these accounts too the amount of secondary work that was carried out during the principal operations was very limited. No secondary stations were built, not half a dozen peaks were intersected, and it was useless to lay down the positions of particular trees when the whole country was covered with them. On the western section of the Series some fifteen intersected points exist, including the palace of Halvad: in Ahmedabad the clock tower and five or six domes and minarets were fixed, and four points in the city of Kaira were laid down from the Sábarmati Minor Series: on

the central section of the Series the positions of the palace of Bálásinor (Vádashinor), of the town of Godhra, and of eleven other points were determined. On the eastern section of the Series some 15 or 20 buildings of different kinds were intersected.

In 1869-72 when the Topographical Survey of Gujarát was in hand, a minor series of triangles was carried down the river Mahi. It started from the principal side Ghoráráo–Poera and closed on the side Dhuváran–Sárod of the Guzerat Coast Minor Series.* It was commenced by Lieutenants A. W. Baird and J. R. McCullagh and finished by Messrs. A. D. Christie and C. H. McA'Fee, an observer working at each end simultaneously. The observations were taken with 10-inch theodolites on four zeros, except at one station where a 6-inch theodolite was used: the average length of the rays was 8 miles.

* This series belongs to the Singi Meridional Series.

October, 1889.

S. G. BURRARD.

GUJARÁT LONGITUDINAL SERIES.

PRINCIPAL TRIANGULATION. ALPHABETICAL LIST OF STATIONS.

The orthography of the names in columns 1 and 4 is based, as far as practicable, on the pamphlet of names entitled *Bombay Places and Common Official Words* (1879) and on the list of *Spelling of Names in the Central India Agency* (1877). As some of the names have thus been considerably altered, it has been thought advisable for easy reference and identification to give in columns 2 and 5 the spellings employed in the original angle books. The orthography in columns 1 and 4 is hereafter only employed in this volume.

Orthography		Number	Orthography		Number
Adopted	From Original Angle Books		Adopted	From Original Angle Books	
Bhagvánji	Bhagwánji	XIV	Kágarol	Kágarol	XIV*
Bhor	Bhor	XVII*	Káphri	Kápri	VIII
Charádi	Charári	XXXII	Karsod	Karsod	IX‡
Charádva	Chalarwa	XVIII†	Kaula-ka-Máta	Kaula-ka-Máta	I
Dehgám	Degám	XXXI	Kavádia	Kuária	XXXV
Dhrángadra	Dhrángadra	XXXIII	Khárigángad	Kárigángar	XXVIII
Ghoráráo	Ghoráráo	XVI*	Khawása	Kuwása	III
Goalia	Gohilia	XIII	Khoraj	Khoraj	XXIV
Hájipur	Hájipur	XXIII	Kukinda	Kukinda	VII
Hásalpur	Hasalpur	XXVI	Mehwása	Mehwása	IV
Indráwan	Indráwan	XIII‡	Mirzápur	Mirzápur	XVI
Ingrodi	Ingrori	XXX	Nárisána	Nárechána	XXXIV
Jathrabhor	Játhrábhor	XII*	Páldi	Pálri	XX
Jhidia	Jhiria	X	Patángdi	Patángri	XIII*
Jinjhar	Jhinjhar	XVII	Pípliaban	Pípliabán	V

* Of the Singi Meridional Series. † Of the Káthiáwár Meridional Series. ‡ Of the Khánpisura Meridional Series.

PRINCIPAL TRIANGULATION. ALPHABETICAL LIST OF STATIONS—(*Continued*).

Orthography		Number	Orthography		Number
Adopted	From Original Angle Books		Adopted	From Original Angle Books	
Poeda	Poera	XI	Sápakda	Sápakra	XXI†
Porda	Por	XXIX	Sola	Sola	XXI
Punákota	Punákot	IX	Sonáda	Sanoda	XIX
Rámsádi	Rámesri	XII	Thárkheri	Tharkheri	II
Richhia	Rencha	XVIII*	Thuleta	Thuleta	XXVII
Rúdan	Rundan	XV	Vádhoda	Wádrora	XXV
Samoi	Samohi	VI	Vardhadi	Wardhari	XV*
Sánand	Sánand	XXII	Vastrál	Wastrál	XVIII

* Of the Singi Meridional Series. † Of the Káthiáwár Meridional Series.

GUJARÁT LONGITUDINAL SERIES.

PRINCIPAL TRIANGULATION. NUMERICAL LIST OF STATIONS.

IX (Of the Khánpisura Meridional Series).	Karsod.
XIII (Of the Khánpisura Meridional Series).	Indráwan.
I	Kaula-ka-Máta.
II	Thárkheri.
III	Khawása.
IV	Mehwása.
V	Pípliaban.
VI	Samoi.
VII	Kukinda.
VIII	Káphri.
IX	Punákota.
XII (Of the Singi Meridional Series).	Jathrabhor.
XIII (Of the Singi Meridional Series).	Patángdi.
XIV (Of the Singi Meridional Series).	Kágarol.
XV (Of the Singi Meridional Series).	Vardhadi.
XVI (Of the Singi Meridional Series).	Ghoráráo.
XVII (Of the Singi Meridional Series).	Bhor.
XVIII (Of the Singi Meridional Series).	Richhia.
X	Jhidia.
XI	Poeda.
XII	Rámsádi.
XIII	Goalia.
XIV	Bhagvánji.
XV	Rúdan.
XVI	Mirzápur.
XVII	Jinjhar.
XVIII	Vastrál.
XIX	Sonáda.
XX	Páldi.
XXI	Sola.

PRINCIPAL TRIANGULATION. NUMERICAL LIST OF STATIONS—(*Continued*).

XXII	Sánand.	XXX	Ingrodi.
XXIII	Hájipur.	XXXI	Delhgám.
XXIV	Khoraj.	XXXII	Charádi.
XXV	Vádhoda.	XXXIII	Dhrángadra.
XXVI	Hásalpur.	XXXIV	Nárisána.
XXVII	Thuleta.	XXXV	Kavádia.
XXVIII	Kharigángad.	XVIII (Of the Káthiáwár Meridional Series).	Charádva.
XXIX	Porda.	XXI (Of the Káthiáwár Meridional Series).	Sápakda.

GUJARÁT LONGITUDINAL SERIES.

DESCRIPTION OF PRINCIPAL STATIONS.

This Series is divided into two portions by the Singi Meridional Series, and in order to make it continuous, it has been necessary to include the data appertaining to Stations XII to XVIII of the Singi Series. The stations of origin, and those numbered I to X, XVII, XVIII, XX and XXIII, also those which belong to the Singi Meridional Series, are situated on hills or rising ground, and with the exception of Station XVII of the Singi Meridional Series, where there is only one mark on a projecting rock, consist generally of isolated and perforated pillars of masonry from 2 to 10 feet high, having a mark engraved on the rock *in sitú* or on a stone embedded at the ground level, and another mark at the surface in the normal of the first. Round these pillars, platforms of earth and rubble or earth and wood have been built for the observatory tent to rest on. At several of these stations an aperture through the platform and pillar was left for reference to the ground level mark. At all the remaining stations situated in the plains, it was found necessary on account of the curvature of the earth to construct towers. These are solid, 12 to 40 feet in height, built either of sun-dried bricks or stones set in mud cement, and in a few cases of loose stones having a broad base. Each encloses a central pillar of masonry, sometimes solid, sometimes perforated, which carries marks at the top and at the ground level, and in the former, other marks are inserted generally at every 5 feet. Of the upper portion of these pillars about 5 feet is circular and isolated, and access to the mark at the ground level is obtained by an aperture left for the purpose.

The following descriptions have been compiled from those given by the officers who executed the series, from the records of the Levelling Operations in 1874 to 1876, and from the General Reports of the Káthiáwár (Káthiávád) Topographical Survey, supplemented as regards adjacent villages and places, from the Topographical Survey maps of the country traversed. Some details regarding the heights and the construction of the stations have been gathered from reports, contingent bills, and other records of the series. The local sub-divisions in which the several stations are situated, have been derived from the latest annual reports furnished by the district officers to whose charge the stations are committed.

IX.—(*Of the Khánpisura Meridional Series*). Karsod Hill Station, lat. 23° 7′, long. 75° 28′—observed at in 1848 and 1862—is situated on a small hill, about $5\frac{1}{2}$ miles N.E. of the town and Railway Station of Barnagar of the Holkar and Neemuch (Nímach) Line. The station is towards the S. extremity of the hill, 119 (feet?) 8 (inches?) S. of the southern wall of a temple. It is in the lands of the village of Chhota Karsod, pargana Barnagar, Gwalior (Gwáliár) territory.

The station consists of a platform of earth and stones enclosing a perforated pillar of masonry 5 feet high with two mark-stones, the upper 4·27 feet above the lower: an aperture on the S. side gives access to the lower mark-stone. When visited in 1883, it was found in good order. The directions and distances of the circumjacent villages are:—Rasulabad S., mile $\frac{3}{4}$; Chhota Karsod E. by N., miles $1\frac{3}{4}$; Palwás N. by W., miles $2\frac{3}{4}$; Untwás S.E., miles $2\frac{1}{2}$; and Mulána S.S.W., miles 2.

XIII.—(*Of the Khánpisura Meridional Series*). Indráwan Station, lat. 22° 49′, long. 75° 13′—observed at in 1847, 1848 and 1862—is situated on rising ground, about 2 miles S.S.W. of the village of Bidwál, and 6½ miles W. by N. of the Engineer's bungalow at Mákni village on the main road from Rutlám (Ratlám) to Indore (Indor). It is in the lands of the village of Barawál, pargana Badnáwar, Dhár State, Bhopáwar Agency.

The station as originally built in April 1847, consisted of a solid pillar of masonry sunk to a depth of 6·3 feet, which contained two marks, the upper in the surface of the pillar, being at the ground level; over this a platform of loose stones, 7·46 feet in height, with a mark at the top was constructed. In November 1848 an addition of 2·17 feet was made to the height of the platform. It was next visited in February 1862 in the course of the operations of the Gujarát Longitudinal Series: in the records of that Series it is simply stated that it is built 4·75 feet high. In 1869 the loose stone platform was removed, and over the original mark at the ground level, a perforated and isolated pillar of masonry 7·46 feet in height and 3½ feet in diameter was built with a mark-stone in its upper surface, and surrounded by a platform of earth and stones of the same height as the pillar. An arched passage from E. to W. gives access to the ground level mark. It thus appears that the station as last constructed is 2·17 feet lower than that of November 1848. When again visited in 1883, the pillar and its upper mark-stone were found in good order. The directions and distances of the circumjacent villages are:—Indráwan S.W. by S., miles 1½; Barwai E. by N., miles 2¼; Karod S.E., miles 3¼; Borjhiri W. by S., miles 1¼; and Shergarh N.W., miles 2¾.

I. Kaula-ka-Máta Hill Station, lat. 23° 8′, long, 75° 13′—observed at in 1862—is situated on an isolated and symmetrically shaped hill rising about 500 feet above the plain. The station is about 20 yards S. of the large temple of Kaula-ka-Máta from which the hill derives its name, 2 miles S.W. of the small village of Lochitára on the high road from Rutlám to Mhow (Mau), and 7 miles W.S.W. of the station of Runija of the Holkar and Neemuch State Railway. It is in the lands of the village of Barmáwal, Sailána State, Western Malwa (Málwa) Agency.

The station consists of a platform of earth and rubble enclosing a circular, isolated and perforated pillar of masonry, 5·93 feet in height, with a lower and an upper mark, the former being engraved on a projecting rock about 10 inches above the ground. The directions and distances of the circumjacent villages are:—Barmáwal W. by S., miles 3; Amleti N.E. by N., mile 1; Rattagarh E.N.E., miles 2¾; Simloda E.S.E., miles 3; and Tilgára S.W. by S., miles 4½.

Another principal station, at the N.E. corner of the flat roof of the porch and E. of the spire of the large temple, is 20 yards W. of the temple, and was established in 1848 in the course of the operations of the Khánpisura Meridional Series, in the Synoptical Volume of which series its full description will be found under the name of station "XI. Kaula-ka-Máta."

II. Thárkheri Hill Station, lat. 22° 52′, long. 74° 53′—observed at in 1862—is situated on a high table-land, about ¼ of a mile E. of the road from the village of Thárkheri to that of Wani, and 6 miles N.W. of the large village of Jhaknawád. It is in the lands of the village of Thárkheri, Jhábua State, Bhopáwar Agency.

The station consists of a platform enclosing a circular, isolated and perforated pillar of masonry, 4·81 feet in height, with a lower and an upper mark-stone. The directions and distances of the circumjacent villages are:—Bolása E. by N., miles 2¾; Garwakheri S.E., miles 2; Thárkheri S.E. by S., miles 1¾; and Wani N., miles 4.

III. Khawása Hill Station, lat. 23° 8′, long. 74° 42′—observed at in 1862—is situated on the highest point about the centre of a group of low hills, about 3¾ miles W.N.W. of the town of Khawása at the junction of the roads from Thándla and Pitláwad. It is in the lands of the village of Mándalda, pargana Thándla, Jhábua State, Bhopáwar Agency.

The station consists of a platform of earth and rubble and logs of wood, enclosing a circular, isolated and perforated pillar of masonry, 5·00 feet in height, with a lower and an upper mark-stone. The directions and distances of the circumjacent villages are:—Bámal (on the road fron Khawása to Kusalgarh) N.E. by E., miles 2¾; Dholkan N.W., miles 4½; Koriapára W.S.W., miles 3½; and Juna Khawása E. by S., miles 2½.

IV. Mehwása Hill Station, lat. 22° 55′, long. 74° 40′—observed at in 1862—is situated on the highest rocky and S.E. point at the western end of a low range of hills running E. and W., about 2¾ miles E. by S. of Agral on the road from the town of Bhagor to that of Thándla, and 3¾ miles W.N.W. of Mokra on the road from Kalyánpur to Pitláwad. It is in the lands of the village of Gondipára, thána Bhagor, Jhábua State, Bhopáwar Agency.

The station of 1862 consisted of a platform of earth and rubble and logs of wood, about 5 feet in height, enclosing a circular, isolated and perforated pillar of masonry, 2·37 feet in height, which contained a lower and an upper mark-stone. It was visited in 1878-79 by Lieutenant Gore who rebuilt the platform 2½ feet in height. The directions and distances of the circumjacent villages are:—Bhagor S.W. by S., miles 2¾; Kheri W., miles 1¾; Shiugarh N., miles 4½; and Kalyánpur S.S.E., miles 3½.

V. Pípliaban Hill Station, lat. 22° 42′, long. 74° 49′—observed at in 1862—is situated towards the western edge of a flat-topped hill, on the site of the deserted village of this name, about 4½ miles W.S.W. of the town of Dattigaon on the road from Jhábua to Rájgarh. It is in the lands of the village of Pípliaban, pargana Amjhera, Bhopáwar Agency.

The station consists of a platform of earth and rubble enclosing a circular, isolated and perforated pillar of masonry, 5 feet in height, with a lower and an upper mark-stone. The directions and distances of the circumjacent villages are:—Kakarpára S.E. by E., miles 1⅛; Amberi E., miles 2¼; and Ambáh N.E., miles 3.

VI. Samoi Hill Station, lat. 22° 39′, long. 74° 28′—observed at in 1862—is situated on the highest part of the hill, about 1¾ miles W.S.W. of the village of Samoi, and 3 miles N.W. by N. of that of Junágám. It is in the lands of the village of Samoi, Jhábua State, Bhopáwar Agency.

The station consists of a platform of earth and rubble enclosing a circular, isolated and perforated pillar of masonry, 5·47 feet in height, with a lower and an upper mark-stone. The directions and distances of the circumjacent villages are:—Khermál S.E., miles 2; Bhoera S., miles 1½; Rupákhera N.W., miles 1¾; and Kusálpura N.N.E., miles 1¼.

VII. Kukinda Hill Station, lat. 23° 2′, long. 74° 29′—observed at in 1862—is situated on a high detached hill, about ¾ of a mile W. by S. of Gumlisaj village, ¾ of a mile S. of the road from the town of Thándla to Jhálod, and 5 miles S.E. by E. of Harinagar. It is in the lands of the village of Morjhari, Jhábua State, Bhopáwar Agency.

The station consists of a platform of earth and rubble and logs of wood, enclosing a circular, isolated and perforated pillar of masonry, 5 feet in height, with a lower and an upper mark-stone; an aperture gives access to the lower mark. The directions and distances of the circumjacent villages are:—Jámbu W., mile 1; Heráwa W.S.W., mile ¾; and Latpura S.S.E., miles 1⅛.

VIII. Káphri Hill Station, lat. 22° 55′, long. 74° 13′—observed at in 1862—is situated on a tableland of the Vindhyáchal range of hills which here partially divide the Báriya State from the sub-divisions of Dohad and Jhálod, about 4½ miles S.E. by E. of the large village of Dungri on the main road from Godhra to Jhálod, and 8½ miles N.W. of the town of Dohad. It is in the lands of the village of Dageria, sub-division Jhálod, district Panch Maháls.

The station consists of a platform of earth and rubble and logs of wood, enclosing a circular, isolated and perforated pillar of masonry, 5 feet in height, with a lower and an upper mark-stone. The directions and distances of the circumjacent villages are:—Dageria N.E., miles 1½; Káphri S.W. by W., miles 1¼; Amba W.S.W., miles 2; and Muváli S.W. by W., miles 3¼.

IX. Punákota Hill Station, lat. 22° 37′, long. 74° 12′—observed at in 1862—is situated on the ridge of a high hill which forms the northern watershed of the Valva river a tributary of the Pánam, about a mile N.E. of the small village or hamlet of Khalta on the road from Varjhar to Dhánpur on the Moti river. It is in the lands of the village of Punákota, Báriya State, Rewa Kántha (Revákántha) Agency.

The station consists of a platform of earth and rubble enclosing a circular, isolated and perforated pillar of masonry, 5·06 feet in height, with a lower and an upper mark-stone. The directions and distances of the circumjacent villages are:—Punákota N.E., miles 1½; Malumoti E., miles 2⅔; Ladiavád W. by N., miles 1¾; and Bhánpur S.E. by E., miles 3.

XII.—(*Of the Singi Meridional Series*). Jathrabhor Hill Station, lat. 23° 2′, long. 73° 43′—observed at in 1860-61 and 1862—is situated on a range of hills running S.W. by S. and N.E. by E., about 7½ miles S.E. by S. of the town of Lúnáváda, and 3⅔ miles N.E. by E. of Gamánbaria on the road from Lúnáváda to Godhra. It is in the lands of the village of Jathrabhor, thána Lúnáváda, Rewa Kántha Agency.

The station consists of a platform of earth and rubble enclosing a circular, isolated and perforated pillar of masonry, 5 feet in height, with an aperture for access to the lower mark. The directions and distances of the circumjacent villages are:—Boria N.W. by N., miles 1¼; Jathrabhor E., miles 1½; Khatukpur S.E. by S., miles 2¼; and Jodhpur S.S.W., miles 1¾.

XIII.—(*Of the Singi Meridional Series*). Patángdi Hill Station, lat. 22° 52′, long. 73° 56′—observed at in 1861 and 1862—is situated on a high, flat-topped hill forming portion of a range, about ½ a mile S.S.E. of the village of Patángdi, and 5 miles N. by E. of Rebádi at the 17th milestone on the high road from the town and Railway Station of Godhra to Dohad. It is in the lands of the village of Patángdi, thána and state Báriya, Rewa Kántha Agency.

The station consists of a platform of earth and rubble enclosing a circular, isolated and perforated pillar of masonry, 2 feet in height, with mark-stones at top and bottom: an aperture gives access to the lower mark. The directions and distances of the circumjacent villages are:—Pála N., miles 2; Devi E.N.E., miles 1¾; Pasáyata E., miles 1½; Jamodra E.S.E., miles 2¼; Dhabuka S.E., mile ½; Navágám S.W., miles 2¼; and Mátadia Vejma N.W. by W., miles 1¾. There is a rejected station of this name on a hill to the west.

XIV.—(*Of the Singi Meridional Series*). Kágarol Hill Station, lat. 22° 53′, long. 73° 42′—observed at in 1860-61—is situated on a low isolated hill at the southern end of a small group of hills; the hill is also known as Pipalia-ni-Dungri. The station is about 8 miles N.N.E. of the town and Railway Station of Godhra of the B. B. and C. I. Line, and 1¾ miles N.N.W. of Dalváda at the junction of the roads from the town of Godhra, Páli and Lúnávada. It is in the lands of the village of Pipalia, sub-division Godhra, district Panch Maháls.

The station consists of a platform of earth and rubble enclosing a circular, isolated and perforated pillar of masonry, 5 feet in height, and has an aperture giving access to the lower mark. The directions and distances of the circumjacent villages are:—Pati (hamlet) N., miles 3; Vijápur N.N.E., miles 1¾; Navágám E.S.E., miles 1¼; Sámpa S.E. by S., miles 2¼; Mitháli S. by W., miles 2; and Dokva W.S.W., mile 1.

XV.—(*Of the Singi Meridional Series*). Vardhadi Hill Station, lat. 23° 6′, long. 73° 30′—observed at in 1860—is situated on one of the ranges of hills to E. of the large village of Vardhadi, and 3 miles N. by E. of Chárangám village on the right bank of the Mahi river. It is in the lands of the village of Vardhadi, thána Lúnávada, Rewa Kántha Agency.

The station consists of a platform of earth and rubble enclosing an isolated and perforated pillar of masonry, 5·83 feet in height, with an aperture giving access to the lower mark. The directions and distances of the circumjacent villages are:—Jitpur N.E. by E., mile 1; Dhesia E. by S., mile 1; Ved N. by W., mile ¾; Ratanpur S.W. by W., miles 2½; and Ghoram S.S.E., miles 2½.

XVI.—(*Of the Singi Meridional Series*). Ghoráráo Hill Station, lat. 22° 52′, long. 73° 24′—observed at in 1859 and 1860—is situated on a ridge of hills, about 4⅓ miles N. by E. of Sevália Railway Station of the B. B. and C. I. Line, and 6 miles S. by E. of the town of Bálásinor (Vadashinor). It is in the lands of the village of Kuni, táluka Thásra, district Kaira (Kheda).

The station consists of a platform of earth and rubble enclosing a circular, isolated and perforated pillar of masonry, 5 feet in height, with an aperture giving access to the lower mark. The directions and distances of the circumjacent villages are:—Kuni N.N.E., miles 1¼; Parál W., miles 2¼; Sonipur S., miles 2¼; and Dhari Juni (on the right bank of the Mahi river) S.E., miles 2½.

XVII.—(*Of the Singi Meridional Series*). Bhor Hill Station, lat. 22° 40′, long. 73° 52′—observed at in 1860-61 and 1862—is situated on the southern of two rocks on the hill of Bhálápur, about 1¼ miles E.N.E. of the small village of Bhor, and 6 miles S.W. by W. of the town of Báriya. It is in the lands of the village of Bhor, thána and state Báriya, Rewa Kántha Agency.

As regards the construction of the station, the following is all that is forthcoming:—"The platform for the observatory was made of bamboos resting on logs of wood fixed in the crevices of the rocks, and the mark is made on the rock." The directions and distances of the circumjacent villages are:—Gholáv N., miles 3; Kálidungri E.N.E., miles 1¾; Virol E. by S., miles 1¾; Kákalpur S. by W., miles 1½; and Khánpála W.N.W., miles 1¼.

XVIII.—(*Of the Singi Meridional Series*). Richhia Hill Station, lat. 22° 42′, long. 73° 39′—observed at in 1860-61—is situated on a small isolated hill locally known as Vagh Dungar, about ⅓ of a mile S. of the village of Richhia, and 3¼ miles E. by N. of the large village of Vejalpur on the high road from Kálol to Godhra. It is in the lands of the village of Richhia, sub-division Kálol, district Panch Maháls.

The station consists of a platform of logs of wood, covered over with earth, enclosing a circular, isolated and perforated pillar of masonry, 5 feet in height, with marks at top and bottom, and has an aperture giving access to the lower mark which is cut on the rock *in sitú*. The directions and distances of the circumjacent villages are:—Chaláli S.E., miles 2; Arádra S., miles 3½; Nadarkha W. by N., miles 2; and Thána N.E. by E., miles 1½.

X. Jhidia Hill Station, lat. 23° 1′, long. 73° 18′—observed at in 1859—is situated on the highest point towards the eastern side of a detached hill, about a mile W. of Hotvád village, and 6 miles N.W. of the town of Bálásinor. It is in the lands of the village of Hotvád, thána and state Bálásinor, Rewa Kántha Agency.

The station consists of a platform of rubble, 6 feet in height, enclosing a circular, isolated and perforated pillar of stone masonry with an aperture in the S. side giving access to the lower mark. The directions and distances of the circumjacent villages are:—Danádra W. by N., miles 2¾; Báthánákua N. by W., miles 2; Choradungri N. by E., miles 1½; and Nágáma S.E., miles 2¾.

XI. Poeda Tower Station, lat. 22° 55′, long. 73° 15′—observed at in 1859—stands about a mile E. of village so called, 8¼ miles N. of Thásra Railway Station of the B. B. and C. I. Line, 8 miles W.S.W. of the town of Bálásinor, and 4 miles E. of the large village of Lasundra. It is in the lands of the village of Phagvel, táluka Kapadvanj, district Kaira.

The station consists of a tower of sun-dried bricks supported by earthwork and brushwood, enclosing a central, perforated pillar of masonry, 30·8 feet in height, the upper 5 feet of which is isolated, with an aperture on the N. side giving access to the lower mark. The original lower mark, indicated by a circle and dot engraved on a stone, is in the intersection of lines drawn through marks at the outer part of small apertures through and through the tower, left for the purpose. Subsequent to an earthquake on the 31st December 1858, a new lower mark was engraved, 1·25 inches to the S.W. and just without the circle of the original mark. The new mark was employed when the observations were taken. It was visited in 1876-77 by the Levelling Party, when the upper mark-stone was found intact. The directions and distances of the circumjacent villages are:—Nadádra S.E. by E., miles 1⅞; Salum S.E. by S., miles 2⅞; Sandheli S., miles 3¼; Dáda W.S.W., miles 2; and Ganeshji N., mile 1.

XII. Rámsádi Tower Station, lat. 23° 0′, long. 73° 10′—observed at in 1859—stands close S. of village of this name, about 3½ miles E.S.E. of the town of Kapadvanj, and 3 miles S.W. by W. of the large village of Antisar. It is in the lands of the village of Rámsádi, táluka Kapadvanj, district Kaira.

The station consists of a tower of sun-dried bricks supported by earthwork and brushwood, enclosing a central, perforated pillar of masonry, 30·82 feet in height, the upper 5 feet of which is isolated, with an aperture on the N. side giving access to the lower mark. The upper mark was displaced by the earthquake of the 31st December 1858, and a new mark to which the observations refer, is indicated by a dot 0·6 of an inch E. of the original mark which has been left undisturbed. The directions and distances of the circumjacent villages are:—Garod N.N.W., miles 1½; Bádhar N.E. by E., mile 1; Kápri E. by S., miles 1½; and Lakháji N.W. by W., miles 1¼.

XIII. Goalia Tower Station, lat. 22° 53′, long. 73° 7′—observed at in 1859—stands adjoining the hamlet of this name appertaining to the large village of Mahisa which lies 2⅔ miles to S.S.W. The town of Kathlál on the main road from Nadiád to Kapadvanj is about 5 miles to W. by N. It is in the lands of the village of Mahisa, táluka Bavisi, Mahi Kántha Agency.

The station consists of a tower of sun-dried bricks, enclosing a central, perforated pillar of masonry, 24·2 feet in height, with an aperture on the E. side giving access to the lower mark. The earthquake of the 31st December 1858 displaced the upper mark, and a new mark, 0·8 of an inch to S.W. of the original, was made, both marks have circles engraved round them; the observations refer to the new mark. The directions and distances of the circumjacent villages are:—Nijámpur S. by E., mile ¾; Kánklia S.W. by W., mile 1; Hanmánpura W., mile ¾; Anáda N.W., miles 2; and Kathána N.N.E., miles 1¼.

XIV. Bhagvánji Tower Station, lat. 23° 0′, long. 73° 2′—observed at in 1858—stands about ½ a mile S.S.E. of the small village of this name, 5½ miles W.S.W. of the town of Kapadvanj, and 2⅔ miles W.N.W. of Dásalváda on the road from Nadiád to Kapadvanj. It is in the lands of the village of Bhagvánji, táluka Kapadvanj, district Kaira.

