

SYNOPTICAL VOLUME XIX

G. T. SURVEY OF INDIA.

THE NORTH PARASNATH AND THE NORTH MALUNCHA
MERIDIONAL SERIES

APPERTAINING TO THE
NORTH-EAST QUADRILATERAL.

PRESENTED