The station consists of a tower of sun-dried bricks, enclosing a perforated pillar of masonry, 23·12 feet in height, with an aperture on the N. side for access to the lower mark. The directions and distances of the circumjacent villages are:—Ántroli E. by N., miles 1⅞; Chára N.N.E., mile 1; Rámpura S. by W., mile ¾; Torna S., miles 2¼; and Dholákua N.N.W., miles 1⅞.

XV. Rúdan Tower Station, lat. 22° 53′, long. 72° 57′—observed at in 1858—stands about ⅓ of a mile N. of the village of this name, 4¾ miles N.N.W. of the town of Mahudha on the high road from Nadiád to Kapadvanj, and 4⅓ miles E. by S. of the large village of Ghodásar on the right bank of the Vátrak river. It is in the lands of the village of Sarasáoni, táluka Mehmadabad, district Kaira.

The station consists of a tower of sun-dried bricks, enclosing a perforated pillar of masonry, 23·04 feet in height, with a mark on its upper surface and another at the ground level, an aperture on the N. side gives access to the latter. The directions and distances of the circumjacent villages are:—Bilia Muváda W., mile ½; Jália N.N.E., mile ¾; Kaloli S.W., miles 1¼; and Sarasáoni (on the Vátrak river) W.N.W., miles 2½.

XVI. Mirzápur Tower Station, lat. 22° 59′, long. 72° 53′—observed at in 1852 and 1858—is situated on a sandy hill, about a mile W. by S. of the village of this name, and 4 miles N.W. by N. of the large village of Haldharvás on the right bank of the Vátrak river. It is in the lands of the village of Chándivel Bhátpura, táluka Daskroi, district Ahmedabad.

The station consists of a tower enclosing a solid pillar of masonry, 18 feet in height, with a mark-stone at the top and others at 3, 8, 13 and 18 feet respectively below it. There is nothing in the records to show that any alteration was made in the construction of the station when it was visited in 1858. The directions and distances of the circumjacent villages are:—Chándivel Bhátpura W.N.W., mile ¾; Várod (on the left bank of the Meshva river) W.S.W., miles 2¾; Kániel S. by E., miles 1½; and Patávat (on the W. bank of the Vátrak river) S.E. by E., miles 3¼.

XVII. Jinjhar Hill Station, lat. 22° 53′, long. 72° 48′—observed at in 1858—is situated on one of the low hills, about 1¼ miles S. by W. of the village so called, and 4½ miles N. of the town of Mehmadabad near the B. B. and C. I. Railway Line. It is in the lands of the village of Rohisa, táluka Mehmadabad, district Kaira.

The station consists of a platform of sun-dried bricks, enclosing a perforated pillar of masonry, 10·04 feet in height, with an aperture on the N. side for access to the ground level mark. It was visited in 1875-76 by the Levelling Party, when the upper mark-stone was found in perfect preservation. The directions and distances of the circumjacent villages are:—Rohisa W.N.W., miles 1¼; Dájipura E. by N., miles 1½; Modej E.S.E., miles 2½; Ghoráli S.E. by S., miles 2; and Ámsarván S.W., miles 2.

XVIII. Vastrál Hill Station, lat. 22° 59′, long. 72° 43′—observed at in 1852 and 1858-59—is situated on a small sand-hill, about ½ a mile S.W. of the village of this name, 5 miles E.S.E. of the city of Ahmedabad, and 6½ miles N. by W. of Bárejadi Railway Station on the B. B. and C. I. Line. It is in the lands of the village of Vastrál, táluka Daskroi, district Ahmedabad.

The station consists of a solid platform, 7 feet in height, enclosing a circular, isolated pillar of masonry. It was visited by the Levelling Party in 1875-76, when the station was found in perfect preservation. The directions and distances of the circumjacent villages are:—Gátrád E.S.E., miles 2½; Mehmadpur S.E., miles 1¼; Rámol S.W. by S., miles 1¼; Singadva N.E. by N., miles 2½; and Vinjhol S.W. by S., miles 3.

XIX. Sonáda Tower Station, lat. 23° 7′, long. 72° 48′—observed at in 1852—stands on rising ground covered with large trees, about a mile S.E. by E. of Sonáda village on the E. bank of the Khári river, and 4¾ miles S.W. of the town of Dehgám on the road from Ahmedabad to Modása. It is in the lands of the village of Sonáda, sub-division Dehgám, Baroda (Vadodra) State.

The station consists of a tower (most probably built like those at the adjacent stations) enclosing a solid pillar of masonry, with a mark-stone in its upper surface and others below at every 5 feet. Four small pillars, with marks thereon, are built around the tower, and the intersection of lines joining these marks indicates the position of the upper mark on the central pillar. The directions and distances of the circumjacent villages are:—Galudan N.W. by N., miles 1¼; Vadodra N. by W., miles 2½; Rathoda Vásna E. by N., miles 2¾; Jalundra Mota S.E., miles 1¼; and Jhánk S.W. by S., miles 2.

XX. Páldi Hill Station, lat. 22° 54′, long. 72° 34′—observed at in 1852 and 1858—is situated on a sandy hill, about 2 miles E. by N. of the large village of Kásandra on the right bank of the Sábarmati river, and 9¾ miles W. of Bárejadi Railway Station of the B. B. and C. I. Line. It is in the lands of the village of Páldi, táluka Daskroi, district Ahmedabad.

The station consists of a platform, 6 feet in height, enclosing a pillar of masonry. The directions and distances of the circumjacent villages are:—Páldi W., mile ½; Miroli S., miles 1¾; Pirána S.E., miles 1¾; and Od N.E. by E., miles 1¾.

XXI. Sola Tower Station, lat. 23° 5′, long. 72° 34′—observed at in 1852—is situated on a small sandy hill, about 200 yards S. of a Bar or Banyan tree, 1 mile N.E. by N. of the village so called, 3 miles N.E. by N. of Ámbli Road Railway Station of the B. B. and C. I. Line, and 5 miles N.W. of the city of Ahmedabad. It is in the lands of the village of Sola, táluka Sánand, district Ahmedabad.

The station consists of a tower, 25 feet in height, enclosing a pillar of masonry in which mark-stones have been placed at every 5 feet. Four small pillars with marks thereon are built around the tower, and the intersection of lines joining these marks indicates the position of the upper mark. It was visited in 1875-76 by the Levelling Party, when the upper mark-stone was found in perfect preservation. The directions and distances of the circumjacent villages are:—Ogánaj N. by W., miles 2; Gota N.E. by E., mile 1; Bháraj W., miles 2½; and Sátej W.N.W., miles 3¼.

XXII. Sánand Tower Station, lat. 22° 59′, long. 72° 25′—observed at in 1852—is situated on a mound immediately S. of and midway between milestones 21 and 22 on the high road from Viramgám to Ahmedabad. The station is about 45 feet E. of a large temple called Hajári Máta; the mound is formed by the ruins of some old buildings, and lies about a mile W. of the large and well known town of Sánand. It is in the lands of the town of Sánand, táluka Sánand, district Ahmedabad.

The station consists of a tower, 12 feet in height, enclosing a pillar of masonry, in which three mark-stones have been fixed. The mark is 49·2 feet from the S.E. corner and 45·9 feet from the N.E. corner of the temple, measured at the height of the top of the tower, equivalent to a height of 9·9 feet measured on the corner of the temple.

XXIII. Hájipur Hill Station, lat. 23° 9′, long. 72° 26′—observed at in 1852—is situated on and towards the southern extremity of a low hill having a large sheet of water on its eastern side, about a mile E. of Sadpha village on the road from the large village of Thol to that of Ádraj Merda. It is in the lands of the village of Hájipur, sub-division Kadi, Baroda State.

The station consists of a platform about 5 feet in height, the lower mark being engraved on a large stone embedded in the masonry. The directions and distances of the circumjacent villages are:—Thol S.S.W., miles 2; Jetlaj S.E. by E., miles 2¾; Bhimásana E., mile 1; Hájipur N.E., miles 2; Ámliyára N.W. by W., miles 2; and Jhálora W., miles 3.

XXIV. Khoraj Tower Station, lat. 23° 2′, long. 72° 17′—observed at in 1852—stands on a mound at the northern edge of a small tank, about 1½ miles E. of the large village of Khoraj Nándoda, and 2½ miles W. by S. of Chhárodi Railway Station on the B. B. and C. I. Line. It is in the lands of the village of Khoraj, sub-division Kadi, Baroda State.

The station consists of a tower of sun-dried bricks, faced with burnt bricks, 18 feet in height, enclosing a pillar of masonry. It was visited in 1875-76 by the Levelling Party, when the tower was found tolerably perfect but the upper mark-stone had disappeared. The upper course of masonry of the pillar was imperfect, but one portion of it appeared to be about the level of the upper mark-stone, and this surface was connected by levelling. The directions and distances of the circumjacent villages are:—Kalána E.S.E., mile 1; Shiaváda S., miles 2¼; Chhárodi E.N.E., miles 2; and Sutárki N., miles 2½.

XXV. Vádhoda Tower Station, lat. 23° 11′, long. 72° 15′—observed at in 1852—stands on a mound at the N.E. corner of a small tank called Jánutaláv, about 2⅔ miles W.S.W. of the large village of Khávad, and 7½ miles N.N.E. of Jakhváda Railway Station of the B. B. and C. I. Line. It is in the lands of the village of Vádhoda, sub-division Kadi, Baroda State.

The station consists of a tower, 12 feet in height, enclosing a pillar of masonry, the upper 5 feet of which is circular and isolated. The directions and distances of the circumjacent villages are:—Vádhoda W. by N., mile ¾; Bhálti N.N.E., miles 2; Nadoli E.S.E., miles 3; Vekra E.S.E., miles 1½; Varkharia S. by W., miles 1¾; and Melaj S.W. by W., miles 2¾.

XXVI. Hásalpur Tower Station, lat. 23° 5′, long. 72° 7′—observed at in 1852—stands on a conical hill, the north-western of two, at the N.E. margin of a large tank called Shertaláv, the other mound having a ruined temple on it. The station is about 3¼ miles S.S.E. of Viramgám Railway Station on the B. B. and C. I. Line, and 3¾ miles W. of Jakhváda village on the main road from Viramgám to Ahmedabad. It is in the lands of the village of Hásalpur, táluka Viramgám, district Ahmedabad.

The station consists of a tower, 21 feet in height, having a mark-stone at the top: it was originally built 16 feet in height and was raised to its present height on the 5th April 1852. It was visited by the Levelling Party in 1875-76, when the upper mark-stone was found in perfect preservation. The directions and distances of the circumjacent villages are:—Hásalpur Sareshvar W.N.W., mile ¾; Soklái (on the Railway line) E.N.E., miles 2½; Kájipur S.W. by W., miles 1½; and Karakthal S.E., miles 3¼.

XXVII. Thuleta Tower Station, lat. 22° 57′, long. 72° 9′—observed at in 1852—stands on the eastern bank of a large tank immediately N. of the village of Thuleta, about 3¾ miles W.S.W. of the large village of Bakrána, and 2¼ miles S. of that of Vásva. It is in the lands of the village of Thuleta, táluka Viramgám, district Ahmedabad.

The station consists of a tower of sun-dried bricks, 16 feet in height, enclosing a pillar of masonry. The directions and distances of the circumjacent villages are:—Vásan E.N.E., miles 2¼; Jaytápur S.S.E., miles 3½; Asalgám S., miles 3; and Ghoda W. by N., miles 2¼.

XXVIII. Khárigángad Tower Station, lat. 22° 58′, long. 72° 1′—observed at in 1852—stands on a mound some 12 feet in height on the S.E. corner of the tank called Ráytaláv, and close to the road from the village of Khárigángad to the town of Vithalgad, and about 2 miles S. of the latter place. It is in the lands of the village of Khárigángad, táluka Lakhtar, Jhálávad State, Káthiáwár Agency.

The station consists of a tower of sun-dried bricks, faced with burnt bricks, 12 feet in height, enclosing a pillar of masonry with marks embedded at every 5 feet. The directions and distances of the circumjacent villages are:—Kalyánpura N.E., miles 2¾; Kamijla E.S.E., miles 3¼; Vadla S.S.E., miles 3; and Khárigángad S., mile 1.

XXIX. Porda Tower Station, lat. 23° 7′, long. 71° 55′—observed at in 1852—stands on a mound at the S.E. corner of a tank, about 200 yards S. of Porda village, about 4¾ miles S.W. by W. of Jhund Railway Station on the B. B. and C. I. Line, and 5¾ miles E. by N. of the town of Bajána. It is in the lands of the village of Porda, táluka Bajána, Jhálávád State, Káthiáwár Agency.

The station consists of a tower 13·2 feet in height. The directions and distances of the circumjacent villages are:—Charáda E.S.E., miles 2¼; Khákharla or Jodávádapáru N.N.W., miles 2; Updiáli N.E. by N., miles 2¼; Godia E. by N., miles 3½; and Shedla W. by N., miles 2¾.

XXX. Ingrodi Tower Station, lat. 22° 57′, long. 71° 51′—observed at in 1852—stands on the western bank of a small tank on the road from the village of Shavlána to Lílápur Railway Station of the B. B. and C. I. Line, and 3¼ miles W. of the latter. It is in the lands of the village of Lílápur, táluka Lakhtar, Jhálávád State, Káthiáwár Agency.

The station as built in March 1852 consisted of a tower of sun-dried bricks, faced with burnt bricks, enclosing a pillar of masonry 16 feet in height. In August of the same year it appears to have been raised 8 feet, 5 inches, and in December following, a further addition of 10 feet was made to its height; the pillar contains marks at the top, bottom and intermediately. It was visited in 1875-76 by the Levelling Party when the mark-stone on the top of the pillar was found in perfect preservation, but the tower was rather dilapidated. The directions and distances of the circumjacent villages are:—Kesadia S.S.W., miles 2; Shavlána W. by N., miles 2; Kárela N.E., miles 2¾; and Ingrodi N. by W., miles 1¼.

XXXI. Dehgám Tower Station, lat. 23° 5′, long. 71° 42′—observed at in 1853—stands on the bank of a small tank on the road from the village of Dehgám to that of Sarvál, about 6¾ miles S.W. by S. of Khárághoda Railway Station, the terminus of the Pátri Branch of the B. B. and C. I. Line, and 7¾ miles W. by S. of the town of Bajána. It is in the lands of the village of Dehgám, táluka Bajána, Jhálávád State, Káthiáwár Agency.

The station consists of a tower enclosing a pillar of masonry 40 feet in height. "The upper mark which was used for "the signals for the Porda observations of season 1851-52 and all the connecting stations of 1852-53 was 12 feet lower than the present "one. Outer marks had been fixed, the intersection of which defined the position of the old one, but the mark from which the final "angles were observed was found to differ 1·27 inches N.W. from that, or in a line forming an azimuth of 126½° less than Porda". The size of the pillar did not admit of a new mark being made which would agree with the old, and it has been necessary to apply to the angles observed at the surrounding stations, corrections to reduce them to the present upper mark. The directions and distances of the circumjacent villages are:—Dehgám N., miles 2; Bharáda W.S.W., miles 4½; Dhrumat S. by W., miles 3½; Sultánpur N.W. by W., miles 4⅛; and Pipli E.S.E., miles 3½.

XXXII. Charádi Tower Station, lat. 22° 55′, long. 71° 38′—observed at in 1852—stands on the eastern bank of a small tank on the road from the village of Hámpur to that of Charádi, and 3¾ miles N. by E. of the town of Sitha on the road from Dhrángadra to Wadhwán (Vadhván). It is in the lands of the village of Charádi, táluka Dhrángadra, Jhálávád State, Káthiáwár Agency.

The station consists of a tower, half solid and half hollow, built of stones and mud cement, 13 feet square and 30 feet in height, enclosing a pillar of stone masonry. As built in 1851 it was only 22 feet in height, and consisted of a solid tower of loose stones enclosing a pillar of stone masonry. The directions and distances of the circumjacent villages are:—Bhárad S.S.E., miles 2⅛; Hámpur S.W. by W., miles 1⅜; Lavána N.W., miles 3½; Charádi E.N.E., miles 2½; and Ganjela S.E. by E., miles 3⅜.

XXXIII. Dhrángadra Tower Station, lat. 23° 1′, long. 71° 31′—observed at in 1852—is built on a rocky table-land, about 2 miles N. by E. of the town of Dhrángadra, and 2⅓ miles W.S.W. of the village of Isadara on the right bank of the Phulka river. It is in the lands of the town of Dhrángadra, táluka Dhrángadra, Jhálávád State, Káthiáwár Agency.

The station consists of a tower of loose stones, 16 feet in height, enclosing a pillar of stone masonry. The directions and distances of the circumjacent villages are:—Haripur E.S.E., miles 3½; Rájpur W. by S., miles 3½; and Sathapur N.W. by N., miles 4.

XXXIV. Nárisána Tower Station, lat. 22° 53′, long. 71° 25′—observed at in 1853—is built on a small rocky hill near the junction of roads from the villages of Kodh, Bávli, Nárisána and Rámpura, and 3¾ miles S.S.W. of Bávli on the right bank of the Phulka river. It is in the lands of the village of Nárisána, táluka Sáyla, Jhálávád State, Káthiáwár Agency.

The station consists of a tower of loose stones with a broad base, 22 feet in height, enclosing a pillar of stone masonry. The directions and distances of the circumjacent villages are:—Nárisána E.S.E. miles 2⅛; Gájanváv N.E. by N., miles 2⅜; Kodh W. by N., miles 4⅛; Rávliávadar S. by E., miles 3⅛; and Rámpura S.S.W., miles 4⅜.

XXXV. Kavádia Tower Station, lat. 23° 1′, long. 71° 20′—observed at in 1852—stands on rising ground, about 1½ miles N. by E. of the small village of Kavádia, and 7 miles E. of the town of Halvad. It is in the lands of the village of Kavádia, táluka Dhrángadra, Jhálávád State, Káthiáwár Agency.

The station consists of a tower of loose stones, 16 feet in height, enclosing a pillar of stone masonry, the upper 5 feet of which is circular and isolated. The directions and distances of the circumjacent villages are:—Pándhara W.N.W., miles 2; Pipalia E.N.E., miles 2¼; Chuli E. by S., miles 3¾; and Butavada N.N.W., miles 3¼.

XVIII.—(*Of the Káthiáwár Meridional Series*). Charádva Tower Station, lat. 22° 57′, long. 71° 6′—observed at in 1852, 1854 and 1856—stands on the bank of a small dry tank near the junction of roads from the villages of Charádva, Kadiána and Susváv. It is in the lands of the village of Kadiána, táluka Dhrángadra, Jhálávád State, Káthiáwár Agency.

The station consists of a tower of stones set in mud cement, 11 feet square and 16 feet in height, enclosing a solid pillar of stone masonry. Four small pillars are built around the tower with marks thereon, and the intersection of lines joining them indicates the position of the upper mark to which the observations refer; the mark at the ground level is 0·65 of an inch to E. of the upper one. When visited in 1856, the upper mark-stone was found displaced by 0·95 of an inch to N.E., but no statement of any alteration in the construction of the station is forthcoming. The directions and distances of the circumjacent villages are:—Charádva S.W., miles 2⅔; Kadiána S.E. by S., miles 2⅓; and Susváv (on the left bank of the Bámbhan river) N.E. by N., miles 3.

XXI.—(*Of the Káthiáwár Meridional Series*). Sápakda Tower Station, lat. 22° 52′, long. 71° 17′—observed at in 1853—stands on rising ground, about 1½ miles S. by E. of the village so called, 3 miles E. by N. of Digadia village close to the right bank of the Bámbhan river, and 5½ miles N.N.E. of the large village of Sara. It is in the lands of the village of Sápakda, táluka Dhrángadra, Jhálávád State, Káthiáwár Agency.

The station consists of a tower of loose stones with a broad base, 26 feet in height, enclosing a pillar of stone masonry. The directions and distances of the circumjacent villages are:—Bhalgámda N.W., miles 3½; Chitrodi S. by W., miles 2⅓; Kodh E. by N., miles 4½; and Ratevália E.S.E., miles 2⅔.

February, 1892.

J. ECCLES,
In charge Computing Office.

GUJARÁT LONGITUDINAL SERIES.

PRINCIPAL TRIANGULATION. TRIANGLES.

No. of Triangle	Station	Spherical Excess	Corrected Plane Angle	Distance		
				Log. feet	Feet	Miles
		"	° ′ ″			
	Karsod, IX*	·79	56 39 45·37	5·0608817	115048·7	21·790
1	Indráwan, XIII*	·79	39 39 56·66	4·9439919	87900·6	16·648
	Kaula-ka-Máta, I	·80	83 40 17·97	5·1363075	136869·7	25·922
	Indráwan, XIII*	1·03	77 9 5·10	5·1578968	143845·7	27·243
2	Kaula-ka-Máta, I	1·02	51 36 29·22	5·0631044	115639·0	21·901
	Thárkheri, II	1·02	51 14 25·68	5·0608817	115048·7	21·790
	Kaula-ka-Máta, I	1·26	40 39 20·42	5·0487763	111886·1	21·191
3	Thárkheri, II	1·26	82 27 20·03	5·2310782	170246·5	32·244
	Khawása, III	1·26	56 53 19·55	5·1578968	143845·7	27·243
	Thárkheri, II	·48	44 19 26·69	4·8933620	78228·0	14·816
4	Khawása, III	·47	43 36 2·79	4·8876770	77210·6	14·623
	Mehwása, IV	·48	92 4 30·52	5·0487763	111886·1	21·191
	Thárkheri, II	·39	82 39 36·59	4·9706777	93471·2	17·703
5	Mehwása, IV	·38	42 19 41·74	4·8025094	63461·4	12·019
	Pípliaban, V	·38	55 0 41·67	4·8876770	77210·6	14·623

NOTE.—The value of the side is given in the same line with the opposite angle.
* These stations appertain to the Khánpisura Meridional Series.

No. of Triangle	Station	Spherical Excess	Corrected Plane Angle			Distance		
						Log. feet	Feet	Miles
		"	°	′	"			
6	Mehwása, IV	·79	68	55	20·81	5·0741648	118621·9	22·466
	Pípliaban, V	·78	63	44	55·31	5·0569651	114015·8	21·594
	Samoi, VI	·78	47	19	43·88	4·9706777	93471·2	17·703
7	Khawása, III	·40	53	48	38·98	4·8558965	71762·3	13·591
	Mehwása, IV	·40	64	34	20·77	4·9047339	80303·4	15·209
	Kukinda, VII	·40	61	37	0·25	4·8933620	78228·0	14·816
8	Mehwása, IV	·65	92	6	3·46	5·1364931	136928·3	25·933
	Samoi, VI	·64	31	34	59·15	4·8558965	71762·3	13·591
	Kukinda, VII	·65	56	18	57·39	5·0569651	114015·8	21·594
9	Samoi, VI	·98	43	49	50·87	5·0005699	100131·3	18·964
	Kukinda, VII	·98	64	54	6·85	5·1170589	130936·0	24·798
	Káphri, VIII	·98	71	16	2·28	5·1364931	136928·3	25·933
10	Samoi, VI	·81	56	6	42·48	5·0442619	110729·1	20·971
	Káphri, VIII	·80	44	53	29·70	4·9737790	94141·0	17·830
	Punákota, IX	·81	78	59	47·82	5·1170589	130936·0	24·798
11	Káphri, VIII	·83	76	11	52·85	5·1100711	128846·1	24·403
	Punákota, IX	·82	47	13	48·61	4·9885433	97396·5	18·446
	Patángdi, XIII*	·83	56	34	18·54	5·0442619	110729·1	20·971
12	Punákota, IX	·71	38	1	58·04	4·9055379	80452·2	15·237
	Patángdi, XIII*	·72	61	18	57·13	5·0590158	114555·5	21·696
	Bhor, XVII*	·72	80	39	4·83	5·1100711	128846·1	24·403
13	Patángdi, XIII*	·50	78	2	9·18	5·0055375	101283·2	19·182
	Bhor, XVII*	·50	50	58	14·37	4·9053978	80426·3	15·232
	Kágarol, XIV*	·50	50	59	36·45	4·9055379	80452·2	15·237
14	Kágarol, XIV*	·39	44	10	25·17	4·8491027	70648·5	13·380
	Bhor, XVII*	·38	43	15	45·22	4·8418802	69483·3	13·160
	Richhia, XVIII*	·39	92	33	49·61	5·0055375	101283·2	19·182
15	Patángdi, XIII*	·32	33	23	2·25	4·7126579	51601·0	9·773
	Kágarol, XIV*	·33	87	33	54·10	4·9717079	93693·2	17·745
	Jathrabhor, XII*	·33	59	3	3·65	4·9053978	80426·3	15·232
16	Jathrabhor, XII*	·30	100	43	59·45	4·9881431	97306·8	18·429
	Kágarol, XIV*	·29	47	51	59·43	4·8659685	73446·1	13·910
	Vardhadi, XV*	·29	31	24	1·12	4·7126579	51601·0	9·773
17	Kágarol, XIV*	·61	53	22	47·60	4·9461985	88348·4	16·733
	Vardhadi, XV*	·62	64	29	32·74	4·9971558	99347·2	18·816
	Ghoráráo, XVI*	·61	62	7	39·66	4·9881431	97306·8	18·429
18	Patángdi, XIII*	·44	38	36	2·69	4·8418802	69483·3	13·160
	Kágarol, XIV*	·44	95	10	2·07	5·0450038	110918·5	21·007
	Richhia, XVIII*	·44	46	13	55·24	4·9053978	80426·3	15·232
19	Kágarol, XIV*	·53	76	1	14·60	5·0277405	106595·9	20·189
	Ghoráráo, XVI*	·53	39	14	14·05	4·8418802	69483·3	13·160
	Richhia, XVIII*	·53	64	44	31·35	4·9971558	99347·2	18·816
20	Vardhadi, XV*	·34	43	8	43·42	4·7848777	60936·5	11·541
	Ghoráráo, XVI*	·35	54	20	24·73	4·8597350	72399·4	13·712
	Jhidia, X	·35	82	30	51·85	4·9461985	88348·4	16·733

* These stations appertain to the Singi Meridional Series.

No. of Triangle	Station	Spherical Excess	Corrected Plane Angle			Distance		
						Log. feet	Feet	Miles
		"	°	′	″			
	Ghoráráo, XVI*	·16	39	33	22·28	4·5924703	39126·4	7·410
21	Jhidia, X	·16	57	46	33·59	4·7157984	51975·5	9·844
	Poeda, XI	·16	82	40	4·13	4·7848777	60936·5	11·541
	Jhidia, X	·12	58	34	13·78	4·6231547	41990·9	7·953
22	Poeda, XI	·12	68	46	1·60	4·6615319	45870·3	8·688
	Rámsádi, XII	·12	52	39	44·62	4·5924703	39126·4	7·410
	Poeda, XI	·14	62	51	14·56	4·6749678	47311·6	8·961
23	Rámsádi, XII	·15	64	58	53·92	4·6828632	48179·6	9·125
	Goalia, XIII	·14	52	9	51·52	4·6231547	41990·9	7·953
	Rámsádi, XII	·16	63	38	18·84	4·7000919	50129·3	9·494
24	Goalia, XIII	·16	58	37	12·39	4·6791011	47764·0	9·046
	Bhagvánji, XIV	·16	57	44	28·77	4·6749678	47311·6	8·961
	Goalia, XIII	·17	52	58	48·24	4·6785886	47707·7	9·036
25	Bhagvánji, XIV	·18	69	59	24·46	4·7493125	56145·2	10·634
	Rúdan, XV	·18	57	1	47·30	4·7000919	50129·3	9·494
	Bhagvánji, XIV	·15	51	50	21·81	4·6361359	43264·9	8·194
26	Rúdan, XV	·15	68	2	45·63	4·7078642	51034·5	9·656
	Mirzápur, XVI	·15	60	6	52·56	4·6785886	47707·7	9·036
	Rúdan, XV	·14	57	36	31·17	4·6532647	45005·4	8·524
27	Mirzápur, XVI	·15	68	7	25·55	4·6942556	49460·2	9·367
	Jinjhar, XVII	·14	54	16	3·28	4·6361359	43264·9	8·194
	Mirzápur, XVI	·17	56	29	57·52	4·6889922	48864·4	9·255
28	Jinjhar, XVII	·17	73	19	25·63	4·7492281	56134·3	10·631
	Vastrál, XVIII	·16	50	10	36·85	4·6532647	45005·4	8·524
	Mirzápur, XVI	·22	63	32	20·43	4·7630075	57943·9	10·974
29	Vastrál, XVIII	·21	56	19	1·06	4·7312541	53858·5	10·200
	Sonáda, XIX	·21	60	8	38·51	4·7492281	56134·3	10·631
	Jinjhar, XVII	·23	47	46	3·89	4·7682559	58648·4	11·108
30	Vastrál, XVIII	·23	94	8	30·46	4·8976383	79002·0	14·963
	Páldi, XX	·22	38	5	25·65	4·6889922	48864·4	9·255
	Vastrál, XVIII	·28	89	2	6·02	4·9193653	83054·9	15·730
31	Sonáda, XIX	·28	46	44	0·81	4·7816623	60487·0	11·456
	Sola, XXI	·27	44	13	53·17	4·7630075	57943·9	10·974
	Vastrál, XVIII	·27	70	19	44·46	4·8365117	68629·6	12·998
32	Páldi, XX	·26	56	5	25·71	4·7816623	60487·0	11·456
	Sola, XXI	·26	53	34	49·83	4·7682559	58648·4	11·108
	Páldi, XX	·28	56	33	5·57	4·7936732	62183·2	11·777
33	Sola, XXI	·28	56	23	35·66	4·7928781	62069·5	11·756
	Sánand, XXII	·28	67	3	18·77	4·8365117	68629·6	12·998
	Sola, XXI	·22	64	7	33·77	4·7823270	60579·7	11·473
34	Sánand, XXII	·22	48	25	11·50	4·7021200	50364·0	9·539
	Hájipur, XXIII	·23	67	27	14·73	4·7936732	62183·2	11·777
	Sánand, XXII	·23	78	20	45·17	4·8386539	68969·0	13·062
35	Hájipur, XXIII	·22	42	18	32·65	4·6757992	47402·3	8·978
	Khoraj, XXIV	·22	59	20	42·18	4·7823270	60579·7	11·473

* This station appertains to the Singi Meridional Series.

No. of Triangle	Station	Spherical Excess	Corrected Plane Angle	Distance		
				Log. feet	Feet	Miles
		"	° ′ ″			
	Hájipur, XXIII	·27	49 56 19·08	4·7518368	56472·5	10·696
36	Khoraj, XXIV	·27	60 52 43·74	4·8092824	64458·8	12·208
	Vádhoda, XXV	·27	69 10 57·18	4·8386539	68969·0	13·062
	Khoraj, XXIV	·22	59 22 58·40	4·7500681	56243·0	10·652
37	Vádhoda, XXV	·22	60 50 12·43	4·7564031	57069·4	10·809
	Hásalpur, XXVI	·22	59 46 49·17	4·7518368	56472·5	10·696
	Khoraj, XXIV	·20	55 48 17·11	4·7209267	52592·9	9·961
38	Hásalpur, XXVI	·21	60 21 36·27	4·7424495	55264·9	10·467
	Thuleta, XXVII	·21	63 50 6·62	4·7564031	57069·4	10·809
	Hásalpur, XXVI	·17	48 35 5·10	4·6541791	45100·3	8·542
39	Thuleta, XXVII	·18	70 25 36·03	4·7533048	56663·7	10·732
	Khárigángad, XXVIII	·18	60 59 18·87	4·7209267	52592·9	9·961
	Hásalpur, XXVI	·28	64 8 13·72	4·8343436	68287·9	12·933
40	Khárigángad, XXVIII	·29	67 33 37·46	4·8459827	70142·8	13·285
	Porda, XXIX	·28	48 18 8·82	4·7533048	56663·7	10·732
	Khárigángad, XXVIII	·27	63 52 40·32	4·8204340	66135·4	12·526
41	Porda, XXIX	·26	48 8 17·03	4·7392400	54858·0	10·390
	Ingrodi, XXX	·27	67 59 2·65	4·8343436	68287·9	12·933
	Porda, XXIX	·33	61 5 38·82	4·8498617	70772·0	13·404
42	Ingrodi, XXX	·34	64 0 52·66	4·8613621	72671·2	13·763
	Dehgám, XXXI	·33	54 53 28·52	4·8204340	66135·4	12·526
	Ingrodi, XXX	·33	53 26 0·73	4·8122658	64903·2	12·292
43	Dehgám, XXXI	·33	65 25 39·03	4·8662323	73490·7	13·919
	Charádi, XXXII	·33	61 8 20·24	4·8498617	70772·0	13·404
	Dehgám, XXXI	·26	49 38 44·05	4·7422735	55242·5	10·463
44	Charádi, XXXII	·26	66 48 17·97	4·8236837	66632·1	12·620
	Dhrángadra, XXXIII	·26	63 32 57·98	4·8122658	64903·2	12·292
	Charádi, XXXII	·27	55 15 36·47	4·8023735	63441·5	12·015
45	Dhrángadra, XXXIII	·27	79 3 6·38	4·8796576	75798·0	14·356
	Nárisána, XXXIV	·27	45 41 17·15	4·7422735	55242·5	10·463
	Dhrángadra, XXXIII	·25	54 14 57·55	4·7565013	57082·3	10·811
46	Nárisána, XXXIV	·25	61 19 52·36	4·7903783	61713·2	11·688
	Kavádia, XXXV	·25	64 25 10·09	4·8023735	63441·5	12·015
	Nárisána, XXXIV	·18	63 34 39·44	4·7397977	54928·5	10·403
47	Kavádia, XXXV	·18	47 53 8·07	4·6580046	45499·3	8·617
	Sápakda, XXI*	·19	68 32 12·49	4·7565013	57082·3	10·811
	Kavádia, XXXV	·30	57 2 46·53	4·8434547	69735·6	13·208
48	Sápakda, XXI*	·30	81 34 55·78	4·9149317	82211·3	15·570
	Charádva, XVIII*	·30	41 22 17·69	4·7397977	54928·5	10·403

* These stations appertain to the Káthiáwár Meridional Series.

June, 1892.

S. G. BURRARD,
In charge of Computing Office.

GUJARÁT LONGITUDINAL SERIES.

SECONDARY TRIANGULATION. TRIANGLES.

SÁBARMATI SECONDARY SERIES.

No. of Triangle	Station		Spherical Excess	Corrected Plane Angle	Distance		
					Log. feet	Feet	Miles
			″	° ′ ″			
	Páldi, XX		·1	42 4 59·1	4·6261135	42278	8·007
49	Sánand, XXII		·1	37 38 18·1	4·5857147	38523	7·296
	Vásna Chácharvádi	s.	·2	100 16 42·8	4·7928781	62069	11·756
	Páldi, XX		·1	58 51 46·7	4·5672407	36918	6·992
50	Vásna Chácharvádi	s.	·1	57 52 4·9	4·5625947	36525	6·918
	Chandisar	h.s.	·1	63 16 8·4	4·5857147	38523	7·296
	Páldi, XX			54 42 44·5	4·5010617	31700	6·004
51	Chandisar	h.s.	·1	55 9 1·8	4·5033930	31871	6·036
	Báreja	„	·1	70 8 13·7	4·5625947	36525	6·918
	Chandisar	h.s.		38 49 42·7	4·3410952	21933	4·154
52	Báreja	„	·1	76 11 5·6	4·5310845	33969	6·434
	Náika	„	·1	64 59 11·7	4·5010617	31700	6·004
	Chandisar	h.s.	·1	55 54 12·0	4·5410993	34762	6·584
53	Náika	„	·1	70 4 38·3	4·5962188	39466	7·475
	Sahej	s.	·1	54 1 9·7	4·5310845	33969	6·434

No. of Triangle	Station		Spherical Excess	Corrected Plane Angle	Distance		
					Log. feet	Feet	Miles
			″	° ′ ″			
	Náika	h.s.	·1	51 46 43·5	4·4385860	27453	5·199
54	Sahej	s.		44 4 27·5	4·3857231	24307	4·604
	Rardhu	„	·1	84 8 49·0	4·5410993	34762	6·584
	Sahej	s.	·1	46 31 5·8	4·4391648	27489	5·206
55	Rardhu	„	·1	87 2 37·9	4·5778929	37835	7·166
	Nandhánpur	h.s.		46 26 16·3	4·4385860	27453	5·199
	Sahej	s.	·1	62 49 45·8	4·5314274	33996	6·439
56	Nandhánpur	h.s.		35 14 2·1	4·3433204	22046	4·175
	Pisáváda	s.	·1	81 56 12·1	4·5778929	37835	7·166
	Nandhánpur	h.s.		41 55 36·2	4·3564636	22723	4·304
57	Pisáváda	s.		49 32 34·9	4·4128941	25876	4·901
	Kalodra	„	·1	88 31 48·9	4·5314274	33996	6·439
	Nandhánpur	h.s.	·1	57 10 50·0	4·5090273	32287	6·115
58	Kalodra	s.	·1	80 28 51·3	4·5785287	37890	7·176
	Bámangám	h.s.		42 20 18·7	4·4128941	25876	4·901

Notes.—1. Names followed by Roman numerals are those of the Principal Stations.
2. The value of the side is given in the same line with the opposite angle.
3. The observations were taken with an 18-inch Theodolite to luminous signals.

No. of Triangle	Station		Spherical Excess	Corrected Plane Angle	Distance		
					Log. feet	Feet	Miles
			"	° ′ ″			
	Kalodra	s.		48 5 9·6	4·4161878	26073	4·938
59	Bámangám	h.s.	·1	64 45 59·4	4·5009743	31694	6·003
	Varsada	„	·1	67 8 51·0	4·5090273	32287	6·115
	Bámangám	h.s.	·1	70 52 41·0	4·5021458	31779	6·019
60	Varsada	„	·1	58 18 7·9	4·4566386	28618	5·420
	Ámbliála	„		50 49 11·1	4·4161878	26073	4·938
	Varsada	h.s.	·1	65 54 16·4	4·5569924	36057	6·829
61	Ámbliála	„	·1	60 31 38·1	4·5363986	34387	6·513
	Rohoni	„		53 34 5·5	4·5021458	31779	6·019
	Varsada	h.s.		40 6 1·5	4·3571806	22760	4·311
62	Rohoni	„	·1	63 12 1·9	4·4988596	31540	5·973
	Golána	s.	·1	76 41 56·6	4·5363986	34387	6·513
	Rohoni	h.s.		36 13 26·7	4·2364485	17236	3·264
63	Golána	s.	·1	92 29 6·0	4·4644930	29140	5·519
	Mitli	h.s.		51 17 27·3	4·3571806	22760	4·311
	Rohoni	h.s.	·1	84 31 2·6	4·5313472	33990	6·437
64	Golána	s.	·1	53 40 48·6	4·4395245	27512	5·211
	Tarakpur	„		41 48 8·8	4·3571806	22760	4·311
	Rohoni	h.s.		48 17 35·9	4·3659102	23223	4·398
65	Mitli	„		62 11 7·6	4·4395246	27512	5·211
	Tarakpur	s.	·1	69 31 16·5	4·4644930	29140	5·519
	Mitli	h.s.	·1	51 25 45·3	4·4370671	27357	5·181
66	Tarakpur	s.	·1	86 59 21·9	4·5433500	34942	6·618
	Pipli	„		41 34 52·8	4·3659102	23223	4·398
	Tarakpur	s.		59 39 59·0	4·3789841	23932	4·533
67	Pipli	„		39 43 18·0	4·2484641	17720	3·356
	Sikotar Máta	„	·1	80 36 43·0	4·4370671	27357	5·181
	Tarakpur	s.		41 28 58·5	4·4576952	28688	5·433
68	Sikotar Máta	„	·1	114 21 55·3	4·5960635	39452	7·472
	Ámbli	„		24 9 6·2	4·2484641	17720	3·356
	Pipli	s.	·1	89 42 40·6	4·4576950	28688	5·433
69	Sikotar Máta	„		33 45 12·3	4·2024782	15940	3·019
	Ámbli	„		56 32 7·1	4·3789841	23932	4·533
	Pipli	s.		76 10 3	4·556667	36030	6·824
70	Ámbli	„		78 23 33	4·560475	36348	6·884
	Válinda	„		25 26 24	4·202478	15940	3·019
	Pipli	s.		52 0 20	4·460190	28853	5·465
71	Válinda	„		44 53 14	4·412254	25838	4·893
	Kámátaláv	„		83 6 26	4·560475	36348	6·884
	Ámbli	s.		47 25 57	4·460190	28853	5·465
72	Válinda	„		19 26 50	4·115393	13043	2·470
	Kámátaláv	„		113 7 13	4·556667	36030	6·824
	Válinda	s.		65 5 3	4·536000	34356	6·507
73	Kámátaláv	„		65 18 17	4·536773	34417	6·518
	Bhadiád	„		49 36 40	4·460190	28853	5·465
	Kámátaláv	s.		67 19 3	4·575023	37586	7·119
74	Bhadiád	„		55 11 6	4·524326	33445	6·334
	Ráhtaláv	„		57 29 51	4·536000	34356	6·507
	Bhadiád	s.		78 31 58	4·679559	47814	9·056
75	Ráhtaláv	„		51 4 44	4·579302	37958	7·189
	Sángásar	„		50 23 18	4·575023	37586	7·119
	Ráhtaláv	s.		56 23 8	4·632860	42940	8·133
76	Sángásar	„		55 35 36	4·628808	42541	8·057
	Khejrátaláv	„		68 1 16	4·679559	47814	9·056
	Sángásar	s.		73 0 56	4·653076	44986	8·520
77	Khejrátaláv	„		41 4 38	4·490059	30907	5·854
	Haibatpur	t.s.		65 54 26	4·632860	42940	8·133
	Khejrátaláv	s.		48 20 47	4·612480	40971	7·760
78	Haibatpur	t.s.		76 31 48	4·726943	53326	10·100
	Bharbhir	„		55 7 25	4·653076	44986	8·520

KÁTHIÁWÁR

MINOR MERIDIONAL SERIES No. 4.

	Khárigángad, XXVIII		·2	43 47 25·3	4·6833508	48234	9·135
79	Ingrodi, XXX		·2	84 17 52·2	4·8410767	69355	13·135
	Anniáli	t.s.	·2	51 54 42·5	4·7392400	54858	10·390
	Khárigángad, XXVIII		·2	45 9 50·3	4·7104911	51344	9·724
80	Anniáli	t.s.	·2	61 31 30·4	4·8037686	63646	12·054
	Nal Báoli	„	·3	73 18 39·3	4·8410767	69355	13·135

NOTE.—Observations of triangles Nos. 59 to 69, 79 and 80 were taken with an 18-inch and those of triangles Nos. 70 to 78 with a 12-inch Theodolite, in both cases to luminous signals.

No. of Triangle	Station		Spherical Excess	Corrected Plane Angle	Distance		
					Log. feet	Feet	Miles
			"	° ′ ″			
	Anniáli	t.s.	·2	74 11 3·4	4·8041310	63699	12·064
81	Nal Báoli	„	·2	54 57 44·7	4·7340563	54207	10·267
	Shiáni	„	·2	50 51 11·9	4·7104911	51344	9·724
	Nal Báoli	t.s.	·2	58 51 9·3	4·7969439	62653	11·866
82	Shiáni	„	·3	60 40 29·2	4·8049952	63826	12·088
	Ralol	„	·3	60 28 21·5	4·8041310	63699	12·064
	Shiáni	t.s.	·2	65 4 40·3	4·7958288	62493	11·836
83	Ralol	„	·2	49 31 31·3	4·7194880	52419	9·928
	Jhámdi	„	·3	65 23 48·4	4·7969439	62653	11·866
	Ralol	t.s.	·2	56 19 49·0	4·7702625	58920	11·159
84	Jhámdi	„	·3	61 41 54·7	4·7947223	62334	11·806
	Advál	„	·3	61 58 16·3	4·7958288	62493	11·836
	Jhámdi	t.s.	·2	57 18 49·3	4·7286398	53535	10·139
85	Advál	„	·2	54 49 19·1	4·7159300	51991	9·847
	Sorta	„	·2	67 51 51·6	4·7702625	58920	11·159
	Advál	t.s.	·1	72 54 45·3	4·7234076	52894	10·018
86	Sorta	„	·1	31 44 52·0	4·4641495	29117	5·515
	Bhutia	s.	·2	75 20 22·7	4·7286398	53535	10·139
	Sorta	t.s.	·1	72 7 32·7	4·7064372	50867	9·634
87	Bhutia	s.	·1	26 7 17·2	4·3716466	23531	4·457
	Sálásar	„	·1	81 45 10·1	4·7234076	52894	10·018
	Bhutia	s.	·1	40 26 31·3	4·5209229	33184	6·285
88	Sálásar	„	·1	43 28 11·9	4·5464658	35194	6·665
	Tagadi	t.s.	·1	96 5 16·8	4·7064372	50867	9·634
	Sorta	t.s.	·1	39 41 53·3	4·5464656	35194	6·665
89	Bhutia	s.	·1	66 33 48·6	4·7037462	50553	9·574
	Tagadi	t.s.	·2	73 44 18·1	4·7234076	52894	10·018
	Sorta	t.s.	·1	81 6 22·9	4·6198252	41670	7·892
90	Sálásar	s.	·1	64 58 54·8	4·5822900	38220	7·239
	Kinára	h.s.	·1	33 54 42·3	4·3716466	23531	4·457
	Sálásar	s.	·1	95 1 9·5	4·7005810	50186	9·505
91	Tagadi	t.s.	·1	43 46 53·6	4·5422997	34858	6·602
	Jhálila	h.s.	·1	41 11 56·9	4·5209229	33184	6·285
	Sálásar	s.	·1	74 46 33·2	4·6700845	46783	8·860
92	Kinára	h.s.	·1	45 58 5·1	4·5422998	34858	6·602
	Jhálila	„	·1	59 15 21·7	4·6198252	41670	7·892
	Tagadi	t.s.	·1	49 17 17·9	4·6217937	41859	7·928
93	Jhálila	h.s.	·2	65 22 29·4	4·7007131	50201	9·508
	Barvála	t.s.	·2	65 20 12·7	4·7005810	50186	9·505
	Tagadi	t.s.	·2	55 26 42·6	4·7619732	57806	10·948
94	Barvála	„	·3	78 53 33·1	4·8380529	68874	13·044
	Haibatpur	„	·2	45 39 44·3	4·7007131	50201	9·508
	Barvála	t.s.	·2	65 7 43·7	4·7319147	53940	10·216
95	Haibatpur	„	·1	38 23 42·1	4·5673325	36926	6·994
	Pátna	s.	·2	76 28 34·2	4·7619732	57806	10·948
*	Haibatpur	t.s.	·2	68 58 40·8	4·7387518	54796	10·378
96	Pátna	s.	·1	44 15 41·9	4·6124797	40971	7·760
	Bharbhir	t.s.	·2	66 45 37·3	4·7319147	53940	10·216

KÁTHIÁWÁR

MINOR MERIDIONAL SERIES NO. 3.

	Charádi, XXXII		·2	31 35 55·3	4·6008536	39889	7·555
97	Nárisána, XXXIV		·2	53 3 22·5	4·7842197	60844	11·524
	Khodu	t.s.	·2	95 20 42·2	4·8796576	75798	14·356
	Charádi, XXXII		·2	41 1 13·7	4·6605960	45772	8·669
98	Khodu	t.s.	·3	78 14 1·9	4·8342520	68273	12·931
	Chamárej	h.s.	·2	60 44 44·4	4·7842197	60844	11·524
	Nárisána, XXXIV		·1	61 59 41·8	4·6522438	44900	8·504
99	Khodu	t.s.	·2	66 20 31·3	4·6682044	46581	8·822
	Kántrodi	h.s.	·1	51 39 46·9	4·6008536	39889	7·555
	Khodu	t.s.	·1	56 54 33·3	4·6316843	42824	8·111
100	Chamárej	h.s.	·1	59 31 14·4	4·6439530	44051	8·343
	Naika	„	·2	63 34 12·3	4·6605960	45772	8·669
	Khodu	t.s.	·2	63 10 10·3	4·6683323	46594	8·825
101	Kántrodi	h.s.	·1	57 31 33·0	4·6439530	44051	8·343
	Naika	„	·1	59 18 16·7	4·6522438	44900	8·504
*	Chamárej	h.s.	·1	52 36 19·9	4·6210312	41786	7·914
102	Naika	„	·2	72 53 9·3	4·7012830	50267	9·520
	Rámpura	s.	·1	54 30 30·8	4·6316843	42824	8·111

* The continuation of this series will be found in the Synoptical Volume of the Káthiáwár Meridional Series.

NOTES.—1. The observations were taken with an 18-inch Theodolite to luminous signals.

2. For Káthiáwár Minor Meridional Series Nos. 1 and 2 see Synoptical Volume of the Káthiáwár Meridional Series.

GUJARÁT LONGITUDINAL SERIES.

SECONDARY TRIANGULATION. TRIANGLES.

PRINCIPAL-AUXILIARY STATIONS, AND INTERSECTED POINTS.

Differences between the common sides of two triangles are shown by the small figures in the 5th and 12th columns between the data of the triangles, the first in order having supplied the greater value.

No. of Triangle	Station	Corrected Plane Angle	Distance			Theodolite used
			Log. feet	Feet	Miles	
		° ′ ″				Inch
	Thárkheri, II	43 50 19	4·764369	58126	11·009	18
108	Mehwása, IV	69 13 44	4·894682	78466	14·861	„
	Ratanáli Hill Mark		4·887677	77211	14·623	
	Mehwása, IV	46 4 58	4·832455	67991	12·877	„
104	Pípliaban, V	35 55 33	4·743360	55381	10·489	„
	Jhábua Palace		4·970678	93471	17·703	
	Samoi, VI	44 24 25	5·012273	102866	19·482	„
105	Kukinda, VII	24 15 22	4·780978	60392	11·438	„
	Jhábua Hill Mark		5·136493	136928	25·933	
	Khawása, III	44 26 30	4·750167	56256	10·655	„
106	Kukinda, VII	47 23 16	4·771805	59130	11·199	„
	Kusalgarh Hill Mark		4·904734	80303	15·209	
	Khawása, III	64 39 29	4·957952	90772	17·192	„
107	Kukinda, VII	62 15 21	4·948855	88890	16·835	„
	Singli Hill Mark		4·904734	80303	15·209	

No. of Triangle	Station	Corrected Plane Angle	Distance			Theodolite used
			Log. feet	Feet	Miles	
		° ′ ″				Inch
	Samoi, VI	44 3 48	4·981825	95901	18·163	18
108	Kukinda, VII	39 8 20	4·939726	87041	16·485	„
	Dohad Fort		5·136493	136928	25·933	
	Samoi, VI	34 44 34	4·735277	54360	10·295	„
109	Punákota, IX	64 31 24	4·935056	86110	16·309	„
	Bilighát Hill Mark		4·973779	94141	17·830	
	Samoi, VI	67 23 18	5·135161	136509	25·854	„
110	Káphri, VIII	50 18 19	5·056082	113784	21·550	„
	Kubhera Hill Mark No. 1		5·117059	130936	24·798	
	Patángdi, XIII*	50 17 19	5·021682	105119	19·909	„
111	Bhor, XVII*	93 38 33	5·134723	136371	25·828	„
	Kubhera Hill Mark No. 2		4·905538	80452	15·237	
				3		
	Punákota, IX	100 51 59	5·134723	136371	25·828	„
112	Patángdi, XIII*	11 1 39	4·424251	26561	5·031	„
	Kubhera Hill Mark No. 2		5·110071	128846	24·403	

* These stations appertain to the Singi Meridional Series.

NOTE.—By a principal-auxiliary station is meant a station auxiliary to a principal station at which observations were taken to fix unvisited points.

No. of Triangle	Station	Corrected Plane Angle	Distance			Theodolite used
			Log. feet	Feet	Miles	
		° ′ ″				Inch
	Punákota, IX	28 54 48	5·003228	100746	19·081	18
113	Patángdi, XIII*	9 16 54	4·526446	33608	6·365	,,
	Khokhra Hill		5·110071	128846	24·403	
	Káphri, VIII	21 25 39	4·803741	63642	12·053	,,
114	Patángdi, XIII*	12 33 55	4·578625	37899	7·178	,,
	Goria Hill Platform		4·988543	97396	18·446	
	Patángdi, XIII*	98 24 28	5·027861	106626	20·194	,,
115	Kágarol, XIV*	33 19 54	4·772510	59226	11·217	,,
	Devgad Báriya Hill		4·905398	80426	15·232	
				5		
	Kágarol, XIV*	17 39 43	4·509898	32352	6·127	,,
116	Bhor, XVII*	90 33 37	5·027861	106626	20·194	,,
	Devgad Báriya Hill		5·005537	101283	19·182	
	Jathrabhor, XII*	59 3 50	4·879688	75803	14·357	,,
117	Kágarol, XIV*	85 12 43	4·944813	88067	16·679	,,
	Patángdi, Hill Mark		4·712658	51601	9·773	
				6		
	Kágarol, XIV*	97 31 14	5·038734	109329	20·706	,,
118	Richhia, XVIII*	43 25 25	4·879688	75803	14·357	,,
	Patángdi Hill Mark		4·841880	69483	13·160	
	Bhor, XVII*	30 55 39	4·587458	38677	7·325	,,
119	Richhia, XVIII*	38 55 18	4·674672	47279	8·954	,,
	Káliákua Hill		4·849103	70648	13·380	
	Bhor, XVII*	16 57 55	4·418743	26227	4·967	,,
120	Richhia, XVIII*	34 50 59	4·710630	51361	9·727	,,
	Richhia h.s.		4·849103	70648	13·380	
				3		
	Kágarol, XIV*	22 23 18	4·710630	51361	9·727	,,
121	Bhor, XVII*	26 17 51	4·776274	59741	11·315	,,
	Richhia h.s.	131 18 51	5·005537	101283	19·182	,,
	Bhor, XVII*	18 49 9	4·418756	26227	4·967	,,
122	Richhia, XVIII*	100 50 44	4·902287	79852	15·124	,,
	Godhra House		4·849103	70648	13·380	
				1		
	Richhia, XVIII*	65 59 45	4·455864	28567	5·410	,,
123	Richhia h.s.	57 0 12	4·418756	26227	4·967	,,
	Godhra House		4·418743	26227	4·967	
	Jathrabhor, XII*	88 27 53	4·785135	60973	11·548	,,
124	Kágarol, XIV*	33 45 24	4·530105	33893	6·419	,,
	Kantár Hill		4·712658	51601	9·773	

No. of Triangle	Station	Corrected Plane Angle	Distance			Theodolite used
			Log. feet	Feet	Miles	
		° ′ ″				Inch
	Kágarol, XIV*	17 14 16	4·701632	50307	9·528	18
125	Ghoráráo, XVI*	18 34 48	4·733129	54092	10·245	,,
	Rena Hill Mark (helio.)		4·997156	99347	18·816	
				2		
	Jathrabhor, XII*	49 29 40	4·733129	54092	10·245	,,
126	Kágarol, XIV*	84 0 32	4·849741	70752	13·400	,,
	Rena Hill Mark (helio.)		4·712658	51601	9·773	
	Ghoráráo, XVI*	70 53 23	4·751389	56414	10·684	,,
127	Poeda, XI	48 35 18	4·651055	44777	8·480	,,
	Dev Dongri Temple		4·715798	51975	9·844	
				0		
	Jhidia, X	103 31 2	4·751389	56414	10·684	,,
128	Poeda, XI	34 4 46	4·512041	32512	6·158	,,
	Dev Dongri Temple		4·592470	39126	7·410	
	Jhidia, X	95 39 59	4·708165	51070	9·672	,,
129	Poeda, XI	34 39 29	4·465158	29185	5·527	,,
	Bori Dongri Hill		4·592470	39126	7·410	
	Jhidia, X	75 51 34	4·637804	43431	8·226	,,
130	Poeda, XI	43 15 47	4·487079	30696	5·814	,,
	Bálásinor Palace		4·592470	39126	7·410	
				1		
	Ghoráráo, XVI*	56 15 25	4·637804	43431	8·226	,,
131	Poeda, XI	39 24 17	4·520555	33155	6·279	,,
	Bálásinor Palace		4·715798	51975	9·844	
	Goalia, XIII	43 6 15	4·536047	34359	6·508	,,
132	Bhagvánji, XIV	42 25 14	4·530443	33919	6·424	,,
	Sorna Hill		4·700092	50129	9·494	
				1		
	Rámsádi, XII	31 48 35	4·530443	33919	6·424	,,
133	Goalia, XIII	15 30 58	4·235889	17214	3·260	,,
	Sorna Hill		4·674968	47312	8·961	
	Vastrál, XVIII	70 42 3	4·756884	57133	10·821	,,
134	Sola, XXI	21 33 41	4·347256	22246	4·213	,,
	Vatuva Dome		4·781662	60487	11·456	
				1		
	Páldi, XX	56 19 4	4·756884	57133	10·821	,,
135	Sola, XXI	32 1 9	4·561137	36403	6·894	,,
	Vatuva Dome		4·836512	68630	12·998	
	Páldi, XX	21 24 16	4·405810	25457	4·821	,,
136	Sola, XXI	58 17 17	4·773355	59341	11·239	,,
	Ahmedabad Mosque		4·836512	68630	12·998	

* These stations appertain to the Singi Meridional Series.

No. of Triangle	Station	Corrected Plane Angle	Distance			Theodolite used
			Log. feet	Feet	Miles	
		° ′ ″		2		Inch
	Vastrál, XVIII	73 44 2	4·773355	59341	11·239	18
137	Páldi, XX	34 41 10	4·546270	35178	6·663	,,
	Ahmedabad Mosque		4·768256	58648	11·108	
	Vastrál, XVIII	5 15 1	4·538797	34578	6·549	,,
138	Sola, XXI	3 57 39	4·416663	26101	4·943	,,
	Ahmedabad Minaret No. 1		4·781662	60487	11·456	
	Páldi, XX	33 2 8	4·613590	41076	7·780	,,
139	Sola, XXI	32 35 13	4·608316	40580	7·686	,,
	Ahmedabad Minaret No. 2		4·836512	68630	12·998	
				2		
	Vastrál, XVIII	33 36 52	4·613590	41076	7·780	,,
140	Sola, XXI	20 59 37	4·424596	26583	5·035	,,
	Ahmedabad Minaret No. 2		4·781662	60487	11·456	
	Vastrál, XVIII	56 47 54	4·690882	49077	9·295	,,
141	Páldi, XX	32 30 50	4·498669	31526	5·971	,,
	Ahmedabad Clock Tower		4·768256	58648	11·108	
				1		
	Páldi, XX	23 34 36	4·487624	30734	5·821	,,
142	Sola, XXI	39 41 40	4·690882	49077	9·295	,,
	Ahmedabad Clock Tower		4·836512	68630	12·998	
	Vastrál, XVIII	20 11 31	4·656094	45300	8·579	,,
143	Páidi, XX	6 21 6	4·161941	14519	2·750	,,
	Ahmedabad Tower of Silence		4·768256	58648	11·108	
	Vastrál, XVIII	5 41 55	4·126383	13378	2·534	,,
144	Páldi, XX	20 6 24	4·665720	46315	8·772	,,
	Od Hill Tree		4·768256	58648	11·108	
	Vastrál, XVIII	13 9 1	4·162774	14547	2·755	,,
145	Sola, XXI	57 55 51	4·733873	54184	10·262	,,
	Thaltej Dome		4·781662	60487	11·456	
				2		
	Vastrál, XVIII	57 10 44	4·733486	54136	10·253	,,
146	Páldi, XX	57 15 30	4·733873	54184	10·262	,,
	Thaltej Dome		4·768256	58648	11·108	
	Porda, XXIX	50 33 55	4·737979	54699	10·360	,,
147	Ingrodi, XXX	60 23 41	4·789410	61576	11·662	,,
	Vithalgad Tree		4·820434	66135	12·526	
				4		
	Khárigángad, XXVIII	84 57 6	4·737979	54699	10·360	,,
148	Ingrodi, XXX	7 35 22	3·860484	7252	1·374	,,
	Vithalgad Tree		4·739240	54858	10·390	
	Khárigángad, XXVIII	65 14 45	4·708963	51164	9·690	18
149	Ingrodi, XXX	37 55 42	4·539469	34631	6·559	,,
	Rájpur Tree		4·739240	54858	10·390	
	Khárigángad, XXVIII	13 14 57	4·168409	14737	2·791	,,
150	Ingrodi, XXX	45 18 20	4·660009	45710	8·657	,,
	Kárela House		4·739240	54858	10·390	
	Khárigángad, XXVIII	10 0 45	4·037458	10901	2·065	,,
151	Ingrodi, XXX	51 1 41	4·687925	48744	9·232	,,
	Lílápur House		4·739240	54858	10·390	
	Charádi XXXII	19 58 37	4·330071	21383	4·050	,,
152	Dhrángadra, XXXIII	41 58 59	4·621868	41867	7·929	,,
	Dhrángadra h.s.	118 2 24	4·742273	55243	10·463	5
				15		
	Charádi, XXXII	35 17 0	4·682483	48137	9·117	18
153	Nárisána, XXXIV	30 9 26	4·621868	41867	7·929	,,
	Dhrángadra h.s.	114 33 34	4·879658	75798	14·356	5
	Dhrángadra, XXXIII	13 41 45	4·036127	10867	2·058	18
154	Dhrángadra h.s.	14 4 15	4·047628	11159	2·113	5
	Dhrángadrá Temple No. 1		4·330071	21383	4·050	
	Charádi, XXXII	7 4 32	3·836890	6869	1·301	18
155	Dhrángadra, XXXIII	75 4 47	4·731462	53884	10·205	,,
	Dhrángadra Temple No. 2		4·742273	55243	10·463	
				2		
	Charádi, XXXII	48 11 5	4·752749	56591	10·718	,,
156	Nárisána, XXXIV	45 12 23	4·731462	53884	10·205	,,
	Dhrángadra Temple No. 2		4·879658	75798	14·356	
	Dhrángadra, XXXIII	12 35 53	4·036187	10869	2·058	,,
157	Dhrángadra h.s.	12 48 45	4·043397	11051	2·093	5
	Dhrángadra Gate		4·330071	21383	4·050	
	Nárisána, XXXIV	13 4 26	4·373448	23629	4·475	18
158	Sápakda, XXI*	12 44 53	4·362673	23050	4·366	,,
	Kodh Temple		4·658005	45499	8·617	
	Nárisána, XXXIV	44 54 44	4·611653	40893	7·745	,,
159	Kavádia, XXXV	54 50 57	4·675396	47358	8·969	,,
	Sápakda Pole		4·756501	57082	10·811	
				8		
	Nárisána, XXXIV	18 39 56	4·180983	15170	2·873	,,
160	Sápakda, XXI*	87 36 46	4·675396	47358	8·969	,,
	Sápakda Pole		4·658005	45499	8·617	

* This station appertains to the Káthiáwár Meridional Series.

No. of Triangle	Station	Corrected Plane Angle	Distance			Theodolite used
			Log. feet	Feet	Miles	
		° ′ ″				Inch
†	Charádva, XVIII*	52 20 13	4·743129	55351	10·483	18
161	Sápakda, XXI*	41 50 47	4·668828	46647	8·835	„
	Halvad Palace		4·843455	69736	13·208	
	SÁBARMATI SECONDARY SERIES.					
	INTERSECTED POINTS.					
	Páldi, XX	64 33 41	4·526330	33599	6·363	„
162	Chandisar h.s.	14 27 28	3·967980	9289	1·759	„
	Pirána Temple		4·562595	36525	6·918	
	Páldi, XX	72 54 3	4·552919	35721	6·765	„
163	Chandisar h.s.	29 19 21	4·262506	18302	3·466	„
	Náj Temple		4·562595	36525	6·918	
	Páldi, XX	26 46 51	4·324994	21135	4·003	„
164	Chandisar h.s.	24 21 40	4·286632	19348	3·664	„
	Vasái Tomb		4·562595	36525	6·918	
	Chandisar h.s.	30 47 22	4·238915	17335	3·283	„
165	Báreja „	38 36 57	4·324994	21135	4·003	„
	Vasái Tomb		4·501062	31700	6·004	
	Báreja h.s.	75 20 36	4·530614	33932	6·427	„
166	Náika „	65 56 59	4·505541	32029	6·066	„
	Chandisar Math		4·341095	21933	4·154	
	Páldi, XX	67 41 18	4·841538	69428	13·149	„
167	Chandisar h.s.	83 11 16	4·872257	74517	14·113	„
	Kaira Temple No. 1		4·562595	36525	6·918	
	Páldi, XX	66 8 38	4·841562	69432	13·150	„
168	Chandisar h.s.	85 5 53	4·878757	75641	14·326	„
	Kaira Temple No. 2		4·562595	36525	6·918	
	Chandisar h.s.	8 52 52	4·559331	36252	6·866	„
169	Náika „	162 48 4	4·841562	69432	13·150	„
	Kaira Temple No. 2		4·531085	33969	6·434	
	Náika h.s.	76 7 50	4·592292	39110	7·407	„
170	Rardhu s.	66 45 29	4·568385	37016	7·011	„
	Kaira Court House		4·385723	24307	4·604	
	Chandisar h.s.	9 22 57	4·568385	37016	7·011	„
171	Náika „	162 0 48	4·845803	70114	13·279	„
	Kaira Court House		4·531085	33969	6·434	
	Chandisar h.s.	8 25 2	4·675035	47319	8·962	„
172	Náika „	165 33 3	4·906659	80660	15·277	„
	Kaira Church		4·531085	33969	6·434	
	Páldi, XX	69 21 53	4·906659	80660	15·277	„
173	Chandisar h.s.	85 33 43	4·934152	85931	16·275	„
	Kaira Church		4·562595	36525	6·918	
	Páldi, XX	5 48 41	4·503995	31915	6·045	„
174	Chandisar h.s.	167 32 3	4·832749	68038	12·886	„
	Dholka Tower		4·562595	36525	6·918	
	Sahej s.	2 52 19	4·287447	19384	3·671	„
175	Nandhánpur h.s.	2 44 25	4·267082	18496	3·503	„
	Vautha House		4·577893	37835	7·166	
	Rardhu s.	14 44 52	3·856720	7190	1·362	„
176	Nandhánpur h.s.	61 58 49	4·396777	24933	4·722	„
	Kháreti Flag		4·439165	27489	5·206	
	Golána s.	128 23 54	4·248970	17741	3·360	„
177	Mitli h.s.	2 0 38	2·899918	794	0·150	„
	Golána Temple		4·236449	17236	3·264	
	Varsada h.s.	1 17 37	2·899918	794	0·150	„
178	Golána s.	62 25 3	4·493877	31180	5·905	„
	Golána Temple		4·498860	31540	5·973	
	Rohoni h.s.	2 15 24	3·204256	1601	0·303	„
179	Mitli „	43 32 38	4·447186	28002	5·303	„
	Mitli Hill Temple		4·464493	29140	5·519	
	Mitli h.s.	14 18 0	4·249903	17779	3·367	„
180	Tarakpur s.	146 52 41	4·594737	39331	7·449	„
	Sikotar Máta Temple		4·365910	23223	4·398	
	Tarakpur s.	59 53 19	4·380391	24010	4·547	„
181	Pipli „	39 49 59	4·249903	17779	3·367	„
	Sikotar Máta Temple		4·437067	27357	5·181	
	Pipli s.	93 31 11	4·583885	38361	7·265	„
182	Ámbli „	61 58 39	4·530549	33927	6·426	„
	Pipli Temple		4·202478	15940	3·019	

* These stations appertain to the Káthiáwár Meridional Series.
† For another triangle to this point, see the Synoptical Volume of the Káthiáwár Meridional Series, by which the value of the common side was greater by 1 foot.

No. of Triangle	Station		Corrected Plane Angle	Distance			Theodolite used
				Log. feet	Feet	Miles	
			° ′ ″				Inch
	Ráhtaláv	s.	31 15 37	4·396033	24890	4·714	12
183	Sángásar	,,	63 17 5	4·631901	42845	8·115	,,
	Gorásu Flag			4·679559	47814	9·056	
	Ráhtaláv	s.	43 25 20	4·541437	34789	6·589	,,
184	Sángásar	,,	27 26 28	4·367794	23324	4·417	,,
	Dholera Temple			4·679559	47814	9·056	
	Haibatpur	t.s.	111 38 37	4·688607	48821	9·246	,,
185	Bharbhir	,,	17 5 30	4·188561	15437	2·924	,,
	Haibatpur Flag-staff			4·612480	40971	7·760	
	Khejrátaláv	s.	31 1 17	4·415797	26049	4·934	,,
186	Haibatpur	t.s.	31 51 5	4·426089	26674	5·052	,,
	Bávlíári Temple			4·653076	44986	8·520	
					5		
	Haibatpur	t.s.	44 40 43	4·461989	28973	5·487	,,
187	Bharbhir	,,	39 12 41	4·415797	26049	4·934	,,
	Bávlíári Temple			4·612480	40971	7·760	
	KÁTHIÁWÁR MINOR MERIDIONAL SERIES No. 4.						
	INTERSECTED POINTS.						
	Ingrodi, XXX		37 26 33	4·467485	29342	5·557	18
188	Anniáli	t.s.	50 35 36	4·571594	37290	7·063	,,
	Dervála Mark (helio.)			4·683351	48234	9·135	
					0		
	Khárigángad, XXVIII		42 49 26	4·571594	37290	7·063	,,
189	Ingrodi, XXX		46 51 19	4·602349	40027	7·581	,,
	Dervála Mark (helio.)			4·739240	54858	10·390	
	Ingrodi, XXX		8 24 57	4·373644	23640	4·477	,,
190	Anniáli	t.s.	8 57 32	4·400593	25153	4·764	,,
	Ádalsar Tree			4·683351	48234	9·135	
	Anniáli	t.s.	34 16 10	4·472472	29681	5·621	,,
191	Nal Báoli	,,	42 39 23	4·552871	35717	6·765	,,
	Rajhásar Mark (helio.)			4·710491	51344	9·724	
					1		
	Anniáli	t.s.	39 54 54	4·547433	35272	6·680	,,
192	Shiáni	,,	40 31 18	4·552871	35717	6·765	,,
	Rajhásar Mark (helio.)			4·734056	54207	10·267	
	Anniáli	t.s.	31 37 8	4·490001	30903	5·853	Inch 18
193	Shiáni	,,	35 15 5	4·531749	34021	6·443	,,
	Jhámpodar Tree			4·734056	54207	10·267	
	Nal Báoli	t.s.	23 52 58	4·512989	32583	6·171	,,
194	Shiáni	,,	28 26 37	4·583552	38331	7·260	,,
	Bhathán Mark (helio.)			4·804131	63699	12·064	
	Shiáni	t.s.	16 20 9	4·401503	25206	4·774	,,
195	Jhámdi	,,	19 27 44	4·475070	29859	5·655	,,
	Bhalgámda Tree			4·719488	52419	9·928	
	Shiáni	t.s.	16 51 31	4·252328	17878	3·386	,,
196	Jhámdi	,,	41 23 10	4·610201	40757	7·719	,,
	Limbdi Building			4·719488	52419	9·928	
	Jhámdi	t.s.	48 58 5	4·677167	47552	9·006	,,
197	Advál	,,	20 12 33	4·337981	21776	4·124	,,
	Khambhláv Tree			4·770263	58920	11·159	
	Jhámdi	t.s.	27 32 32	4·543272	34936	6·617	,,
198	Advál	,,	23 42 16	4·482499	30374	5·753	,,
	Taradia Mota Mark (helio.)			4·770263	58920	11·159	
	Jhámdi	t.s.	3 4 40	4·632174	42872	8·120	,,
199	Advál	,,	1 9 14	4·206281	16080	3·045	,,
	Bhoika Building			4·770263	58920	11·159	
	Jhámdi	t.s.	28 16 42	4·467856	29367	5·562	,,
200	Sorta	,,	28 43 45	4·474149	29795	5·643	,,
	Chachána Mark (helio.)			4·715930	51991	9·847	
					1		
	Advál	t.s.	31 4 28	4·467856	29367	5·562	,,
201	Sorta	,,	39 8 7	4·555214	35910	6·801	,,
	Chachána Mark (helio.)			4·728640	53535	10·139	
	Sorta	t.s.	38 35 35	4·416971	26120	4·947	,,
202	Kinára	h.s.	75 31 5	4·607913	40543	7·679	,,
	Karmad Flag			4·582290	38220	7·239	
	Sorta	t.s.	3 3 50	4·008122	10189	1·930	,,
203	Kinára	h.s.	165 22 12	4·682571	48147	9·119	,,
	Ránpur Minaret			4·582290	38220	7·239	
	Sorta	t.s.	2 53 57	3·892257	7803	1·478	,,
204	Kinára	h.s.	11 26 41	4·485883	30611	5·798	,,
	Nágnes Flag			4·582290	38220	7·239	

No. of Triangle	Station		Corrected Plane Angle	Distance			Theodolite used
				Log. feet	Feet	Miles	
			° ′ ″				Inch
	Sorta	t.s.	74 1 24	4·375522	23742	4·497	18
205	Sálásar	s.	33 38 40	4·136169	13683	2·591	„
	Devlia Flag			4·371647	23531	4·457	
	Sorta	t.s.	31 16 1	4·201722	15912	3·014	„
206	Sálásar	s.	18 52 7	3·996271	9915	1·878	„
	Vágad Tree			4·371647	23531	4·457	
	Sorta	t.s.	46 4 4	4·576661	37728	7·145	„
207	Tagadi	„	59 8 30	4·652940	44972	8·517	„
	Dhandhuka Building			4·703746	50553	9·574	
	Advál	t.s.	56 11 59	4·652940	44972	8·517	„
208	Sorta	„	25 22 42	4·365394	23195	4·393	„
	Dhandhuka Building			4·728640	53535	10·139	
	Jhálila	h.s.	51 30 54	4·545418	35109	6·649	„
209	Barvála	t.s.	59 32 0	4·587252	38659	7·322	„
	Bhimnáth Temple			4·621794	41859	7·928	
	Tagadi	t.s.	13 5 12	4·545418	35109	6·649	„
210	Barvála	„	5 48 13	4·195327	15679	2·970	„
	Bhimnáth Temple			4·700713	50201	9·508	
	Haibatpur	t.s.	37 25 56	4·555034	35895	6·798	„
211	Pátna	s.	76 35 21	4·759250	57445	10·880	„
	Barvála Temple			4·731915	53940	10·216	
	Barvála	t.s.	69 3 14	4·759250	57445	10·880	„
212	Haibatpur	„	0 57 46	3·014324	1034	0·196	„
	Barvála Temple			4·761973	57806	10·948	

KÁTHIÁWÁR MINOR MERIDIONAL SERIES NO. 8.

SECONDARY STATIONS AND INTERSECTED POINTS.

	Nárisána, XXXIV		29 17 29	4·356271	22713	4·302	„
213	Khodu	t.s.	29 56 24	4·364920	23170	4·388	„
	Kherla Hill Mark			4·600854	39889	7·555	
	Khodu	t.s.	56 30 47	4·582304	38221	7·239	„
214	Chamárej	h.s.	36 19 55	4·433792	27151	5·142	„
	Gujarvadi	„		4·660596	45772	8·669	
	Chamárej	h.s.	22 24 2	4·279984	19054	3·609	18
215	Gujarvadi	„	107 44 37	4·677802	47621	9·019	„
	Sitha Temple			4·582304	38221	7·239	
	Khodu	t.s.	39 6 4	4·463098	29047	5·501	„
216	Chamárej	h.s.	57 15 49	4·588164	38740	7·337	„
	Jogia Dongar	„		4·660596	45772	8·669	
					10		
	Charádi, XXXII			4·588164	38740	7·337	
217	Khodu	t.s.	39 7 58	4·594613	39320	7·447	„
	Jogia Dongar	h.s.	102 25 6	4·784220	60844	11·524	„
	Khodu	t.s.	26 22 31	4·397224	24959	4·727	„
218	Chamárej	h.s.	28 10 57	4·423799	26534	5·025	„
	Dánáváda Tower			4·660596	45772	8·669	
					8		
	Chamárej	h.s.	31 20 18	4·400020	25120	4·758	„
219	Naika	„	31 6 53	4·397224	24959	4·727	„
	Dánáváda Tower			4·631684	42824	8·111	
	Khodu	t.s.	22 32 8	4·300893	19994	3·787	„
220	Naika	h.s.	35 4 21	4·476778	29976	5·677	„
	Pandoda Tower			4·643953	44051	8·343	
	Kántrodi	h.s.	6 9 29	3·985725	9677	1·833	„
221	Naika	„	24 56 29	4·580235	38040	7·204	„
	Tikar Tree			4·668332	46594	8·825	
	Naika	h.s.	52 59 7	4·552512	35687	6·759	„
222	Rámpura	s.	57 47 46	4·577698	37818	7·162	„
	Malachi Math			4·621031	41786	7·914	
					4		
	Chamárej	h.s.	60 33 51	4·577698	37818	7·162	„
223	Naika	„	19 54 3	4·169707	14781	2·799	„
	Malachi Math			4·631684	42824	8·111	
	Chamárej	h.s.	95 17 41	4·681862	48069	9·104	„
224	Naika	„	22 11 46	4·260956	18237	3·454	„
	Kheráli Building			4·631684	42824	8·111	
*	Chamárej	h.s.	15 35 47	4·208005	16144	3·058	„
225	Naika	„	118 54 31	4·720682	52563	9·955	„
	Múli Temple			4·631684	42824	8·111	

* For another triangle to this point, see the Synoptical Volume of the Káthiáwár Meridional Series, by which the value of the common side was greater by 16 feet.

MAHI RIVER SECONDARY SERIES.

No. of Triangle	Station		Corrected Plane Angle	Distance: Log. feet	Distance: Feet	Distance: Miles	Theodolite used
			° ′ ″				Inch
	Ghoráráo, XVI*		59 40 54	4·762524	57879	10·962	10
226	Poeda, XI		69 29 49	4·797975	62802	11·894	„
	Ágarva	h.s.	50 49 17	4·715798	51975	9·844	„
	Poeda, XI		36 13 58	4·534205	34214	6·480	„
227	Ágarva	h.s.	52 56 56	4·664625	46198	8·750	„
	Kájipur	s.	90 49 6	4·762524	57879	10·962	„
	Ágarva	h.s.	93 40 35	4·676234	47450	8·987	„
228	Kájipur	s.	40 18 15	4·487929	30756	5·825	„
	Pándvánia	h.s.	46 1 10	4·534205	34214	6·480	„
	Ágarva	h.s.	71 46 14	4·623617	42036	7·961	„
229	Pándvánia	„	64 12 24	4·600400	39847	7·547	„
	Partáppura	s.	44 1 22	4·487929	30756	5·825	6
	Pándvánia	h.s.	48 35 17	4·500260	31642	5·993	10
230	Partáppura	s.	36 30 4	4·399613	25096	4·753	6
	Sandalpur	h.s.	94 54 39	4·623617	42036	7·961	10
	Pándvánia	h.s.	60 53 52	4·432361	27062	5·125	„
231	Sandalpur	„	64 58 40	4·448169	28065	5·315	„
	Od	„	54 7 28	4·399613	25096	4·753	„
	Sandalpur	h.s.	63 36 17	4·438561	27451	5·199	„
232	Od	„	54 22 58	4·396426	24913	4·718	„
	Poicha	s.	62 0 45	4·432361	27062	5·125	„
	Od	h.s.	78 15 33	4·575996	37670	7·134	„
233	Poicha	s.	56 13 19	4·504883	31980	6·057	„
	Sársa	„	45 31 8	4·438561	27451	5·199	„
	Poicha	s.	47 3 51	4·490290	30924	5·857	„
234	Sársa	„	69 49 50	4·598225	39648	7·509	„
	Mángsi	„	63 6 19	4·575996	37670	7·134	„
	Sársa	s.	39 14 9	4·339163	21836	4·136	„
235	Mángsi	„	77 9 24	4·527090	33658	6·375	„
	Vásad	„	63 36 27	4·490290	30924	5·857	„
	Mángsi	s.	67 34 22	4·382094	24104	4·565	Inch 10
236	Vásad	„	55 33 53	4·332581	21507	4·073	„
	Padamla	„	56 51 45	4·339163	21836	4·136	„
	Vásad	s.	63 12 22	4·426463	26697	5·056	„
237	Padamla	„	63 5 33	4·426027	26670	5·051	„
	Ámlol	„	53 42 5	4·382094	24104	4·565	„
	Padamla	s.	53 32 56	4·421549	26397	4·999	„
238	Ámlol	„	72 0 36	4·494327	31212	5·911	„
	Sirkhi	„	54 26 28	4·426463	26697	5·056	„
	Ámlol	s.	51 44 16	4·440534	27576	5·223	„
239	Sirkhi	„	79 31 59	4·538274	34536	6·541	„
	Jáspur	„	48 43 45	4·421549	26397	4·999	„
	Ámlol	s.	52 25 1	4·465929	29237	5·537	„
240	Jáspur	„	58 10 28	4·496190	31347	5·937	„
	Kinkhilod	„	69 24 31	4·538274	34536	6·541	„
	Jáspur	s.	53 41 57	4·437642	27393	5·188	„
241	Kinkhilod	„	66 57 59	4·495268	31280	5·924	„
	Sultánpura	„	59 20 4	4·465929	29237	5·537	„
	Kinkhilod	s.	54 37 37	4·360544	22937	4·344	„
242	Sultánpura	„	48 31 4	4·323748	21074	3·991	„
	Válvod	„	76 51 19	4·437642	27393	5·188	„
	Sultánpura	s.	52 49 29	4·501561	31737	6·011	„
243	Válvod	„	92 0 52	4·599948	39806	7·539	„
	Dehván	„	35 9 39	4·360544	22937	4·344	„
	Sultánpura	s.	52 8 20	4·538916	34587	6·551	„
244	Dehván	„	62 32 42	4·589669	38875	7·363	„
	Káreli	„	65 18 58	4·599948	39806	7·539	„
	Dehván	s.	83 12 27	4·606161	40380	7·648	„
245	Káreli	„	38 31 19	4·403579	25327	4·797	„
	Dhuváran	„	58 16 14	4·538916	34587	6·551	„
	Káreli	s.	44 6 22	4·462450	29003	5·493	„
246	Dhuváran	„	60 12 9	4·558260	36163	6·849	„
	Sárod	„	75 41 29	4·606161	40380	7·648	„
	Jáspur	s.	94 20 29	4·606032	40368	7·645	„
247	Sultánpura	„	35 3 55	4·366577	23258	4·405	„
	Latipur	„	50 35 36	4·495268	31280	5·924	„

* This station appertains to the Singi Meridional Series.

No. of Triangle	Station		Corrected Plane Angle	Distance			Theodolite used
				Log. feet	Feet	Miles	
			° ′ ″				Inch
	Sultánpura	s.	49 42 31	4·514687	32711	6·195	10
248	Latipur	,,	60 1 3	4·569903	37145	7·035	,,
	Jalálpur	,,	70 16 26	4·606032	40368	7·645	,,
	Ágarva	h.s.	41 4 44	4·358791	22845	4·327	,,
249	Kájipur	s.	38 41 37	4·337150	21734	4·116	,,
	Dákor Temple			4·534205	34214	6·480	
	Sultánpura	s.	128 35 56	4·649103	44576	8·442	,,
250	Dehván	,,	7 8 33	3·850758	7092	1·343	,,
	Dabka Court House			4·599948	39806	7·539	
	Sultánpura	s.	50 54 11	4·492713	31097	5·890	,,
251	Dehván	,,	32 31 49	4·333383	21547	4·081	,,
	Válvod Tree			4·599948	39806	7·539	
	Kinkhilod	s.	50 32 53	4·333383	21547 14	4·081	,,
252	Sultánpura	,,	50 26 22	4·332704	21513	4·074	,,
	Válvod Tree			4·437642	27393	5·188	

CAMBAY SECONDARY SERIES.*

	Jambusar	s.	48 42 8	4·495685	31310	5·930	12
253	Tundaj	,,	78 43 3	4·611403	40870	7·741	,,
	Sárod	,,	52 34 49	4·519811	33099	6·269	,,
	Tundaj	s.	68 29 25	4·663393	46067	8·725	12
254	Sárod	,,	72 17 16	4·673653	47169	8·933	,,
	Kávi	,,	39 13 19	4·495685	31310	5·930	,,
	Sárod	s.	71 22 14	4·662118	45932	8·699	,,
255	Kávi	,,	36 45 8	4·462450	29003	5·493	,,
	Dhuváran	,,	71 52 38	4·663393	46067	8·725	,,
	Kávi	s.	80 10 56	4·752389	56544	10·709	,,
256	Dhuváran	,,	46 38 49	4·620413	41727	7·903	,,
	Cambay	,,	53 10 15	4·662118	45932	8·699	,,
	Kávi	s.	42 28 10	4·603779	40159	7·606	,,
257	Cambay	,,	92 58 42	4·773761	59397	11·249	,,
	Bhátha	,,	44 33 8	4·620413	41727	7·903	,,
	Cambay	s.	42 26 22	4·620782	41762	7·909	,,
258	Bhátha	,,	97 6 6	4·788255	61412	11·631	,,
	Rohoni	h.s.	40 27 32	4·603779	40159	7·606	,,
	Cambay	s.	35 57 7	4·556992	36057	6·829	,,
259	Rohoni	h.s.	53 29 22	4·693395	49362	9·349	,,
	Ámbliála	,,	90 33 31	4·788255	61412	11·631	,,
	Kávi	s.	80 13 43	4·752076	56504	10·701	,,
260	Dhuváran	,,	46 32 5	4·619235	41614	7·881	,,
	Cambay Flag-staff			4·662118	45932	8·699	

* The southern portion of this triangulation will be found in the Synoptical Volume of the Singi Meridional Series.

June, 1892.

S. C. BURRARD,
In charge of Computing Office.

GUJARÁT LONGITUDINAL SERIES.

AZIMUTHS OF SURROUNDING STATIONS AND POINTS AT PRINCIPAL, PRINCIPAL-AUXILIARY AND SECONDARY STATIONS.

The following table contains, in the first column, the name of each Principal, Principal-Auxiliary, or Secondary Station, at which azimuths of surrounding Points have been measured; immediately followed by those azimuths. The second column contains the number of the triangle which gives the distance between the Station and the Point.

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Advál t.s.			
Dhandhuka Building		11 6 4	208
Sorta	t.s.	67 18 2·9	85
Chachána Mark (helio.)		98 22 31	201
Bhoika Building		120 58 8	199
Jhámdi	„	122 7 22·2	84
Khambhláv Tree		142 19 55	197
Taradia Mota Mark (helio.)		145 49 38	198
Ralol	„	184 5 38·8	84
Bhutia	s.	354 23 17·5	86
Ágarva h.s.			
Pándvánia	h.s.	32 36 2	228
Dákor Temple		85 11 53	249
Kájipur	s.	126 16 37	227
Poeda, XI		179 13 33	226
Ghoráráo, XVI*		230 2 50	226
Partáppura	„	320 49 48	229
Ámbli s.			
Kámátaláv	s.	78 14 10	72
Válinda	„	125 40 7	70
Pipli Temple		142 5 1	182
Pipli	„	204 3 40·2	69
Tarakpur	„	236 26 41·1	68
Sikotar Máta	„	260 35 47·3	68
Ámbliála h.s.			
Rohoni	h.s.	72 31 30·2	61
Varsada	„	133 3 8·4	60
Bámangám	„	183 52 19·5	60
Cambay	s.	341 57 59	259

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Ámlol s.			
Jáspur	s.	7 24 32	239
Kinkhilod	„	59 49 33	240
Vásad	„	189 57 35	237
Padamla	„	243 39 40	237
Sirkhi	„	315 40 16	238
Anniáli t.s.			
Jhámpodar Tree		29 58 36	193
Ádalsar Tree		161 46 39	190
Ingrodi, XXX		170 44 10·6	79
Dervála Mark (helio.)		221 19 47	188
Khárigángad, XXVIII		222 38 53·3	79
Nal Báoli	t.s.	284 10 23·9	80
Rajhásar Mark (helio.)		318 26 34	191
Shiáni	„	358 21 27·5	81
Bámangám h.s.			
Ámbliála	h.s.	3 52 27·4	60
Varsada	„	74 45 8·5	59
Kalodra	s.	139 31 8·0	58
Nandhánpur	h.s.	181 51 26·7	58
Báreja h.s.			
Náika	h.s.	0 40 12·6	52
Chandisar Math		76 0 49	166
Chandisar	„	76 51 18·3	51
Vasái Tomb		115 28 15	165
Páldi, XX		146 59 32·1	51

* This station appertains to the Singi Meridional Series.

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Barvála t.s.			
Jhálila	h.s.	137 56 59·8	93
Bhimnáth Temple		197 29 0	209
Tagadi	t.s.	203 17 12·7	93
Haibatpur	„	282 10 46·1	94
Pátna	s.	347 18 30·0	95
Barvála Temple		351 14 0	212
Bhadiád s.			
Sángásar	s.	33 28 36	75
Válinda	„	210 8 52	73
Kámátaláv	„	259 45 32	73
Ráhtaláv	„	314 56 38	74
Bhagvánji, XIV			
Rúdan, XV		34 33 25·13	25
Mirzápur, XVI		86 23 47·09	26
Rámsádi, XII		266 49 31·56	24
Sorna Hill		282 8 46	132
Goalia, XIII		324 34 0·49	24
Bharbhir t.s.			
Pátna	s.	108 6 46·5	96
Haibatpur	t.s.	174 52 24·0	78
Haibatpur Flag-staff		191 57 54	185
Bávlíári Temple		214 5 5	187
Khejrátaláv	s.	229 59 49	78
Bhátha s.			
Rohoni	h.s.	166 26 45	258
Cambay	s.	263 32 51	257
Kávi	„	308 5 59	257
Bhor, XVII*			
Richhia, XVIII*		102 31 53·44	14
Richhia	h.s.	119 29 48	120
Godhra House		121 21 2	122
Káliákua Hill		133 27 32	119
Kágarol, XIV*		145 47 39·04	13
Patángdi, XIII*		196 45 53·91	12
Devgad Báriya Hill		236 21 16	116
Punákota, IX		277 24 59·46	12
Kubhera Hill Mark No. 2		290 24 27	111
Bhutia s.			
Tagadi	t.s.	32 29 17·5	88
Sálásar	s.	72 55 48·9	87
Sorta	t.s.	99 3 6·2	86
Advál	„	174 23 29·1	86
Cambay s.			
Bhátha	s.	83 35 32	257
Rohoni	h.s.	126 1 54	258
Ámbliála	„	161 59 1	259
Dhuváran	s.	297 26 35	256
Kávi	„	350 36 50	256

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Chamárej h.s.			
Malachi Math		4 15 6	223
Rámpura	s.	12 12 37·3	102
Múli Temple		49 13 10	225
Naika	h.s.	64 48 57·3	100
Dánáváda Tower		96 9 15	218
Khodu	t.s.	124 20 11·8	98
Gujarvadi	h.s.	160 40 7	214
Jogia Dongar	„	181 36 1	216
Sitha Temple		183 4 9	215
Charádi, XXXII		185 4 56·4	98
Kheráli Building		329 31 16	224
Chandisar h.s.			
Dholka Tower		34 8 5	174
Vásna Chácharvádi	s.	138 23 59·9	50
Páldi, XX		201 40 8·4	50
Pirána Temple		216 7 36	162
Vasái Tomb		226 1 48	164
Náj Temple		230 59 29	163
Báreja	h.s.	256 49 10·3	51
Kaira Temple No. 1		284 51 24	167
Kaira Court House		286 15 56	171
Kaira Temple No. 2		286 46 1	168
Kaira Church		287 13 51	172
Náika	h.s.	295 38 53·0	52
Sahej	s.	351 33 5·1	53
Charádi, XXXII			
Chamárej	h.s.	5 5 21·4	98
Jogia Dongar	„	7 39 39	217
Khodu	t.s.	46 6 35·3	97
Nárisána, XXXIV		77 42 30·77	45
Dhrángadra	h.s.	112 59 31	152
Dhrángadra Temple No. 2		125 53 36	155
Dhrángadra, XXXIII		132 58 7·51	44
Dehgám, XXXI		199 46 25·74	43
Ingrodi, XXX		260 54 46·31	43
Charádva, XVIII†			
Halvad Palace		244 26 43	161
Kavádia, XXXV		255 24 38·13	48
Sápakda, XXI†		296 46 56·12	48
Dehgám, XXXI			
Charádi, XXXII		19 47 57·65	43
Dhrángadra, XXXIII		69 26 41·96	44
Porda, XXIX		259 28 49·44	42
Ingrodi, XXX		314 22 18·29	42
Dehván s.			
Dhuváran	s.	60 31 37	245
Válvod	„	239 36 49	243
Válvod Tree		242 14 39	251
Sultánpura	„	274 46 28	243
Dabka Court House		281 55 1	250
Káreli	„	337 19 10	244

* These stations appertain to the Singi Meridional Series.

† These stations appertain to the Káthiáwár Meridional Series.

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Dhrángadra, XXXIII			
Dhrángadra Gate		7 30 11	157
Dhrángadra Temple No. 1		8 36 3	154
Dhrángadra Temple No. 2		28 0 6	155
Nárisána, XXXIV		31 58 25·26	45
Kavádia, XXXV		86 13 23·06	46
Dehgám, XXXI		249 22 20·37	44
Charádi, XXXII		312 55 18·61	44
Dhrángadra	h.s.	354 54 18	152
Dhrángadra h.s.			
Nárisána, XXXIV		47 30 24	153
Dhrángadra Temple No. 1		160 50 11	154
Dhrángadra Gate		162 5 41	157
Dhrángadra, XXXIII		174 54 26	152
Charádi, XXXII		292 56 50	152
Dhuváran s.			
Kávi	s.	70 51 9	255
Cambay Flag-staff		117 23 14	260
Cambay	„	117 29 58	256
Dehván	„	240 30 8	245
Káreli	„	298 46 22	245
Sárod	„	358 58 31	246
Ghoráráo, XVI*			
Ágarva	h.s.	50 6 10	226
Poeda, XI		109 47 4·19	21
Jhidia, X		149 20 26·63	20
Bálásinor Palace		166 2 29	131
Dev Dongri Temple		180 40 27	127
Vardhadi, XV*		203 40 51·71	17
Rena Hill Mark (helio.)		247 13 44	125
Kágarol, XIV*		265 48 31·98	17
Richhia, XVIII*		305 2 46·56	19
Goalia, XIII			
Rúdan, XV		91 37 13·24	25
Bhagvánji, XIV		144 36 1·65	24
Sorna Hill		187 42 16	132
Rámsádi, XII		203 13 14·20	23
Poeda, XI		255 23 5·86	23
Golána s.			
Tarakpur	s.	9 22 47·0	64
Mitli	h.s.	48 11 4·4	63
Golána Temple		176 34 59	177
Varsada	„	238 0 1·6	62
Rohoni	„	315 41 58·3	62
Gujarvadi h.s.			
Khodu	t.s.	67 48 32	214
Sitha Temple		232 54 37	215
Chamárej	h.s.	340 39 14	214

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Haibatpur t.s.			
Pátna	s.	63 50 50·4	95
Barvála Temple		101 16 47	211
Barvála	t.s.	102 14 32·6	94
Tagadi	„	147 54 17·1	94
Sángásar	s.	212 25 55	77
Haibatpur Flag-staff		243 13 32	185
Khejrátaláv	„	278 20 21	77
Bávliári Temple		310 11 26	186
Bharbhir	t.s.	354 52 9·4	78
Hájipur, XXIII			
Sánand, XXII		7 6 12·90	34
Khoraj, XXIV		49 24 45·77	35
Vádhoda, XXV		99 21 5·12	36
Sola, XXI		299 38 57·94	34
Hásalpur, XXVI			
Khárigángad, XXVIII		37 58 18·67	39
Porda, XXIX		102 6 32·67	40
Vádhoda, XXV		229 14 47·53	37
Khoraj, XXIV		289 1 36·92	37
Thuleta, XXVII		349 23 13·40	38
Indráwan, XIII†			
Thárkheri, II		100 29 58·52	2
Kaula-ka-Máta, I		177 39 4·65	1
Karsod, IX†		217 19 2·10	1
Ingrodi, XXX			
Charádi, XXXII		80 59 48·92	43
Dehgám, XXXI		134 25 49·98	42
Porda, XXIX		198 26 42·98	41
Kárela House		221 7 26	150
Rájpur Tree		228 30 4	149
Vithalgad Tree		258 50 24	147
Khárigángad, XXVIII		266 25 45·90	41
Dervála Mark (helio.)		313 17 5	188
Lílápur House		317 27 27	151
Anniáli	t.s.	350 43 38·3	79
Ádalsar Tree		359 8 35	190
Jalálpur s.			
Sultánpura	s.	160 17 3	248
Latipur	„	230 33 29	248
Jambusar s.			
Tundaj	s.	114 2 55	253
Sárod	„	162 45 3	253
Jáspur s.			
Sultánpura	s.	75 31 49	241
Kinkhilod	„	129 13 46	240
Ámlol	„	187 24 14	239
Sirkhi	„	236 7 59	239
Latipur	„	341 11 20	247

* These stations appertain to the Singi Meridional Series.

† These stations appertain to the Khánpisura Meridional Series.

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Jathrabhor, XII*			
Kágarol, XIV*		7 10 38·82	15
Rena Hill Mark (helio.)		56 40 19	126
Kantár Hill		95 38 32	124
Vardhadi, XV*		107 54 38·57	16
Patángdi Hill Mark		308 6 49	117
Patángdi, XIII*		308 7 34·84	15
Jhálila h.s.			
Kinára	h.s.	152 5 18·6	92
Sálásar	s.	211 20 40·4	91
Tagadi	t.s.	252 32 37·4	91
Bhimnáth Temple		266 24 13	209
Barvála	„	317 55 7·0	93
Jhámdi t.s.			
Limbdi Building		133 35 5	196
Bhalgámda Tree		155 30 31	195
Shiáni	t.s.	174 58 14·9	83
Ralol	„	240 22 3·6	83
Khambhláv Tree		253 5 54	197
Taradia Mota Mark (helio.)		274 31 27	198
Advál	„	302 3 58·6	84
Bhoika Building		305 8 39	199
Chachána Mark (helio.)		331 6 6	200
Sorta	„	359 22 48·1	85
Jhidia, X			
Poeda, XI		27 4 50·71	21
Rámsádi, XII		85 39 4·61	22
Vardhadi, XV*		246 47 24·76	20
Dev Dongri Temple		283 33 49	128
Bori Dongri Hill		291 24 52	129
Bálásinor Palace		311 13 17	130
Ghoráráo, XVI*		329 18 16·96	20
Jinjhar, XVII			
Páldi, XX		93 27 16·18	30
Vastrál, XVIII		141 13 20·30	28
Mirzápur, XVI		214 32 46·10	27
Rúdan, XV		268 48 49·52	27
Jogia Dongar h.s.			
Chamárej	h.s.	1 36 4	216
Khodu	t.s.	85 14 11	216
Charádi, XXXII		187 39 17	217
Kágarol, XIV*			
Richhia, XVIII*		9 54 8·86	14
Ghoráráo, XVI*		85 55 23·99	17
Rena Hill Mark (helio.)		103 9 40	125
Vardhadi, XV*		139 18 12·20	16
Kantár Hill		153 24 48	124
Jathrabhor, XII*		187 10 11·92	15
Patángdi Hill Mark		272 22 55	117
Patángdi, XIII*		274 44 6·35	13
Devgad Báriya Hill		308 4 0	115
Bhor, XVII*		325 43 43·30	13
Richhia	h.s.	348 7 1	121

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Kájipur s.			
Poeda, XI		215 25 37	227
Ágarva	h.s.	306 14 43	227
Dákor Temple		344 56 20	249
Pándvánia	„	346 32 58	228
Kalodra s.			
Varsada	h.s.	7 34 51·8	59
Pisávada	s.	150 29 1·8	57
Nandhánpur	h.s.	239 0 50·8	57
Bámangám	„	319 29 42·2	58
Kámátaláv s.			
Ráhtaláv	s.	12 28 45	74
Bhadiád	„	79 47 48	73
Válinda	„	145 6 5	71
Pipli	„	228 12 31	71
Ámbli	„	258 13 18	72
Kántrodi h.s.			
Nárisána, XXXIV		192 39 44·9	99
Khodu	t.s.	244 19 31·9	99
Tikar Tree		295 41 36	221
Naika	h.s.	301 51 5·0	101
Káphri, VIII			
Punákota, IX		2 48 56·86	10
Kubhera Hill Mark No. 1		8 13 45	110
Goria Hill Platform		57 35 12	114
Patángdi, XIII*		79 0 50·54	11
Kukinda, VII		246 39 23·10	9
Samoi, VI		317 55 26·36	9
Káreli s.			
Sárod	s.	74 42 23	246
Dhuváran	„	118 48 45	245
Dehván	„	157 20 4	244
Sultánpura	„	222 39 2	244
Karsod, IX†			
Indráwan, XIII†		37 24 48·90	1
Kaula-ka-Máta, I		94 4 35·06	1
Kaula-ka-Máta, I			
Thárkheri, II		49 15 15·17	2
Khawása, III		89 54 36·85	3
Karsod, IX†		273 58 26·16	1
Indráwan, XIII†		357 38 44·93	1
Kavádia, XXXV			
Sápakda, XXI‡		18 27 23·88	47
Sápakda Pole		25 25 13	159
Charádva, XVIII‡		75 30 10·71	48
Dhrángadra, XXXIII		266 9 5·29	46
Nárisána, XXXIV		330 34 15·63	46

* These stations appertain to the Singi Meridional Series.
† These stations appertain to the Khánpisura Meridional Series.
‡ These stations appertain to the Káthiáwár Meridional Series.

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Kávi s.			
Bhátha	s.	128 9 9	257
Cambay Flag-staff		170 34 32	260
Cambay	„	170 37 19	256
Dhuváran	„	250 48 15	255
Sárod	„	287 33 23	254
Tundaj	„	326 46 42	254
Khárigángad, XXVIII			
Anniáli	t.s.	42 42 8·9	79
Dervála Mark (helio.)		43 40 8	189
Lílápur House		76 28 49	151
Ingrodi, XXX		86 29 34·42	41
Kárela House		99 44 31	150
Porda, XXIX		150 22 15·01	40
Rájpur Tree		151 44 19	149
Vithalgad Tree		171 26 40	148
Hásalpur, XXVI		217 55 52·76	39
Thuleta, XXVII		278 55 11·81	39
Nal Báoli	t.s.	357 32 18·4	80
Khawása, III			
Mehwása, IV		10 12 4·41	4
Kukinda, VII		64 0 43·79	7
Kusalgarh Hill Mark		108 27 14	106
Singli Hill Mark		128 40 13	107
Kaula-ka-Máta, I		269 42 40·34	3
Thárkheri, II		326 36 1·15	3
Khejrátaláv s.			
Bharbhir	t.s.	50 2 33	78
Bávliári Temple		67 22 3	186
Haibatpur	„	98 23 20	77
Sángásár	s.	139 27 58	76
Ráhtaláv	„	207 29 14	76
Khodu t.s.			
Naika	h.s.	1 12 8·8	100
Pandoda Tower		23 44 17	220
Kántrodi	„	64 22 19·3	99
Nárisána, XXXIV		130 42 50·8	97
Kherla Hill Mark		160 39 15	213
Charádi, XXXII		226 3 33·2	97
Gujarvadi	„	247 46 48	214
Jogia Dongar	„	265 11 31	216
Chamárej	„	304 17 35·4	98
Dánáváda Tower		330 40 6	218
Khoraj, XXIV			
Thuleta, XXVII		53 17 5·85	38
Hásalpur, XXVI		109 5 23·16	37
Vádhoda, XXV		168 28 21·78	36
Hájipur, XXIII		229 21 5·79	35
Sánand, XXII		288 41 48·19	35

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Kinára h.s.			
Ránpur Minaret		86 48 51	203
Karmad Flag		176 39 58	202
Nágnes Flag		240 44 22	204
Sorta	t.s.	252 11 2·5	90
Sálásar	s.	286 5 44·9	90
Jhálila	h.s.	332 3 50·1	92
Kinkhilod s.			
Sultánpura	s.	16 10 13	241
Válvod Tree		66 43 6	252
Válvod	„	70 47 50	242
Ámlol	„	239 47 43	240
Jáspur	„	309 12 14	240
Kukinda, VII			
Samoi, VI		1 51 39·51	8
Jhábua Hill Mark		24 15 22	105
Dohad Fort		41 0 0	108
Káphri, VIII		66 45 47·34	9
Singli Hill Mark		181 40 20	107
Kusalgarh Hill Mark		196 32 25	106
Khawása, III		243 55 40·82	7
Mehwása, IV		305 32 41·47	7
Latipur s.			
Jalálpur	s.	50 35 11	248
Sultánpura	„	110 36 14	247
Jáspur	„	161 11 50	247
Mángsi s.			
Padamla	s.	3 38 41	236
Vásad	„	71 13 3	235
Sársa	„	148 22 27	234
Poicha	„	211 28 46	234
Mehwása, IV			
Jhábua Palace		10 40 18	104
Samoi, VI		33 30 41·16	6
Kukinda, VII		125 36 45·27	7
Khawása, III		190 11 6·44	4
Ratanáli Hill Mark		213 1 53	103
Thárkheri, II		282 15 37·44	4
Pípliaban, V		324 35 19·56	5
Mirzápur, XVI			
Jinjhar, XVII		34 34 32·56	27
Vastrál, XVIII		91 4 30·25	28
Sonáda, XIX		154 36 50·89	29
Bhagvánji, XIV		266 20 14·15	26
Rúdan, XV		326 27 6·86	26

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Mitli h.s.			
Pipli	s.	33 4 32·4	66
Golána Temple		226 9 34	177
Golána	„	228 10 12·1	63
Rohoni	h.s.	279 27 39·4	63
Mitli Hill Temple		323 0 17	179
Tarakpur	s.	341 38 47·0	65
Sikotar Máta Temple		355 56 47	180
Naika h.s.			
Múli Temple		3 40 48	225
Kántrodi	h.s.	121 53 48·2	101
Pandoda Tower		146 7 44	220
Tikar Tree		146 50 17	221
Khodu	t.s.	181 12 5·0	100
Dánáváda Tower		213 39 25	219
Chamárej	h.s.	244 46 17·5	100
Malachi Math		264 40 20	222
Kheráli Building		266 58 4	224
Rámpura	s.	317 39 27·0	102
Náika h.s.			
Sahej	s.	45 36 21·3	53
Chandisar Math		114 43 13	166
Chandisar	h.s.	115 40 59·7	52
Báreja	„	180 40 11·5	52
Kaira Court House		277 41 48	170
Kaira Temple No. 2		278 29 4	169
Kaira Church		281 14 3	172
Rardhu	s.	353 49 37·7	54
Nal Báoli t.s.			
Bhathán Mark (helio.)		25 23 7	194
Shiáni	t.s.	49 16 5·2	81
Rajhásar Mark (helio.)		61 34 27	191
Anniáli	„	104 13 50·1	80
Khárigángad, XXVIII		177 32 29·7	80
Ralol	„	350 24 55·7	82
Nandhánpur h.s.			
Bámangám	h.s.	1 51 31·5	58
Kalodra	s.	59 2 21·6	57
Pisáváda	„	100 57 57·8	56
Vautha House		133 27 35	175
Sahej	„	136 11 59·9	55
Rardhu	„	182 38 16·2	55
Kháreti Flag		244 37 5	176
Nárisána, XXXIV			
Kántrodi	h.s.	12 40 27·2	99
Sápakda, XXI*		87 1 32·94	47
Kodh Temple		100 5 59	158
Sápakda Pole		105 41 29	159
Kavádia, XXXV		150 36 12·56	46
Dhrángadra, XXXIII		211 56 5·17	45
Dhrángadra Temple No. 2		212 25 0	156
Dhrángadra	h.s.	227 27 57	153
Charádi, XXXII		257 37 22·59	45
Kherla Hill Mark		281 23 16	213
Khodu	t.s.	310 40 45·3	97

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Od h.s.			
Sársa	s.	33 1 35	233
Pándvánia	h.s.	206 15 36	231
Sandalpur	„	260 23 4	231
Poicha	s.	314 46 2	232
Padamla s.			
Sirkhi	s.	10 8 21	238
Ámlol	„	63 41 17	237
Vásad	„	126 46 50	236
Mángsi	„	183 38 35	236
Páldi, XX			
Chandisar	h.s.	21 41 4·4	50
Dholka Tower		27 29 45	174
Vásna Chácharvádi	s.	80 32 51·2	49
Sánand, XXII		122 37 50·36	33
Thaltej Dome		178 0 52	146
Sola, XXI		179 10 56·21	32
Ahmedabad Mosque		200 35 12	136
Ahmedabad Clock Tower		202 45 32	141
Ahmedabad Minaret No. 2		212 13 4	139
Od Hill Tree		215 9 58	144
Ahmedabad Tower of Silence		228 45 16	143
Vastrál, XVIII		235 16 22·18	30
Vatuva Dome		235 30 0	135
Jinjhar, XVII		273 21 48·05	30
Náj Temple		308 47 1	163
Kaira Church		312 19 11	173
Kaira Temple No. 1		313 59 46	167
Kaira Temple No. 2		315 32 26	168
Pirána Temple		317 7 23	162
Báreja	h.s.	326 58 19·9	51
Vasái Tomb		354 54 13	164
Pándvánia h.s.			
Od	h.s.	26 16 27	231
Kájipur	s.	166 33 44	228
Ágarva	h.s.	212 34 54	228
Partáppura	s.	276 47 18	229
Sandalpur	h.s.	325 22 35	230
Partáppura s.			
Sandalpur	h.s.	60 20 6	230
Pándvánia	„	96 50 10	229
Ágarva	„	140 51 32	229
Patángdi, XIII†			
Bhor, XVII†		16 47 29·94	12
Richhia, XVIII†		56 13 36·49	18
Kágarol, XIV†		94 49 39·62	13
Jathrabhor, XII†		128 12 42·19	15
Káphri, VIII		258 54 12·72	11
Goria Hill Platform		271 28 8	114
Punákota, IX		315 28 32·09	11
Khokhra Hill		324 45 26	113
Kubhera Hill Mark No. 2		326 30 11	111
Devgad Báriya Hill		356 25 12	115

* This station appertains to the Káthiáwár Meridional Series.

† These stations appertain to the Singi Meridional Series.

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Pátna s.			
Barvála Temple		167 12 16	211
Barvála	t.s.	167 19 2·5	95
Haibatpur	„	243 47 36·9	95
Bharbhir	„	288 3 18·9	96
Pipli s.			
Ámbli	s.	24 4 6·5	69
Kámátaláv	„	48 13 50	71
Válinda	„	100 14 10	70
Pipli Temple		117 35 18	182
Mitli	h.s.	213 3 15·0	66
Tarakpur	s.	254 38 7·8	66
Sikotar Máta	„	294 21 25·8	67
Sikotar Máta Temple		294 28 7	181
Pípliaban, V			
Samoi, VI		80 54 7·76	6
Jhábua Palace		108 43 31	104
Mehwása, IV		144 39 3·85	5
Thárkheri, II		199 39 45·90	5
Pisáváda s.			
Sahej	s.	198 59 28·7	56
Nandhánpur	h.s.	280 55 40·9	56
Kalodra	s.	330 28 15·8	57
Poeda, XI			
Kájipur	s.	35 27 28	227
Goalia, XIII		75 26 19·94	23
Rámsádi, XII		138 17 34·64	22
Jhidia, X		207 3 36·36	21
Dev Dongri Temple		241 8 22	127
Bori Dongri Hill		241 43 5	129
Bálásinor Palace		250 19 23	130
Ghoráráo, XVI*		289 43 40·65	21
Ágarva	h.s.	359 13 30	226
Poicha s.			
Mángsi	s.	31 30 12	234
Sársa	„	78 34 3	233
Od	h.s.	134 47 22	232
Sandalpur	„	196 48 7	232
Porda, XXIX			
Ingrodi, XXX		18 28 10·72	41
Dehgám, XXXI		79 33 49·87	42
Hásalpur, XXVI		282 1 44·33	40
Vithalgad Tree		327 54 16	147
Khárigángad, XXVIII		330 19 53·43	40
Punákota, IX			
Kubhera Hill Mark No. 2		34 42 46	112
Bhor, XVII*		97 32 46·20	12
Khokhra Hill		106 39 57	113
Patángdi, XIII*		135 34 44·95	11
Káphri, VIII		182 48 34·38	10
Samoi, VI		261 48 23·01	10
Bilighát Hill Mark		326 19 47	109

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Ráhtaláv s.			
Khejrátaláv	s.	27 30 33	76
Sángásar	„	83 53 41	75
Gorásu Flag		115 9 18	183
Dholera Temple		127 19 1	184
Bhadiád	„	134 58 25	74
Kámátaláv	„	192 28 16	74
Ralol t.s.			
Advál	t.s.	4 5 56·9	84
Jhámdi	„	60 25 46·1	83
Shiáni	„	109 57 17·6	82
Nal Báoli	„	170 25 39·4	82
Rámpura s.			
Naika	h.s.	137 41 22·6	102
Chamárej	„	192 11 53·5	102
Malachi Math		195 29 9	222
Rámsádi, XII			
Goalia, XIII		23 14 32·04	23
Sorna Hill		55 3 7	133
Bhagvánji, XIV		86 52 51·04	24
Jhidia, X		265 35 53·23	22
Poeda, XI		318 15 37·97	22
Rardhu s.			
Nandhánpur	h.s.	2 38 21·4	55
Sahej	s.	89 40 59·4	54
Náika	h.s.	173 49 48·5	54
Kaira Court House		240 35 18	170
Kháreti Flag		347 53 29	176
Richhia, XVIII*			
Ghoráráo, XVI*		125 8 47·53	19
Godhra House		181 36 25	122
Kágarol, XIV*		189 53 19·41	14
Patángdi Hill Mark		233 18 44	118
Patángdi, XIII*		236 7 15·09	18
Káliákua Hill		243 31 51	119
Richhia	h.s.	247 36 10	120
Bhor, XVII*		282 27 9·41	14
Richhia h.s.			
Richhia, XVIII*		67 37 50	120
Godhra House		124 38 2	123
Kágarol, XIV*		168 7 53	121
Bhor, XVII*		299 26 44	120
Rohoni h.s.			
Tarakpur	s.	51 12 0·3	64
Mitli Hill Temple		97 14 12	179
Mitli	h.s.	99 29 36·2	63
Golána	s.	135 43 2·9	62
Varsada	h.s.	198 55 4·9	61
Ámbliála	„	252 29 10·4	61
Cambay	s.	305 58 33	258
Bhátha	„	346 26 5	258

* These stations appertain to the Singi Meridional Series.

Name of Station with Azimuths of surrounding Points			No. of Triangle giving Distance
Rúdan, XV		° ′ ″	
Jinjhar, XVII		88 52 15·22	27
Mirzápur, XVI		146 28 46·53	26
Bhagvánji, XIV		214 31 32·31	25
Goalia, XIII		271 33 19·79	25
Sahej s.			
Pisáváda	s.	18 59 58·2	56
Chandisar	h.s.	171 33 29·1	53
Náika	„	225 34 38·9	53
Rardhu	s.	269 39 6·4	54
Nandhánpur	h.s.	316 10 12·3	55
Vautha House		319 2 31	175
Sálásar s.			
Jhálila	h.s.	31 21 53·6	91
Kinára	„	106 8 26·9	90
Devlia Flag		137 28 42	205
Sorta	t.s.	171 7 21·8	87
Vágad Tree		189 59 29	206
Bhutia	s.	252 52 32·0	87
Tagadi	t.s.	296 20 44·0	88
Samoi, VI			
Bilighát Hill Mark		47 10 12	109
Kubhera Hill Mark No. 1		70 38 11	110
Punákota, IX		81 54 45·94	10
Dohad Fort		137 47 33	108
Káphri, VIII		138 1 29·23	9
Kukinda, VII		181 51 21·08	8
Mehwása, IV		213 26 20·87	6
Jhábua Hill Mark		226 15 46	105
Pípliaban, V		260 46 5·53	6
Sánand, XXII			
Khoraj, XXIV		108 44 56·07	35
Hájipur, XXIII		187 5 41·47	34
Sola, XXI		235 30 53·19	33
Páldi, XX		302 34 12·24	33
Vásna Chácharvádi	s.	340 12 30·4	49
Sandalpur h.s.			
Poicha	s.	16 48 37	232
Od	h.s.	80 24 54	231
Pándvánia	„	145 23 34	230
Partáppura	s.	240 18 13	230
Sángásar s.			
Haibatpur	t.s.	32 27 2	77
Gorásu Flag		200 33 25	183
Bhadiád	s.	213 27 12	75
Dholera Temple		236 24 2	184
Ráhtaláv	„	263 50 30	75
Khejrátaláv	„	319 26 6	76

Name of Station with Azimuths of surrounding Points			No. of Triangle giving Distance
Sápakda, XXI*		° ′ ″	
Charádva, XVIII*		116 51 15·31	48
Halvad Palace		158 42 2	161
Sápakda Pole		179 21 38	160
Kavádia, XXXV		198 26 11·39	47
Kodh Temple		254 13 31	158
Nárisána, XXXIV		266 58 24·07	47
Sárod s.			
Tundaj	s.	35 19 3	253
Kávi	„	107 36 19	254
Dhuváran	„	178 58 33	246
Káreli	„	254 40 2	246
Jambusar	„	342 44 14	253
Sársa s.			
Vásad	s.	7 35 30	235
Od	h.s.	213 0 23	233
Poicha	s.	258 31 31	233
Mángsi	„	328 21 21	234
Shiáni t.s.			
Bhalgámda Tree		11 18 5	195
Limbdi Building		11 49 27	196
Jhámpodar Tree		143 6 29	193
Anniáli	t.s.	178 21 33·9	81
Rajhásar Mark (helio.)		218 52 52	192
Nal Báoli	„	229 12 46·0	81
Bhathán Mark (helio.)		257 39 23	194
Ralol	„	289 53 15·5	82
Jhámdi	„	354 57 56·0	83
Sikotar Máta s.			
Ámbli	s.	80 37 41·7	68
Pipli	„	114 22 54·0	67
Tarakpur	„	194 59 37·1	67
Sirkhi s.			
Jáspur	s.	56 9 32	239
Ámlol	„	135 41 31	238
Padamla	„	190 7 59	238
Sola, XXI			
Thaltej Dome		3 31 53	145
Sánand, XXII		55 34 28·05	33
Hájipur, XXIII		119 42 2·04	34
Sonáda, XIX		261 22 8·58	31
Ahmedabad Mosque		300 53 35	136
Vastrál, XVIII		305 36 2·02	31
Ahmedabad Minaret No. 2		309 33 41	139
Ahmedabad Clock Tower		319 29 12	142
Ahmedabad Minaret No. 1		326 35 39	138
Vatuva Dome		327 9 43	134
Páldi, XX		359 10 52·11	32

* These stations appertain to the Káthiáwár Meridional Series.

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Sonáda, XIX			
Vastrál, XVIII		34 43 52·73	29
Sola, XXI		81 27 53·82	31
Mirzápur, XVI		334 35 14·01	29
Sorta t.s.			
Devlia Flag		65 8 31	205
Kinára	h.s.	72 13 30·1	90
Nágnes Flag		75 7 27	204
Ránpur Minaret		75 17 20	203
Karmad Flag		110 49 5	202
Jhámdi	t.s.	179 22 50·4	85
Chachána Mark (helio.)		208 6 35	200
Advál	„	247 14 42·2	85
Dhandhuka Building		272 37 24	207
Bhutia	s.	278 59 34·3	86
Tagadi	t.s.	318 41 27·7	89
Vágad Tree		319 51 6	206
Sálásar	s.	351 7 7·1	87
Sultánpura s.			
Káreli	s.	42 40 49	244
Dehván	„	94 49 9	243
Válvod Tree		145 43 20	251
Válvod	„	147 38 38	242
Kinkhilod	„	196 9 42	241
Jáspur	„	255 29 46	241
Latipur	„	290 33 41	247
Dabka Court House		326 13 13	250
Jalálpur	„	340 16 12	248
Tagadi t.s.			
Barvála	t.s.	23 18 32·4	93
Bhimnáth Temple		36 23 44	210
Jhálila	h.s.	72 35 50·4	91
Sálásar	s.	116 22 44·1	88
Sorta	t.s.	138 43 42·7	89
Dhandhuka Building		197 52 13	207
Bhutia	s.	212 28 1·0	88
Haibatpur	t.s.	327 51 49·6	94
Tarakpur s.			
Sikotar Máta	s.	14 59 55·7	67
Ámbli	„	56 28 54·2	68
Pipli	„	74 39 54·7	66
Mitli	h.s.	161 39 16·7	65
Golána	s.	189 22 24·5	64
Rohoni	h.s.	231 10 33·3	64
Thárkheri, II			
Pípliaban, V		19 41 14·35	5
Mehwása, IV		102 20 51·33	4
Ratanáli Hill Mark		146 11 10	103
Khawása, III		146 40 18·50	3
Kaula-ka-Máta, I		229 7 39·79	2
Indráwan, XIII*		280 22 6·49	2

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Thuleta, XXVII			
Khárigángad, XXVIII		98 58 17·71	39
Hásalpur, XXVI		169 23 53·92	38
Khoraj, XXIV		233 14 0·75	38
Tundaj s.			
Kávi	s.	146 48 26	254
Sárod	„	215 17 51	253
Jambusar	„	294 0 54	253
Vádhoda, XXV			
Hásalpur, XXVI		49 17 46·96	37
Hájipur, XXIII		279 16 36·86	36
Khoraj, XXIV		348 27 34·31	36
Válinda s.			
Bhadiád	s.	30 10 2	73
Pipli	„	280 11 45	70
Ámbli	„	305 38 9	70
Kámátaláv	„	325 4 59	71
Válvod s.			
Dehván	s.	59 38 40	243
Kinkhilod	„	250 46 29	242
Sultánpura	„	327 37 48	242
Vardhadi, XV†			
Ghoráráo, XVI†		23 43 20·10	17
Jhidia, X		66 52 3·86	20
Jathrabhor, XII†		287 49 45·33	16
Kágarol, XIV†		319 13 46·74	16
Varsada h.s.			
Rohoni	h.s.	18 55 50·3	61
Golána	s.	59 1 51·8	62
Golána Temple		60 19 29	178
Kalodra	„	187 34 34·7	59
Bámangám	h.s.	254 43 25·8	59
Ámbliála	„	313 1 33·8	60
Vásad s.			
Ámlol	s.	9 57 54	237
Sársa	„	187 35 12	235
Mángsi	„	251 11 39	235
Padamla	„	306 45 32	236

* This station appertains to the Khánpisura Meridional Series.

† These stations appertain to the Singi Meridional Series.

Name of Station with Azimuths of surrounding Points		° ′ ″	No. of Triangle giving Distance
Vásna Chácharvádi s.			
Sánand, XXII		160 13 30·1	49
Páldi, XX		260 30 13·1	49
Chandisar	h.s.	318 22 18·1	50
Vastrál, XVIII			
Vatuva Dome		54 57 25	134
Páldi, XX		55 19 43·32	30
Od Hill Tree		61 1 38	144
Ahmedabad Tower of Silence		75 31 14	143

Name of Station with Azimuths of surrounding Points	° ′ ″	No. of Triangle giving Distance
Vastrál, XVIII—(*Contd.*)		
Ahmedabad Minaret No. 2	92 2 36	140
Ahmedabad Clock Tower	112 7 37	141
Thaltej Dome	112 30 27	145
Ahmedabad Minaret No. 1	120 24 27	138
Sola, XXI	125 39 28·05	31
Ahmedabad Mosque	129 3 45	137
Sonáda, XIX	214 41 34·35	29
Mirzápur, XVI	271 0 35·62	28
Jinjhar, XVII	321 11 12·63	28

September, 1892.

J. ECCLES,
In charge of Computing Office.

GUJARÁT LONGITUDINAL SERIES.

CO-ORDINATES AND DESCRIPTIONS OF ALL STATIONS AND POINTS.

The following table gives the co-ordinates of all stations and other fixed points, arranged in alphabetical order, also the descriptions of the secondary and intersected (or unvisited) points, and references to the preceding pages where the descriptions of the principal stations are given.

NOTE.—Principal stations are followed by the Roman numerals I, II, &c., secondary stations by the letters h.s., s. and t.s. Wherever the spelling and designation of stations and points have been altered from the old nomenclature, the latter is given in italics where necessary, immediately below the former. The year or season in which a station or point was originally fixed is usually given after its description.

For visited stations and points of superior accuracy, the values of latitude and longitude are given to two places of decimals, for well determined objects to one place, and for the remaining points to the nearest second.

The Trigonometrical heights in general refer to the upper surface of the pillar or to the mark engraved on top of pillar, building, &c.; but in exceptional cases, when the information is forthcoming in the field books, the surfaces to which the heights refer are specified in footnotes. The spirit-levelled heights are given to two places of decimals of a foot, and the surfaces to which they refer are also indicated in footnotes. In a few cases, where Trigonometrical heights do not exist, but values have been found on the Topographical Survey maps, these values have been reduced to the same terms as the Trigonometrical heights and enclosed in brackets, thus [47]; the surface to which they refer may be assumed to be the ground level. In the column of heights, the upper numeral gives the height of the station above mean sea-level and the lower is that of the structure itself above ground level.

The numerals in the last column indicate the triangles given on pages 14—K. to 28—K., by which the station or point has been fixed; when these numerals are omitted it is to be understood that no triangles are given.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station / Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Ádalsar Tree	Káthiáwár (Káthiávád) Agency	Close N.E. of the village so called and E. of a tank band, and about 2½ miles E. by N. of Lakhtar station on the B. B. and C. I. Railway: sub-division Jhálávád táluka Lakhtar. 1863-64.	22 52 58	71 51 5	...	190
Advál t.s.	Ahmedabad (Amdávád)	On a mound on the western skirts of the village so called on the main road from Dhandhuka to Ahmedabad and about 4½ miles N. by E. of the former town. The station consists of an isolated and perforated pillar of masonry 15 feet in height with an aperture giving access to the lower mark-stone: sub-division Dhandhuka. 1864.	22 26 31·25	72 2 22·35	77	84
Ágarva h.s.	Kaira (Kheda)	On a very high ridge called Kálka Máthata on one of several small hills, about 1 mile E. of the village so called, and 2½ miles S. of Thásru town and Railway station: sub-division Thásru. The station consists of a pillar 2 feet in height. 1869-72.	22 45 31·77	73 15 17·80	276	226
Ahmedabad Clock Tower ...	Ahmedabad	In the western portion of the city, about 300 yards S.E. of the Collector's office, and ⅛ of a mile W. of the Jáma Masjid: sub-division Daskroi. 1851-52.	23 1 25·5	72 37 21·3	...	141 142

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Ahmedabad Minaret No 1 ...	Ahmedabad	On the E. edge of the city, and near the Railway station: sub-division Daskroi. 1851-52.	23 1 38·8	72 38 33·0	...	138
Ahmedabad Minaret No 2 ...	„	Or Sháh Álam Roza minaret about 1¾ miles S. of Ahmedabad city: sub-division Daskroi. 1851-52.	22 59 37·2	72 37 49·6	...	139 140
Ahmedabad Mosque ...	„	Known as Daria Khán mosque, immediately S. of the Bheel Light Corps Lines about 1 mile N. of Ahmedabad city, and ¼ of a mile W. of the B. B. and C. I. Railway Line: sub-divison Daskroi. 1851-52.	23 3 7·5	72 37 41·5	...	136 137
Ahmedabad Tower of Silence ...	„	Parsi's tower at Golasun at the N.W. end of a hill, about 3 miles S.E. of Ahmedabad city, and ¼ a mile E. of the B. B. and C. I. Railway Line: sub-division Daskroi. 1851-52.	22 58 51·9	72 40 3·5	...	143
Ámbli s.	„	In a salt waste, about ¾ of a mile S. of the Ghela river, 5 miles E.S.E. of the village so called, and 8 miles N.E. by E. of Dholera town: sub-division Dhandhuka. The station consists of a solid, isolated, triangular pillar of masonry surrounded by a platform of mud and bricks. 1854.	22 18 10·84	72 20 56·33	35	68, 69
Ámbliála h.s.	Kaira Agency	On rising ground, about 1½ miles S.W. of the village so called, 1½ miles S.E. by E. of Gorád village, and 8½ miles N.N.W. of Cambay (Khambhát) city: Cambay State. The station consists of a solid, isolated, triangular pillar of masonry 1 foot in height surrounded by a platform of sand. 1854.	22 26 25·12	72 36 41·68	102	60 259
Ámlol s.	„	On the right bank of the Mahi river, about ¼ a mile N. by E. of the village of this name, 1¾ miles S. by W. of Kánvádi village, and 3 miles E. of the large village called Ánkláv: sub-division Borsad. The station consists of a pillar of masonry 3 feet in height. 1869-72.	22 22 48·94	73 5 25·66	117	237
Anniáli t.s.	Káthiáwár Agency	On the N. band of a small tank about 1¼ miles W. of the village so called, and 5 miles S.E. of Lakhtar station on the B.B. and C.I. Railway: sub-division Jhálávád, taluka or State Devlia. The station consists of an isolated and perforated pillar of masonry 15 feet in height with an aperture giving access to the lower mark-stone. 1864.	22 49 15·86	71 52 24·38	141	79
Bálásinor Palace (helio.) ...	Rewa Kántha (Revákántha) Agency	In the N.W. quarter of the town: Bálásinor (Vádáshinor) State. 1858-59.	22 57 30·01	73 22 27·05	380	130
Baloda s.	Bheel (Bhíl) Agency	This station was originally fixed by the secondary triangulation of the Bhopal (Bhopál) and Malwa (Málwa) Topographical Survey, and is about 2 miles N.W. of the village of that name, and 2¼ miles N.E. of Gadgára on the high road from Rutlam (Ratlám) to Indore (Indor): Dhár State. The station is denoted by a mud platform, 2 feet high, with a mark-stone in the centre. 1882-83.	22 59 45·94	75 19 24·22	$\frac{1753}{2}$	*
Bámangám h.s.	Kaira	On the highest point of a hill about 1¼ miles W. of the village so called, 1 mile S.W. by S. of Daloli village, and 2¼ miles E. of the Alang river: sub-division Mátar. The station consists of a solid, isolated, triangular pillar of masonry about 1¼ feet in height surrounded by a platform of sand. 1854.	22 31 8·07	72 37 2·29	104	58

* For triangles fixing this point, *see* Synoptical Volume of the Khánpisura Meridional Series.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station / Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Báreja h.s. ... ... *Bareja S.*	Ahmedabad	On rising ground, about 2 miles S.W. by S. of the town of this name, the same distance N. of Navágám village, and 8 miles S.W. of Bárejadi Station of the B. B. and C. I. Railway: sub-division Daskroi. The station consists of an isolated pillar of masonry surrounded by a platform of sand. 1854.	22 49 32·26	72 37 3·75	101 / *	51
Báreja Tree	„	White flag on tree: sub-division Daskroi. 1854. ...	22 50 8	72 37 9	...	...
Barvála Temple	„	Spire. In the town of this name on the left bank of the Utávli river close and W. of the main road from Gogha to Dhandhuka: sub-divison Dhandhuka. 1863-64.	22 9 2·8	71 56 1·7	...	211 212
Barvála t.s.	„	On one of the northern bastions of the high fort wall which surrounds the town of that name on the left bank of the Utávli river, close W. of the main road leading from Gogha to Dhandhuka, and ½ a mile W. of the travellers' bungalow: sub-division Dhandhuka. 1864.	22 9 12·94	71 56 0·06	116	93
Bávlíári Temple ... ... *Baoliali Temple Spire*	„	Spire. About the centre of the village of this name, about 1½ miles N. of Ádhelái village, and 4½ miles S. by E. of Haibatpur village: sub-division Dhandhuka. 1860-61.	22 4 25·1	72 9 32·7	...	186 187
Bhadiád s. ... ... *Bariad S.*	„	Within the compound of some buildings at the S.E. skirt of the village of this name on the road from Dholera to Dhandhuka, and about 3 miles N.W. by N. of the latter town. The station consists of a platform enclosing a solid, isolated, triangular pillar of masonry 5 feet in height, having mark-stones at top and bottom. 1861.	22 16 44·06	72 12 40·28	[47]	73
Bhagvánji, XIV	Kaira	*Vide* page 9—K.	22 59 49·84	73 1 39·86	255 / 23·1	24
Bhalgámda Tree ... ... *Balgamra Tree Pole*	Káthiáwár Agency	Close N.W. by W. of the place so called, and 2 miles N. by E. of Limbdi town on the Bhogáva river: táluka Bhalgámda. 1863-64.	22 35 29	71 51 39	...	195
Bharbhir t.s.	„	On the western bank of a tank close to and N.N.E. of the village of that name, and about 4½ miles S.E. by E. of Nelávadar village: Bhávnagar State, division Gohelvád. The station consists of a perforated pillar of masonry with an archway on the south side giving access to the lower mark. 1860.	22 0 27·36	72 6 40·02	41	78, 96
Bhátha s.	Kaira Agency	On some waste land at the mouths of the Mahi and Sábarmati rivers, about 3½ miles S. of Navágám village, 3½ miles S.E. by S. of Vainej village, and 7½ miles W. by S. of Cambay city: Cambay State. The station consists of an isolated pillar of masonry 5 feet in height and surrounded by a platform of mud. 1863.	22 17 55·38	72 32 19·42	34 / 5	257
Bhathán Mark (helio.) ... *Bhathan S.*	Káthiáwár Agency	About ½ a mile N.W. of the village so called, 2 miles N.E. by N. of Jámbu village close to the right bank of the Bhogáva river, and 6½ miles E. by N. of Sbáni village: Bhathán State, division Jhálávád. 1863-64	22 41 27·84	71 58 20·91	[79]	194

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Bhimnáth Temple	Ahmedabad	At S.E. corner of the large village so called on the main road from Gogha to Dhandhuka, and 6¾ miles N.N.E. of Barvála town: sub-division Dhandhuka. 1863-64.	22 14 44·8	71 57 52·4	...	209 210
Bhoika Building ... ... *Bhoria Building S. gable*	Káthiáwár Agency	Southern gable. At the S.W. corner of the town on the left bank of a stream, and about 6 miles S.E. of the town and Railway Station of Limbdi: division Jhálávád. 1863-64.	22 30 9·8	71 55 50·3	...	199
Bhor, XVII*	Rewa Kántha Agency	*Vide* page 8—K.	22 39 32·41	73 51 41·35	1037 †	12
Bhutia s.	Ahmedabad	On a slight elevation at the N.W. side of a small tank so called, about 2 miles S.E. of Dhandhuka town, and close S. of the road from Dhandhuka to Dholera: sub-division Dhandhuka. The station consists of a perforated and isolated pillar of masonry 2 feet in height with an aperture giving access to the lower mark-stone. 1864.	22 21 44·09	72 2 52·69	69/2	86
Bilighát Hill Mark ... *Jamburana H.*	Bheel Agency	About a mile N.E. of the village of that name, the same distance S.W. of Airan, 2 miles E. of Sathpál, and 1¼ miles N.N.W. of Mandar: sub-division Amkhut, Rájpur Ali State. 1861-62.	22 29 36·20	74 17 15·35	1292	109
Bori Dongri Hill	Rewa Kántha Agency	About 2 miles N. by E. of Bálásinor town, and ¼ a mile N.W. of Karanpur village: sub-division Bálásinor. 1858-59.	22 59 5	73 23 11	...	129
Cambay Flag-staff	Kaira Agency	At the S. end of the city immediately W. of the Custom House: Cambay State. 1862-63.	22 18 38·8	72 39 24·3	...	260
Cambay s.	"	On the roof of the building, at the S. end of the city and close by the pier, once the British Factory and long used as a sanitarium for the officers stationed in Gujarát: Cambay State. The station is marked by a circle and dot cut on lead let into the terrace roof. 1863.	22 18 39·95	72 39 24·44	‡ 103·09	256
Chachána Mark (helio.) ... *Sassana S.*	Káthiáwár Agency	On a tank bund close S.W. by S. of the village so called, about 2¼ miles E. of Khándia village, and 2¼ miles N.W. by W. of Vanála village. The telegraph line from Wadhwán to Dhandhuka passes close S. of the tank: division Jhálávád, Chachána State. 1863-64.	22 27 22·97	71 56 3·57	92	200 201
Chamárej h.s. ... ... *Samarad H.S.*	"	On the highest point of a group of hills about 6¼ miles W. by N. of the town of Wadhwán, 1 mile N. of the small village of Khamisáná on the left bank of the Bhogáva river, and 2 miles S. by W. of Chamárej village: division Jhálávád, Wadhwán State. The station consists of a perforated and isolated pillar of masonry 2 feet in height with an aperture giving access to the lower mark. 1860.	22 43 59·22	71 37 0·07	§ 331·84/2	98
Chandisar h.s.	Ahmedabad	On a hill, about 175 yards N. of a conspicuous temple on the same ridge, ¼ a mile N.N.W. of the village so called, 1¼ miles S. of Saroda village, and 6 miles in the same direction from Kásandra town on the right bank of the Sábarmati river: sub-division Dholka. The station consists of a solid, isolated, triangular pillar of masonry surrounded by a platform of mud and sand. 1854.	22 48 20·73	72 31 33·78	155	50

* This station appertains to the Singi Meridional Series. † See description of this station.
‡ To mark on roof. § To top of circular pillar.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Chandisar Math ... ... *Vermomni Matha*	Ahmedabad	A temple about 175 yards S. of Chandisar h.s., ½ a mile N.N.W. of the village, and 6 miles S. of Kásandra town on the right bank of the Sábarmati river: sub-division Dholka. 1853-54.	22 48 16·1	72 31 31·1	...	166
Charádi, XXXII	Káthiáwár Agency	*Vide* page 12—K.	22 55 13·09	71 38 4·78	242/30	43
Charádva, XVIII*	„	*Vide* page 13—K.	22 57 20·81	71 5 41·08	218/16	48
Dabka Court House ...	Baroda	In the eastern part of the large village of that name on the eastern bank of the Mahi river, about a mile S.E. of Sultánpura, 3½ miles N.N.E. of Majháthan, and 2 miles N.E. of Choukári: sub-division Baroda. 1869-72.	22 14 53·6	72 59 57·7	...	250
Dákor Temple	Kaira	Highest spire of the temple in the town of that name: táluka Dákor, sub-division Thásra. 1869-72.	22 45 13·7	73 11 26·4	...	249
Dánáváda Tower	Káthiáwár Agency	On the S. edge of the village so called, about 3¾ miles N.W. by N. of Godávari village on the left bank of the Bhogáva river, and 7½ miles N.N.E. of Múli town: Múli State, division Jhálávád. 1859-60.	22 44 25·7	71 32 35·0	350	218 219
Dehgám, XXXI	„	*Vide* page 12—K.	23 5 18·25	71 41 59·97	102/40	42
Dehván s.	Kaira	On high ground on the right bank of the Mahi river and near its mouth, about 200 yards S.E. of the town of Dehván: sub-division Borsad. The station consists of a solid pillar of masonry 11¼ feet in height having marks at top and bottom, an intermediate mark-stone is fixed at a height of 8 feet above the ground. 1869-72.	22 16 24·99	72 52 13·38	90/11·8	243
Dervála Mark (helio.) ... *Dherwala S.*	Ahmedabad	About ¾ of a mile N. of the village so called, 5¾ miles E. of Lakhtar station on the B. B. and C. I. Railway, and 5 miles E. of Sílápur Road station: sub-division Viramgám. 1863-64.	22 52 54·16	71 55 51·62	†76·30	188 189
Dev Dongri Temple ...	Rewa Kántha Ageney	Spire. About ½ mile S. of Saroda village, 1 mile W. of Gadváda village, and 2¾ miles N.N.E. of Bálásinor town: sub-division Bálásinor. 1858-59.	22 59 34·8	73 23 58·3	...	127 128
Devgad Báriya Hill ... *Barriah H.*	„	Close N. by W. of the town of this name, and at the terminus of the high road from Godhra: Devgad Báriya State. 1860-61.	22 42 30	73 56 29	1242	115 116

* This station appertains to the Káthiáwár Meridional Series. † To the upper surface of the pillar.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Devlia Flag	Ahmedabad	At the S.E. corner of the village of the same name on the left bank of the Bhádhar river, and 10 miles E. of Ránpur town and Railway Station of the Bhávnagar and Gondal Line: sub-division Dhandhuka. 1863-64.	22 22 9	71 51 24	...	205
Dhandhuka Building ... *Dundooka Mahal*	„	S. Minaret of the Mahal in the S.E. corner of the town: sub-division Dhandhuka. 1863-64.	22 22 45·7	72 1 34·8	...	207 208
Dholera Temple	„	Spire of the highest temple in the S.W. portion of the town and close to the W. bank of a tank: sub-division Dhandhuka. 1860-61.	22 14 41·0	72 14 6·0	...	184
Dholka Tower	„	Centre of the highest tower called Turi on the E. bank of the Khán tank, about ½ a mile W. of the town: sub-division Dholka. 1853-54.	22 43 58·9	72 28 22·5	...	174
Dhrángadra, XXXIII ...	Káthiáwár Agency	*Vide* page 12—K.	23 1 26·04	71 30 52·01	207/16	44
Dhrángadra Gate ...	„	On the E. side of the town; whence the road to Wadhwán emerges: division Jhálávád, Dhrángadra State. 1851-52.	22 59 38	71 30 37	...	157
Dhrángadra h.s. ... ... *Sasria H.S.*	„	At the southern edge of a plateau, about 2 miles S.S.E. of the town and alongside of the western of two quarries. The main road from Dhrángadra to Wadhwán runs about 1 mile E. of the station: division Jhálávád, Dhrángadra State. 1851-53.	22 57 55·99	71 31 12·33	[264]	152 153
Dhrángadra Temple No. 1 ...	„	Spire. Close to the E. gate of the town; whence the road to Wadhwán emerges: Dhrángadra State, division Jhálávád. 1851-52.	22 59 37·7	71 30 34·1	...	154
Dhrángadra Temple No. 2 ... *Drangadra N.W. Temple Spire*	„	Small white temple about a mile N. of town on the right bank of the Phulka river: division Jhálávád, Dhrángadra State. 1851-53.	23 0 25·9	71 30 17·5	...	155 156
Dhuváran s.	Kaira Agency	On a mound close to and N.W. of the village so called on the right bank of the Mahi river, about 1¾ miles S. by W. of Kharádhi, and 4½ miles S.W. of Dehván town: Cambay State. The station consists of a pillar of masonry 1 foot in height. 1863.	22 14 21·46	72 48 18·65	76/1	245 255
Dohad Fort	Panch Mahals	N. gate of the fort of that name: sub-division Dohad. 1861-62.	22 49 55	74 18 4	1029	108
Ghoráráo, XVI*	Kaira	*Vide* page 8—K.	22 52 11·17	73 23 52·63	323/5	17
Goalia, XIII	Mahi Kántha Agency	*Vide* page 9—K.	22 53 5·01	73 6 50·69	249/24·2	23

* This station appertains to the Singi Meridional Series.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station / Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Godhra House	Panch Mahals	In the eastern portion of the town of this name: sub-division Godhra. 1860-61.	22 46 23·6	73 39 32·6	459	122 123
Golána s.	Kaira Agency	On the E. bank of a tank S.E. of the village so called, about 3½ miles N.N.E. of Mitli village: Cambay (Khambhát) State. The station consists of a pillar of masonry surrounded by a platform of sand. 1854.	22 27 19·16	72 27 45·66	49	62
Golána Temple	„	Kalas of the temple on the N. bank of a tank S.E. of the village so called, about 1½ miles S. of the Sábarmati river, 3½ miles N.N.E. of Mitli village, and 6 miles N.N.W. of Pándad village: Cambay State. 1854.	22 27 27·0	72 27 45·2	...	177 178
Gorásu Flag	Ahmedabad	On the highest tree on the W. edge of the village so called, about 4 miles W. by N. of Dholera town, and 2¾ miles S.W. of Bhadiád large village: sub-division Dhandhuka. 1860-62.	22 15 21	72 10 31	...	183
Goria Hill Platform .. *Walwandi H. Pm.*	Rewa Kántha Agency	On the highest part of a hill, about ¼ a mile N. of the village of that name, and 1¾ miles N.N.W. of Valundi close to the 12th milestone on the high road from Dohad to Godhra: Báriya State. 1860-62.	22 51 59·1	74 7 9·9	1218	114
Gujarvadi h.s.	Káthiáwár Agency	On a small hill about 1½ miles E. of the village after which the station is named, and 4 miles W.S.W. of Sitha town on the road from Dhrángadra to Wadhwán: division Jhálávád, Dhrángadra State. 1859-60.	22 49 56·59	71 34 44·80	295	214
Haibatpur Flag-staff ...	Ahmedabad	At the S.W. corner of the village so called, about 3½ miles S. of Sángásar village, and 4½ miles N. by W. of Bávlíári village: sub-division Dhandhuka. 1860-61.	22 8 20·7	72 8 27·7	...	185
Haibatpur t.s.	„	About 3 miles S.W. by W. of the village so called, 3½ miles N.E. by N. of Kánátaláv village, and 6¼ miles E.S.E. of Návra large village: sub-division Dhandhuka. The station consists of a perforated pillar of masonry 15 feet high, having an archway, on the south side, giving access to the lower mark. 1860-61.	22 7 11·77	72 6 1·08	$\frac{45}{15}$	77, 94
Hájipur, XXIII	Baroda State	*Vide* page 11—K.	23 9 24·14	72 25 58·72	$\frac{259}{5}$	84
Halvad Palace	Káthiáwár Agency	Conspicuous Palace tower at S.W. corner of the town of same name. 1852-53.	23 0 40·0	71 13 11·6	...	* 161
Hásalpur, XXVI	Ahmedabad	*Vide* page 11—K.	23 5 3·88	72 7 0·29	† $\frac{133·27}{21}$	37
Indráwan, XIII‡	Bhopáwar Agency	*Vide* page 6—K.	22 48 48·54	75 13 23·78	$\frac{1834}{7·5}$	§
Ingrodi, XXX	Káthiáwár Agency	*Vide* page 12—K.	22 57 7·58	71 51 1·30	† $\frac{151·78}{34·4}$	41

* For another triangle fixing this point, see the Synoptical Volume of the Káthiáwár Meridional Series.
† To upper mark-stone on top of tower. ‡ This station appertains to the Khánpisura Meridional Series.
§ For triangle fixing this station, see the Synoptical Volume of the Khánpisura Meridional Series.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Jalálpur s.	Gaikwár's Territory	On slightly rising ground, about ¾ of a mile W. by N. of the village so called, 1¼ miles E. by S. of Mahuvál, and 5½ miles N. of Kotna village on the right bank of the Dhádhar river: sub-division Pádra, Baroda State. The station consists of an isolated pillar of masonry 8 feet in height surrounded by a platform of earthwork. 1869-72.	22 10 5·48	73 1 29·17	90/8	248
Jalodia h.s.	Bheel Agency	This station was originally fixed by the secondary triangulation of the Bhopal Malwa Topographical Survey, and is on a slight rise near the western edge of a plateau. It is about 2½ miles W. by N. of the village of that name, 3½ miles N.W. by N. of Kod town, and the same distance W.S.W. of Píplia. It is close to the road from Kod town to Delchi: Dhár State. The station consists of a platform 8·8 feet high having a mark-stone 1 foot above the ground. 1882-83.	22 55 29·04	75 11 24·83	1825/8·8	†
Jambusar s.	Broach	On the turret of the Naulaka Haveli belonging to Kalidas Banian, in the town so called, west of the Government building: sub-division Jambusar. The station is denoted by a circle and dot on lead let into the floor. 1863.	22 3 7·28	72 50 33·11	97	253
Jáspur s.	Gaikwár's Territory	On some high ground on the left bank of the Mahi river, about 1¼ miles S.W. by W. of the village so called, the same distance W. of Dhobikuva village, and 11 miles in the same direction from Baroda City: sub-division Baroda, Baroda State. The station consists of an isolated pillar of masonry 3 feet in height surrounded by a platform of earthwork. 1869-72.	22 17 9·54	73 4 38·23	101/3	239
Jathrabhor, XII*	Rewa Kántha Agency	*Vide* page 7—K.	23 1 49·45	73 42 41·32	798/5	15
Jhábua Hill Mark ... ... *Hathipao H.S.*	Bheel Agency	On a table-land, about 1¾ miles W. of the town of that name: Jhábua State. 1861-62.	22 46 10·26	74 36 15·13	1426	105
Jhábua Palace	„	In the town of that name: Jhábua State. 1861-62. ...	22 45 59·8	74 37 51·4	1167	104
Jhálila h.s.	Ahmedabad	On the ledge of a quarry about the middle of a low range of hills running E. and W., about a mile S. of the village so called, and 7 miles W. of Bhimnáth large village on the main road from Gogha to Dhandhuka: sub-division Dhandhuka. The station consists of an isolated and perforated pillar of masonry 12·1 feet in height with an aperture giving access to the lower mark cut on a sheet of rock. 1864.	22 14 20·90	71 51 1·60	211/12·1	91, 92
Jhámdi Tree ... ... *Jamri Tree Pole*	Káthiáwár Agency	On a tank bund close S. of the village so called, about a mile E.N.E. of Bornu village, and 4 miles S.E. of the town of Limbdi: Limbdi State. 1863-64.	22 30 48	71 53 40	...	...
Jhámdi t.s.	„	On a ridge, about 2 miles S.E. by S. of Untdi village, 1 mile N. by W. of Jhámdi village, and 3½ miles S.E. of Limbdi town: division Jhálávád, Untdi State. The station consists of an isolated and perforated pillar of masonry 15 feet in height with an aperture giving access to the lower mark-stone. 1864.	22 31 41·48	71 53 30·04	141/15	83

* This station appertains to the Singi Meridional Series.
† For triangle fixing this point, see the Synoptical Volume of the Khánpisura Meridional Series.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Jhámpodar Tree	Káthiáwár Agency	At the S. edge of the village so called, about 7 miles E.N.E. of Wadhwán town, and 5 miles N. of the Bhogáva river: division Jhálávád, Jhámpodar State. 1863-64.	22 44 24	71 49 23	...	193
Jhidia, X	Rewa Kántha Agency	*Vide* page 8—K.	23 0 50·50	73 18 19·98	447 / 6	20
Jinjhar, XVII	Kaira	*Vide* page 10—K.	22 53 10·53	72 48 1·54	* 213·00 / 10·0	27
Jogia Dongar h.s. ...	Káthiáwár Agency	On a small hill close S. of the road from Devcharádi to Katuda, about 1¼ miles S.E. by E. of the former and 1¼ miles N.W. by W. of the latter village, and 3¼ miles S. of Sitha town on the road from Dhrángadra to Wadhwán: sub-division Jhálávád, táluka or State Wadhwán. 1859-60.	22 48 46·94	71 37 8·74	268	216 217
Kágarol, XIV†	Panch Mahás	*Vide* page 8—K.	22 53 22·13	73 41 32·37	595 / 5	13
Kaira Church	Kaira	Spire of the church on the left bank of the Shedhi river, about 2 miles E. by S. of Kaira City, and 1 mile in the same direction from the race course: sub-division Mehmadabad. 1853-54.	22 44 23·4	72 45 16·9	[131]	172 173
Kaira Court House ...	„	Heliotrope on the house about the centre of the city of the same name: sub-division Mehmadabad. 1853-54.	22 45 5·68	72 43 32·95	...	170 171
Kaira Temple No. 1 *Kaira W. Temple* ...	„	Close E. of the metalled road to Mehmadabad Railway Station on the B.B. and C.I. Line, and about ¼ of a mile N. of the city of Kaira: sub-division Mehmadabad. 1853-54.	22 45 23·9	72 43 30·8	...	167
Kaira Temple No. 2 *Kaira Black Temple* ...	„	Spire of the black temple in the W. portion of the city so called, about 325 yards S.W. by S. of the court house: sub-division Mehmadabad. 1853-54.	22 45 1·8	72 43 24·1	...	168 169
Kájipur s.	„	On a slightly elevated plateau, about ¼ a mile N.W. of the village so called, 1¼ miles E. of Saiát village, and 4¼ miles N. by W. of Dákor town on the metalled road from Kapadvanj: sub-division Thásra. The station consists of a pillar of masonry 2 feet in height. 1869-72.	22 48 52·30	73 10 22·95	250 / 2	227
Káliákua Hill	Panch Mahás	About ¼ a mile S. by W. of the small village of that name, 3 miles in the same direction of the 7th mile-stone on the high road from Godhra to Dohad, 6¼ miles E. by S. of the former town, and 2 miles N.E. by E. of the small village of Richhia: sub-division Godhra. 1860-61.	22 44 55	73 45 35	638	119
Kalodra s.	Kaira Agency	About 1¼ miles S.E. by E. of the village close to the left bank of the Sábarmati river, and 2 miles S.W. by S. of Ásámli large village: Cambay State. The station consists of a solid, isolated, triangular pillar of masonry 1·7 feet in height surrounded by a platform. 1854.	22 35 11·39	72 33 18·60	52 / 1·7	57

* To top of circular pillar. † This station appertains to the Singi Meridional Series.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Kámátaláv Flag	Ahmedabad	Conspicuous tree on a small tank E. of Sarasla. 1860-61.	22 20 14	72 17 50	...	...
Kámátaláv s.	,,	In the midst of a grass preserve, about 2 miles S. of the village so called, 3 miles S.E. of Ámbli village, and 6 miles N.E. by E. of Dholera town: sub-division Dhandhuka. The station consists of a platform enclosing a solid, isolated, triangular pillar of masonry 5 feet in height. 1861.	22 17 44·47	72 18 40·34	[40]	71, 72
Kantár Hill ... ... *Jawalia H.*	Rewa Kántha Agency	About a quarter of a mile W. of the small village of that name, 2½ miles W. by N. of Shingnál on the road from Lúnáváda to Godhra, 3½ miles E.N.E. of the large village of Kothamba, and 2½ miles N.N.E. of Dhámnia: táluka Lúnáváda. 1860-61.	23 2 22	73 36 40	579	124
Kántrodi h.s.	Káthiáwár Agency	On rising ground covered with jungle, about 1½ miles S. of the village so called, 4½ miles in the same direction from Rámpura village, and 9½ miles E.S.E. of Sara large village: division Jhálávád, Dhrángadra State. The station consists of an isolated and perforated pillar of masonry 10 feet in height with an aperture giving access to the lower mark. 1860.	22 45 2·31	71 23 3·54	$\frac{445}{10}$	99
Káphri, VIII	Panch Mahál	*Vide* page 7—K.	22 55 20·54	74 12 52·00	$\frac{1239}{5}$	9
Kárela House	Káthiáwár Agency	Highest house in the centre of the village of the same name, 2½ miles N.W. by. N. of Lílápur Road Station on the B.B. and C.I. Railway, and 9 miles N.N.E. of the town of Lakhtar: division Jhálávád, Lakhtar State. 1851-52.	22 58 57·6	71 52 45·0	...	150
Kárelí s.	Broach	About 1 mile S. of the village so called, same distance S.W. of Dúdhváda, and 1½ miles N.E. by N. of Pilodra village: sub-division Jambusar. 1869-72.	22 11 8·72	72 54 35·30	83	244
Karmad Flag	Káthiáwár Agency	Immediately N. of the village so called, about 5½ miles N.N.E. of Ránpur town and station of the Bhávnagar and Gondal Railway: division Jhálávád, Karmad State. 1863-64.	22 25 29	71 46 52	...	202
Karsod, IX*	Gwalior Territory	*Vide* page 5—K.	23 6 46·48	75 28 12·70	$\frac{1781}{5}$	†
Karsod Hill Pagoda ...	,,	About 1½ miles W.S.W. of the village of that name, 1 mile N.N.W. of a Police Chauki on the road from Barnagar town to Karsod, and 5 miles N.E. of the town and Railway Station of Barnagar. 1848.	23 6 47·6	75 28 11·7	...	†
Kaula-ka-Máta, I	Western Malwa Agency	*Vide* page 6—K.	23 7 47·62	75 12 33·27	$\frac{1936}{5·9}$	1
Kavádia, XXXV	Káthiáwár Agency	*Vide* page 12—K.	23 0 45·38	71 19 52·79	$\frac{222}{16}$	46

* This station appertains to the Khánpisura Meridional Series.
† For triangle fixing this point, see the Synoptical Volume of the Khánpisura Meridional Series.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station / Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Kávi s. ... ... *Khavi Temple S.*	Broach	On the cupola of the elaborately built Jain temple known as the "Sass" temple, in distinction to another more elaborately built to the W., known as the "Bhaw" temple, in the town of the same name: sub-division Jambusar. The station is denoted by a mark cut in lead on the urn crowning the dome. 1863.	22 11 51·98	72 40 36·86	107	254
Khambhláv Tree ... ... *Kamlair Tree Pole*	Káthiáwár Agency	About ¼ of a mile S.W. of the village so called, and ½ a mile S. of the Bhogáva river: division Jhálávád, Khambhláv State. 1863-64.	22 32 44	71 57 12	...	197
Kháreti Flag ... ... *Karanti Village Flag*	Kaira	At the S.W. corner of the village so called, about 4 miles E.S.E. of the junction of the Vátrak and the Sábarmati rivers, and 4¼ miles S. by E. of Radhu town: sub-division Mátar. 1853-54.	22 37 54	72 38 25	...	176
Khárigángad, XXVIII ...	Káthiáwár Agency	*Vide* page 11—K.	22 57 41·13	72 0 47·20	87 / 12	39
Khawása, III	Bhopáwar Agency	*Vide* page 6—K.	23 7 42·04	74 42 9·17	1618 / 5	3
Khejrátaláv s. ... ... *Kejra Talao Stn.*	Ahmedabad	At the N.E. corner of the tank so called about ¼ a mile N.E. of Rokária village, and 1 mile W. by N. of Navágám or Mungalpur: sub-division Dhandhuka. The station consists of a platform enclosing a solid, isolated, triangular pillar of masonry 5 feet high, having the lower mark-stone set in lime cement. 1861.	22 6 6·90	72 13 54·45	[49]	76
Kheráli Building ... ... *Kerali Highest Building*	Káthiáwár Agency	Western gable of the Kheráli Darbár in the village so called, about 5 miles W. by S. of Wadhwán town, and 2¼ miles S. of the Bhogáva river: Kheráli táluka Wadhwán State. 1859-60.	22 41 23·5	71 38 38·9	...	224
Kherla Hill Mark ... ... *Kerela H.S.*	,,	On a mound about 1½ miles N.W. by W. of the large village of Ankevália, 3 miles S. by W. of Lákhájika-gám, and 2¼ miles E. of Nárisána close to the left bank of the Phulka river: Dhrángadra State. 1859-60.	22 51 47·27	71 28 55·62	333	213
Khodu t.s. ... ... *Kuru T.S.*	,,	On rising ground surrounded by jungle, about 1¼ miles W. of the village so called, 7 miles S.W. by W. of the town of Sitha on the main road from Dhrángadra to Wadhwán: division Jhálávád, Wadhwán State. The station consists of an isolated and perforated pillar of masonry 15 feet in height, with an aperture giving access to the lower mark. 1860.	22 48 14·91	71 30 16·08	372 / 15	97
Khokhra Hill ... ... *Kukurwa H.*	Rewa Kántha Agency	Conspicuous hill about a mile E. of Khokhra Nána village, and 2¾ miles W. by N. of Dhánpur: Devgad Báriya State. 1861-62.	22 38 40	74 6 10	1494	113
Khoraj, XXIV	Gáikwár's Territory	*Vide* page 11—K.	23 1 59·23	72 16 37·94	* 132·11 / 18	35

* To mark-stone on top of tower.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Kinára h.s.	Ahmedabad	On a small hill about a mile E. of the village so called, 2 miles in the same direction from Ránpur town midway between which and the station runs the Bhávnagar and Gondal Railway: sub-division Dhandhuka. The station consists of an isolated and perforated pillar of masonry 2 feet high, having an aperture giving access to the lower mark-stone, and surrounded by a kacha platform of the same height. 1864.	22 21 10·53	71 47 8·28	230 / 2	90
Kinkhilod s. ... ... *Kinkhilor S.*	Gáikwár's Territory	On the west bank of a large tank immediately N. of the village so called, about 2¼ miles S. of Kosindra village, and 5¼ miles W. of Umeta large village on the right bank of the Mahi river: Baroda State. The station consists of a pillar of masonry 6·5 feet in height, surrounded by a platform of earth. 1869-72.	22 20 12·73	73 0 36·97	115 / 6·5	240
Kodh Temple ... ... *Kokind Temple W. Spire*	Káthiáwár Agency	W. spire. Towards the S.W. corner of the large village so called, about 3 miles N. by E. of the source of the Kankávati river, and 6¼ miles W.S.W. of Bávli village on the right bank of the Phulka river: Dhrángadra State. 1852-53.	22 53 12·7	71 20 50·0	...	158
Kubhera Hill Mark No. 1 ... *Rutun Mhall Upper Mark*	Bheel Agency	On the northern portion of a high plateau, about ¼ a mile N. of the deserted village of that name, 1 mile N.W. by W. of Pipargota, 2 miles S.S.E. of Kanjeta close to the left bank of the Pánam river, and 3 miles S.W. of Pánam village on the right bank of the same river: Thákurat Ratanmál. 1861-62.	22 33 1·71	74 9 23·53	2059	110
Kubhera Hill Mark No. 2 ... *Rutun Mhall Lower Mark*	„	On a very steep hill, about a mile N. of the deserted village of that name, 1¼ miles S. by E. of Kanjeta close to the left bank of the Pánam river, and 2¼ miles S.W. of Bhendu on the right bank of the same river: Thákurat Ratanmál. 1861-62.	22 33 28·21	74 9 12·55	1851	111 112
Kukinda, VII	Bhopáwar Agency	*Vide* page 7—K.	23 1 52·85	74 29 16·32	1562 / 5	7, 8
Kusalgarh Hill Mark *Izilia H.S.* ...	Rajputana Agency	About 3 miles E.S.E. of the town of that name, 1¾ miles N.N.E. of Indoria Nagda on the road from Kusalgarh to Thándla, and 2 miles S. by E. of Ambábarlia on the road from Kusalgarh to Bájna: Bánswára State. 1861-62.	23 10 47·20	74 32 7·98	1799	106
Latipur s.	Gáikwár's Territory	On the N. bank of a tank immediately N. of the village so called, about 1¾ miles S.W. of the town of Pádra, and 8 miles N.W. of the Railway station of Itola on the B. B. and C. I. Line: sub-division Pádra, Baroda State. The station consists of an isolated pillar of masonry 5 feet in height, surrounded by a platform of earth. 1869-72.	22 13 31·36	73 5 58·06	108 / 5	247
Lílápur House	Káthiáwár Agency	Highest house in the southern portion of the village so called close N. of the railway line, about 2¼ miles S.W. by W. of the station of the same name on the B. B. and C. I. Railway, and 6 miles N.E. by N. of Lakhtar town: division Jhálábád, Lakhtar State. 1863-64.	22 55 48·0	71 52 20·2	...	151
Limbdi Building ... ... *Limree Building*	„	Highest building about the centre of the town of this name on the left bank of the Bhogáva river: Limbdi State. 1863-64.	22 33 43·6	71 51 11·9	...	196

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station / Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Malachi Math ... ... *Malaki H. Temple*	Káthiáwár Agency	On a small hill about 1½ miles N. of Limbli village, and 1¼ miles S.E. by E. of Shekhpur village on the right bank of the Bhogáva river. The main road from Múli to Wadhwán passes about a mile to the north: division Jhálávád, Múli State.1859-60.	22 41 33·2	71 36 48·4	...	222 223
Mángsi s.	Rewa Kántha Agency	On slightly rising ground close W. of the Nava tank, about a mile W. by N. of the village of that name, 2 miles E. of the Mahi river, and 3 miles N.W. of Vásna large village. The station consists of an isolated pillar of masonry 3·3 feet in height. 1869-72.	22 28 18·96	73 9 55·25	156 / 3·3	234
Mehwása, IV	Bhopáwar Agency	*Vide* page 6—K.	22 54 59·11	74 39 40·96	1382 / 2·4	4
Mirzápur, XVI	Ahmedabad	*Vide* page 9—K.	22 59 17·79	72 52 34·70	238 / 18	26
Mitli h.s.	Kaira Agency	On rising ground, about 1½ miles N.W. of the village so called, 200 yards in the same direction from a temple on the same ridge, and 3½ miles S.W. of Golána village: Cambay State. The station consists of a solid, isolated, triangular pillar of masonry 1 foot in height surrounded by a platform of sand. 1854.	22 25 25·26	72 25 28·72	90 / 1	63
Mitli Hill Temple	„	Kalas of the domed temple on a hill, about a mile N.W. of the village so called, and 3½ miles S.W. of Golána village: Cambay State. 1853-54.	22 25 12·6	72 25 39·0	...	179
Múli Temple	Káthiáwár Agency	Highest spire. At the N.E. corner of the town of the same name on the right bank of the Bámbhan rirer: Múli State. 1859-60.	22 38 18·8	71 29 55·2	...	225*
Nágnes Flag ... ... *Nagneel Flag*	„	About half way from either end of the southern edge of the town of the same name on the E. bank of the Bhádhar river, 3½ miles E. by N. of the town of Rán-pur, and ¼ a mile W. of the Bhávnagar and Gondal Railway: division Jhálávád, Wadhwán State. 1863-64.	22 21 48	71 48 21	...	204
Naika h.s.	„	On some rising ground, about ¾ of a mile W. by N. of the village so called, 3½ miles N. of Múli town a little N. of the metalled road from Rájkot to Wadhwán: division Jhálávád, Múli State. The station consists of an isolated and perforated pillar of masonry 2 feet in height, with an aperture giving access to the lower mark. 1860.	22 40 58·49	71 30 6·21	409 / 2	100 101
Náika h.s.	Kaira	On a small isolated hill called Randola near the left bank of the Khári river, about a mile N. of the town of that name, and 6¾ miles W. by N. of Kaira city: sub-division Mátar. The station consists of an isolated pillar of masonry 1 foot in height, surrounded by a platform. 1854.	22 45 54·94	72 37 1·01	103 / 1	52

* For another triangle fixing this point, see the Synoptical Volume of the Káthiáwár Meridional Series.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Náj Temple ... ... *Jatalpur Temple Spire*	Ahmedabad	Spire of the black temple about a mile S. of the village so called, 2 miles N.W. of Báreja town, and 7¼ miles W. by S. of Bárejadi Railway Station on the B. B. and C. I. Line: sub-division Daskroi. 1853-54.	22 52 3·5	72 36 30·6	...	163
Nal Báoli t.s.	Káthiáwár Agency	On some open ground, about a mile N.W. by N. of the village so called, 4¼ miles S. by W. of Náni Katchechi village close to the left bank of the Bámani river, and 1¼ miles W. of "The Nal": division Jhálávád, Limbdi State. The station consists of an isolated and perforated pillar of masonry 9 feet in height, having an aperture giving access to the lower mark-stone. 1864.	22 47 11·03	72 1 16·42	69/9	80
Nandhánpur h.s. ... ... *Nananpur H.S.*	Kaira Agency	On a small hill about a mile E. of the village so called, 1¼ miles W.S.W. of Kháreti village, and 4¼ miles S. by E. of Radhu town on the right bank of the Vátrak river: Cambay State. The station consists of a solid, isolated, triangular pillar of masonry 1 foot in height, surrounded by a platform. 1854.	22 37 23·35	72 37 15·41	94/1	55
Nárisána, XXXIV	Káthiáwár Agency	*Vide* page 12—K.	22 52 32·65	71 24 52·74	360/22	45
Navápura Tree	Ahmedabad	Conspicuous high tree about ¼ a mile S.W. of the village so called, 1 mile W. of the main road from Dhandhuka to Ahmedabad, and 5 miles S.E. of Sánand town: sub-division Sánand. 1853-54.	22 56 39	72 29 5	...	...
Od h.s. ... ... *Or H.S.*	Kaira	On a small hill about ¼ a mile E. of the town so called, and 5¾ miles E. by S. of Bhálaj Station on the B. B. and C. I. Railway Line: sub-division Ánand. The station consists of an isolated pillar of masonry 2 feet in height. 1869-72.	22 37 5·60	73 10 8·21	198/2	231
Od Hill Tree ... ... *Wor H. Tree*	Ahmedabad	On a small hill about a mile N. of the village so called, ¼ a mile E. of Kámod village on the left bank of the Sábarmati river, and 6 miles S.S.W. of Ahmedabad City: sub-division Daskroi. 1851-52.	22 55 45	72 35 20	...	144
Padamla s.	Gáikwár's Territory	On the S. bank of a tank about ¼ a mile W. of the village of the same name, 1¼ miles S. of Sákarda village, and 1 mile E. by N. of the Railway bridge over the Meni river: Baroda State. The station consists of an isolated pillar of masonry 6·3 feet in height, surrounded by a platform of earth. 1869-72.	22 24 46·26	73 9 40·68	133/6·3	236
Páldi, XX	Ahmedabad	*Vide* page 10—K.	22 53 57·07	72 33 58·04	208/6	30
Pandoda Tower ... ... *Pandora S.*	Káthiáwár Agency	On a flat, about 3¼ miles E. by S. of Sarla village, 2 miles N. by E. of Tikar village site near a tank, and 6¼ miles N.N.W. of the town of Múli: Dhrángadra State. 1859-60.	22 43 43·0	71 28 7·2	365	220

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station / Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Pándvánia h.s.	Kaira	On a low hill, about ¼ a mile S.E. by E. of the hamlet called Darabkhánia, 1¼ miles S.E. by S. of the village after which the station is named, and 2¾ miles E. by S. of Umreth Railway Station on the B.B. and C.I. Line: sub-division Ánand. The station consists of an isolated pillar of masonry 3 feet in height. 1869-72.	22 41 14·99	73 12 20·82	208 / 3	228
Partáppura s.	Rewa Kántha Agency	So called after a small village from which the station is about ¼ of a mile S.E. by S., and 1¼ miles N.E. of the large village of Sihora: sub-division Pándu Mehvás. The station consists of an isolated pillar of masonry 2·1 feet in height. 1869-72.	22 40 25·58	73 19 46·57	197 / 2·1	229
Patángdi, XIII*	"	*Vide* page 7—K.	22 52 15·70	73 55 49·52	922 / 2	11
Patángdi Hill Mark *Patangri H.S.* ...	Panch Mahála Panch Mahála Agency	On a hill on the boundary of Godhra sub-division and Devgad Báriya State, about a mile N.W. of the Principal Station of the same name. 1860-61.	22 52 50·34	73 55 2·38	865	117 118
Pátna s.	Káthiáwár Agency	On a swell about a mile N.E. of the large village of the same name, 7 miles S. by E. of Barvála town on the main road from Gogha to Dhandhuka: division Gohelvád, Bhávnagar State. The station consists of an isolated and perforated pillar of masonry 12 feet high, having an archway on the south side giving access to the lower mark. 1864.	22 3 15·93	71 57 26·31	52 / 12	95
Pipli s. ... ... *Piplia S.*	Ahmedabad	In a salt waste, about 6¼ miles S.E. by E. of the large village of the same name, and 3¼ miles in the same direction from Navágám: sub-division Dhandhuka. The station consists of a solid, isolated, triangular pillar of masonry 6 feet in height surrounded by a platform of brick and earth work. 1854.	22 20 35·07	72 22 5·56	32 / 6	66
Pipli Temple ... ... *Piplia V. Temple*	"	Spire of the white temple, the southern of two, about the centre of the village of the same name, 2¼ miles N.E. by N. of Válinda, and 4 miles E. of Pachham village: sub-division Dhandhuka. 1853-54.	22 23 10·7	72 16 45·1	...	182
Pípliaban, V	Bhopáwar Agency	*Vide* page 7—K.	22 42 23·92	74 49 19·47	1784 / 5	5
Pirána Temple ... ... *Pirana Flag Temple*	Ahmedabad	Gilt spire of the white domed temple immediately S. of the village of this name, and about 3¼ miles E. by S. of Kásandra town on the right bank of the Sábarmati river: sub-division Daskroi. 1853-54.	22 52 49·6	72 35 5·6	...	162
Pisáváda s. ... ... *Pisawara S.*	"	On the E. bank of a tank immediately outside and S.E. of the village so called, and about 8 miles W.S.W. of Radhu town on the right bank of the Vátrak river: sub-division Dholka. The station consists of a solid, isolated, triangular pillar of masonry 1 foot in height surrounded by a platform. 1854.	22 38 27·33	72 31 19·08	65 / 1	56
Poeda, XI	Kaira	*Vide* page 9—K.	22 55 5·26	73 15 9·43	† 309·77 / 30·8	21

* This station appertains to the Singi Meridional Series. † To mark-stone on top of tower.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station / Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Poicha s. ... ... *Poicha H.S.*	Rewa Kántha Agency	On a small hillock about 3 miles N.E. by N. of Vánkáner, and 2¼ miles S. by E. of the village of Poicha, both on the left bank of the Mahi river: sub-division Pándu Mehvás. The station consists of an isolated pillar of masonry 2·1 feet in height. 1869-72.	22 33 53·99	73 13 36·16	181 / 2·1	232
Porda, XXIX	Káthiáwár Agency	*Vide* page 11—K.	23 7 29·21	71 54 45·49	97 / 13·2	40
Punákota, IX	Rewa Kántha Agency	*Vide* page 7—K.	22 37 4·60	74 11 53·94	1748 / 5·1	10
Ráhtaláv s. ... ... *Rah Talao S.*	Ahmedabad	On the bund of a tank about 100 yards S.S.E. of the village of the same name, and 4 miles S.E. by E. of Dholera town: sub-division Dhandhuka. The station consists of a solid, isolated, triangular pillar of masonry 5 feet high, surrounded by a mud platform. The lower mark is set in lime cement. 1861.	22 12 20·86	72 17 23·42	[57]	74
Rajhásar Mark (helio.) ... *Rajasar S.*	Káthiáwár Agency	On a tank bund close W. of the village so called, about 5½ miles N. by W. of Jámbu village, and 3½ miles N.E. by E. of Távi village: division Jhálávád, Limbdi State. 1863-64.	22 44 50·96	71 56 37·53	77	191 192
Rájpur Tree ... ... *Chabli Palm*	„	Palm tree about 1 mile N.E. by E. of the village so called, 1 mile W. of Bhadena village, and 2 miles W.N.W. of Sábli Railway Station on the B. B. and C. I. Line: division Jhálávád, Bajána State. 1863-64.	23 2 43	71 57 52	...	149
Raiol t.s.	„	On the highest point of a ridge surrounding a tank, about 1½ miles E.N.E. of the village so called, and 5 miles N.E. by N. of Pánsina village: division Jhálávád, Limbdi State. The station consists of an isolated and perforated pillar of masonry 15 feet in height with an aperture giving access to the lower mark-stone. 1864.	22 36 47·37	72 3 9·85	71 / 15	82
Rámpura s.	„	On a knoll a few yards from an old wall, about 1½ miles W. of the village so called, 5 miles N.E. of Sáyla town, and 6 miles E.S.E. of Múli town: division Jhálávád, Wadhwán State. The station consists of an isolated and perforated pillar of masonry 5 feet in height with an aperture giving access to the lower mark. 1860.	22 35 52·35	71 35 6·60	360 / 5	102
Rámsádi, XII	Kaira	*Vide* page 9—K.	23 0 15·82	73 10 10·37	336 / 30·8	22
Ránpur Minaret	Ahmedabad	At the N.E. corner of the town so called on the left bank of the Bhádhar river, and ½ a mile S.S.W. of Ránpur Railway Station on the Bhávnagar and Gondal Line: sub-division Dhandhúka. 1863-64.	22 21 4·9	71 45 19·9	...	203
Rardhu s. ... ... *Raru H.S.*	Kaira	On rising ground in the centre of the town of the same name on the right bank of the Vátrak river, and 7 miles S.W. by W. of Kaira town: sub-division Mátar. The station consists of a solid, isolated, triangular pillar of masonry 1 foot in height surrounded by a platform. On top of this another pillar, 3 feet high, about 2½ feet square at base and tapering up to 15 inches at the top, has been built. When visited by the Levelling Party in 1875-76, the station was found in good order. 1854.	22 41 55·47	72 37 28·92	* 114·35 / 4	54

* To upper surface of square pillar.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Ratanáli Hill Mark ... *Ratnali H.S.*	Holkar Territory	On a small isolated hill close to the village of that name, about 2½ miles W.S.W. of Rámpur on the road from Khawása town to Pitláwad town, and 4 miles S. of the former: Indore State. 1861-62.	23 3 1·90	74 45 20·24	1431	103
Rena Hill Mark (helio.) ... *Reyna Hill*	Panch Mahále	On the highest point of a small isolated hill about ½ a mile N. of the village of that name, 1½ miles S.S.W. of Dháeka, 2 miles E.N.E. of Morva, 1¾ miles S.E. of Tarsang, and 4¼ miles N.N.W. of Karsana close W. of the high road from Páli to Lúnáváda: sub-division Godhra. 1858-59.	22 55 23·90	73 32 8·88	501	125 126
Richhia, XVIII*	,,	*Vide* page 8—K.	22 42 3·84	73 39 24·74	$\frac{542}{5}$	14, 18 19
Richhia h.s. ... ... *Reinchia Asala Platm.*	,,	On a small isolated hill about ½ a mile S.W. of the small village of that name, 6 miles E. of the 3rd milestone on the high road from Godhra to Kálol, 1 mile S.S.W. of Mahulia, and the same distance N.N.E. of Mirápuri Mota: sub-division Godhra. 1860-61.	22 43 42·81	73 43 43·79	676	120 121
Rohoni h.s. ... ... *Rhoni S.*	Kaira Agency	On a sandy hillock about ½ of a mile S.W. of the village so called, 3½ miles W.N.W. of Gudel village, and 3 miles N.W. of Támsa village: Cambay State. The station consists of an isolated pillar of masonry 1 foot in height surrounded by a platform. On top of this another pillar, 3 feet high, about 2½ feet square at base and tapering up to 15 inches at the top, has been built. When visited by the Levelling Party in 1875-76, the station was found in good order. 1854.	22 24 37·71	72 30 35·09	$\frac{61}{1}$	61
Rúdan, XV	Kaira	*Vide* page 9—K.	22 53 20·43	72 56 50·43	$\frac{196}{23·0}$	25
Sahej s.	Ahmedabad	On the E. bank of a small tank about a mile W. by N. of the village so called, 4 miles W. of the town of Rardhu, and 5¾ miles S.W. by W. of that of Naika: sub-division Dholka. The station consists of a solid, isolated, triangular pillar of masonry 1 foot in height surrounded by a platform of earth. On top of this another pillar, 3 feet high, about 2½ feet square at base and tapering up to 15 inches at the top, has been built. When visited by the Levelling Party in 1875-76, the station was found in good order. 1854.	22 41 53·89	72 32 35·71	† $\frac{73·01}{1}$	53
Sálásar s.	,,	On a well elevated bank of a tank close N.W. of the village so called, 3 miles N.N.W. of Unchadi village, and 10 miles E. by S. of Ránpur town and Railway Station on the Bhávnagar and Gondal Line: sub-division Dhandhuka. The station consists of an isolated and perforated pillar of masonry 2 feet high, having an aperture giving access to the lower mark-stone and surrounded by a kacha platform of the same height. 1864.	22 19 15·89	71 54 14·74	$\frac{168}{2}$	87
Samoi, VI	Bhopáwar Agency	*Vide* page 7—K.	22 39 16·70	74 28 28·85	$\frac{1744}{5·5}$	6
Sánand, XXII	Ahmedabad	*Vide* page 10—K.	22 59 28·45	72 24 38·54	‡ $\frac{163·66}{12}$	33
		Note.—When visited by the Levelling Party in 1875-76, the station was found in good order.				
Sandalpur h.s.	Kaira	On the highest point of a low ridge running parallel to and at a distance of about ½ a mile W. of the Mahi river, 1 mile E. by S. of the village of Sandalpur, and 5¾ miles E. of Od town: sub-division Ánand. The station consists of an isolated pillar of masonry 2 feet in height surrounded by a platform. 1869-72.	22 37 50·32	73 14 53·04	$\frac{193}{2}$	230

* This station appertains to the Singi Meridional Series. † To the upper surface of the pillar. ‡ To mark-stone on top of tower.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Sángásar s.	Ahmedabad	On the E. embankment of a small tank about 200 yards S. of the village so called, 3½ miles N. of Haibatpur village, and 6½ miles S.W. by W. of Dholera town: sub-division Dhandhuka. The station consists of a solid, isolated, triangular pillar of masonry 5 feet in height surrounded by a mud platform. The lower mark is set in lime cement. 1861.	22 11 30·26	72 8 57·47	[64]	75
Sápakda, XXI*	Káthiáwár Agency	*Vide* page 13—K.	22 52 9·05	71 16 46·83	$\frac{313}{26}$	47
Sápakda Pole ... ... *Jetwa Pole*	,,	At the S.E. corner of some high ground, about 1½ miles N. by E. of the village so called, 8 mile in the same direction from Sara village, and 11 miles S.E. by E. of Susváv on the left bank of the Bámbhan river: Dhrángadra State. 1852-53.	22 54 39	71 16 45	[275]	159 160
Sárod s.	Broach	About 1½ miles S.E. by E. of the town of the same name on the left bank of the Mahi river, 2 miles E.N.E. of Sámoj, and the same distance N.W. by N. of Nodhana Valipur village: sub-division Jambusar. The station consists of an isolated pillar of masonry 5 feet in height surrounded by a platform of earth. 1863.	22 9 34·08	72 48 24·17	$\frac{70}{5}$	246
Sársa s.	Kaira	On the N. bank of a tank immediately E. of the town of the same name, and 7 miles E. by S. of Ánand Railway Station: sub-division Ánand. The station consists of an isolated pillar of masonry 2½ feet in height surrounded by a platform. 1869-72.	22 32 39·87	73 7 2·25	$\frac{179}{2·5}$	233
Semlia s. ... ... *Samalia S.*	Bheel Agency	On a strip of waste land, about 1½ miles S. of the village of that name, 2¾ miles N.W. by N. of Kánwan town, 3½ miles E.N.E. of Kod, and ¼ a mile W. of the high road from Rutlam to Indore: Dhár State. The station consists of a platform of earth enclosing a circular, perforated pillar of masonry, 2½ feet in diameter and 5 feet in height, with an aperture on the S. side giving access to the mark-stone at the ground level. 1882-83.	22 54 9·61	75 16 48·15	$\frac{1774}{5}$	†
Sháhápur Mark (helio.) ...	Ahmedabad	Close S. of the village so called, and about 2½ miles S. by E. of the large village of Bhimnáth on the metalled road from Gogha to Dhandhuka: sub-division Dhandhuka. 1864.	22 12 48·01	71 58 29·39	...	...
Shergarh s.	Bheel Agency	On a high swell of ground near the western edge of an extensive plateau, about 1½ miles N.W. of the large village of that name, 3½ miles S.W. by W. of Kod town, and the same distance W.N.W. of Bidwál town: Dhár State. The station is denoted by a mark-stone embedded flush with the ground, having four other stones around it with marks thereon; the intersection of lines joining them coincides with station mark. 1882-83.	22 51 33·36	75 10 47·69	1826	†
Shiáni t.s. ... ... *Siani T.S.*	Káthiáwár Agency	On the bund of a small tank about a mile S. by E. of the village so called, 10 miles E. by S. of the town of Wadhwán, and 8 miles N. by E. of Limbdi town. The station is about 1½ miles N. of the Bhogáva river: division Jhálávád, Limbdi State. The station consists of an isolated and perforated pillar of masonry 15 feet in height with an aperture giving access to the lower mark-stone. 1864.	22 40 18·92	71 52 40·97	$\frac{145}{15}$	81

* This station appertains to the Káthiáwár Meridional Series.
† For triangles fixing these stations, see the Synoptical Volume of the Khánpisura Meridional Series.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station / Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Sikotar Máta s.	Kaira Agency	Within a few yards of the N.W. corner of the enclosure of the temple close to the left bank of the Sábarmati river, about 2 miles W. by S. of Vadgám: Cambay State. The station consists of a solid, isolated, triangular pillar of masonry 1 foot in height surrounded by a platform of earth. 1854.	22 18 57·21	72 25 57·78	39/1	67
Sikotar Máta Temple ...	„	Kalas of the domed temple close to the left bank of the Sábarmati river, about 2 miles W. by S. of Vadgám, and 8 miles S. of Mitli village: Cambay State. 1853-54.	22 18 56·5	72 25 58·3	...	180 181
Singli Hill Mark ... ... *Kutchomar H.S.*	Rajputana Agency	On the highest part of a range of hills, about 1½ miles S.E. of the village of that name, 2 miles E. of Sában, and 2¾ miles E.N.E. of Timarda on the road from Khándu to Kusalgarh: Bánswára State. 1861-62.	23 16 51·92	74 29 44·73	1939	107
Sirkhi s.	Gaikwár's Territory	On a high mound near the road between the villages of Sirkhi and Sevási, about 1¾ miles E.S.E. of the former and 1½ miles N.W. of the latter, and 3 miles E.N.E. of the junction of the Meni with the Mahi river. About 50 yards S.E. of the station is a large paka well called Borikua: Baroda State. The station consists of an isolated pillar of masonry 3 feet in height surrounded by a platform of earth. 1869-72.	22 19 41·78	73 8 42·14	127/3	238
Sitha Temple ... ... *Sita Temple*	Káthiáwár Agency	Spire of the temple in a tope of trees about ½ a mile W. of the town so called on the main road from Dhrángadra to Wadhwán, and 11 miles S.E. of the former town: division Jhálávád, Dhrángadra State. 1859-60.	22 51 50·4	71 37 27·3	...	215
Sola, XXI	Ahmedabad	*Vide* page 10—K.	23 5 17·06	72 33 47·55	*242·06/25	31, 32
Sonáda, XIX	Gaikwár's Territory	*Vide* page 10—K.	23 7 19·89	72 48 27·32	250	29
Sorna Hill	Kaira	About ¾ of a mile S. by E. of the village so called, 3¾ miles E. by S. of Dásalváda on the metalled road from Nadiád to Kapadvanj: sub-division Kapadvanj. 1858-59.	22 58 38	73 7 39	...	132 133
Sorta t.s.	Káthiáwár Agency	On a circular tower of stone masonry surrounded by a parapet wall 5 feet in height in the centre of the village so called, about 2 miles N.W. by N. of Vágad village on the right bank of the Bhádhar river and close to the main road from Ránpur to Dhandhuka, and 2½ miles S. by W. of Kantháría: division Jhálávád. 1864.	22 23 6·29	71 53 36·04	166	85
Sultánpura s.	Gaikwár's Territory	On high raviny ground on the left bank of the Mahi river, about ½ of a mile N. of the village of Sultánpura, 1½ miles S. of Muhammadpura village, and 7 miles S.S.E. of Bhádran town: Baroda State. The station consists of a pillar of masonry 14 feet in height having a mark-stone at the ground level and another 3 feet above it. No platform surrounds the pillar. 1869-72.	22 15 52·00	72 59 15·74	93/14	241

* To mark-stone on top of tower.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station / Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Tagadi t.s. ... ... *Taggri T.S.*	Ahmedabad	On some slightly rising ground, about a mile S.S.E. of the village of the same name, 4 miles E. of Unchadi village, and 16 miles E. by S. of Ránpur town and Railway Station on the Bhávnagar and Gondal Line: sub-division Dhandhuka. The station consists of an isolated and perforated pillar of masonry with an aperture giving access to the lower mark-stone. 1864.	22 16 49·87	71 59 31·39	87	88, 89
Taradia Mota Mark (helio.) ... *Mota Tarraria S.*	Káthiáwár Agency	About ¼ of a mile S.W. of the village so called, 3½ miles E.N.E. of Bhoika town, and 8½ miles E. by S. of Limbdi town: táluka Dhandhuka. 1863-64.	22 31 17·65	71 58 53·03	73	198
Tarakpur s.	Kaira Agency	On the S. bank of a small tank of sweet water about 250 yards E. of the village of the same name, 3¼ miles S. of Mitli village, and 3 miles N.N.W. of Vadgám: Cambay State. The station consists of a solid, isolated, triangular pillar of masonry 1 foot in height surrounded by a platform of earth. 1854.	22 21 46·83	72 26 46·63	41/1	64, 65
Thaltej Dome ... ... *Tultage Dome*	Ahmedabad	On a small isolated hill about ¼ a mile E. of the large village of the same name, 1⅞ miles in the same direction of Ambli Road Railway Station on the line from Wadhwán to Ahmedabad, and 3¼ miles W. of Ahmedabad city: sub-division Sánand. 1851-52.	23 2 53·2	72 33 38·0	...	145 146
Thárkheri, II	Bhopáwar Agency	*Vide* page 6—K.	22 52 16·07	74 53 7·83	1742/4·8	2
Thuleta, XXVII	Ahmedabad	*Vide* page 11—K.	22 56 31·64	72 8 43·93	101/16	38
Tikar Tree ... ... *Dewalio Tree*	Káthiáwár Agency	Immediately S. of a road, about 1½ miles E. by N. of the village so called, and 4½ miles N. by W. of Múli town: Múli State. 1859-60.	22 42 19	71 29 10	...	221
Tundaj House ... ... *Tondaj House*	Broach	Highest house about ¼ a mile N.N.E. of the village so called, 1½ miles S.W. of Amanpur, and 2½ miles E. of Kora village: sub-division Jambusar. 1862-63.	22 6 47·0	72 46 0·2	...	*
Tundaj s. ... ... *Tondaj St.*	„	On the N. bank of a small tank about 100 yards E. of a paka well, about 1¼ miles S.W. by S. of the village so called, 1½ miles E. of Pánchkara, and 2¼ miles N.W. by N. of Káva village: sub-division Jambusar. The station consists of an isolated pillar of masonry 5 feet in height surrounded by a platform of earth. 1863.	22 5 20·86	72 45 11·68	54/5	253
Vádhoda, XXV	Gaikwár's Territory	*Vide* page 11—K.	23 11 7·51	72 14 36·97	158/12	36
Vágad Tree ... ... *Wagar Palm*	Ahmedabad	Palm tree immediately N. of the village of the same name near the right bank of the Bhádhar river, and 10 miles E. of Ránpur town and Railway Station on the Bhávnagar and Gondal Line: sub-division Dhandhuka. 1863-64.	22 21 51	71 54 44	...	206

* For triangle fixing this point, see the Synoptical Volume of the Singi Meridional Series.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. of Triangle
			° ′ ″	° ′ ″	*feet*	
Válinda s. ... ... *Walinda S.*	Ahmedabad	On the S. bank of a small tank S. of the village of the same name, 3½ miles E. of Gámph village, and 8 miles N. by E. of Dholera town: sub-division Dhandhuka. The station consists of a platform enclosing a solid, isolated, triangular pillar of masonry 3 feet in height, having the lower mark-stone set in lime cement. 1861.	22 21 38·96	72 15 44·45	[55]	70
Válvod s. ... ... *Walwor S.*	Gaikwár's Territory	On a large temple in the centre of the village so called about a mile N. of the right bank of the Mahi river and 3 miles S. of Bhádran town: Baroda State. The station is denoted by a circle and dot engraved on the terraced roof of the temple. 1869-72.	22 19 4·00	72 57 4·99	116	242
Válvod Tree ... ... *Walwor Bur Tree*	,,	About ½ of a mile S.E. of the large village of that name close to the right bank of the Mahi river, 3 miles S. by E. of Bhádran town, and 2½ miles E.S.E. of Shisva: Baroda State. 1869-72.	22 18 48	72 57 6	[116]	251 252
Vardhadi, XV*	Rewa Kántha Agency	*Vide* page 8—K.	23 5 32·78	73 30 12·73	556 / 5·8	16
Varsada h.s. ... ... *Warsora H.S.*	Kaira Agency	On a hill, about ¾ of a mile N. of the village of the same name, 1½ miles S.E. of Kasbára village, and 3½ miles S.W. of Chángada village: Cambay State. 1854.	22 30 0·06	72 32 34·00	82	59
Varsada Temple ... ... *Warsora Temple*	,,	Spire of a small white temple about ¼ of a mile N.W. of the village of the same name, and 2½ miles N. of Vali or Vadli village: Cambay State. 1853-54.	22 29 40·3	72 32 35·5	...	...
Vásad s. ... ... *Wasad S.*	Kaira	On a high tank bank about 300 yards W. of the village so called, 100 yards W. of the Railway Station of the same name on the line from Ahmedabad to Baroda, 50 yards S. of a travellers' bungalow: sub-division Ánand. The station consists of an isolated pillar of masonry 3 feet in height surrounded by a platform of earth. 1869-72.	22 27 9·25	73 6 14·84	146 / 3	235
Vasái Tomb ... ... *Wasai Tomb*	Ahmedabad	Small tomb on the most southern point of a range of hills, about a mile W. of the village so called, ½ a mile E. of Timba village, and 4 miles S.E. by S. of Kásandra town on the right bank of the Sábarmati river: sub-division Daskroi. 1853-54.	22 50 46·1	72 34 16·4	...	164 165
Vásna Chácharvádi s. ... *Wasna S.*	,,	On the southern bank of a small tank about a mile W. by N. of the village so called, ½ of a mile E. of the main road from Dhandhuka to Ahmedabad, and 8 miles S.S.E. of Sánand town: sub-division Sánand. The station consists of a solid, isolated, triangular pillar of masonry surrounded by a platform of earth and sand. 1854.	22 52 54·24	72 27 11·64	93	49
Vastrál, XVIII	,,	*Vide* page 10—K.	22 59 27·91	72 42 33·97	† 229·48 / 7	28

* This station appertains to the Singi Meridional Series. † To mark-stone on top of pillar.

Name of Station or Point	District	Description	Latitude North	Longitude East of Greenwich	Height of Station — Height of Structure	No. Trian
			° ′ ″	° ′ ″	*feet*	
Vatuva Dome ... ... *Batwa L. Dome*	Ahmedabad	Large dome about the centre of the village of the same name 4 miles S. by E. of Ahmedabad city, and 1 mile W. of the B. B. and C. I. Railway Line: sub-division Daskroi. 1851-52.	22 57 21·3	72 39 19·1	...	13 13
Vautha House ... ... *Wowta House*	"	Centre of a high white tiled house near the N.W. corner of the village so called, close on the right bank of the Sábarmati river and at its junction with the Vátrak river, and 7 miles S.E. of Dholka town. A fair is yearly held lasting for six days at which over 20,000 pilgrims assemble, and considerable trade is carried on: sub-division Dholka. 1853-54.	22 39 35·5	72 34 45·2	...	17
Vithalgad Tree ... ... *Vitalgarh P. Tree*	Káthiáwár Agency	On the E. edge of a salt waste about ¾ of a mile S.W. by S. of the town so called, and 1¼ miles N. of the Rai tank: Vithalgad State, division Jhálávád. 1851-52.	22 58 52	72 0 36	...	14 14

October, 1892.

J. ECCLES,
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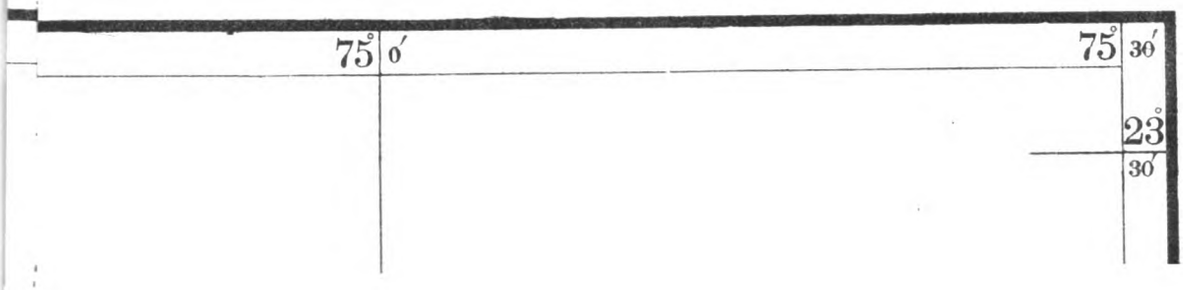

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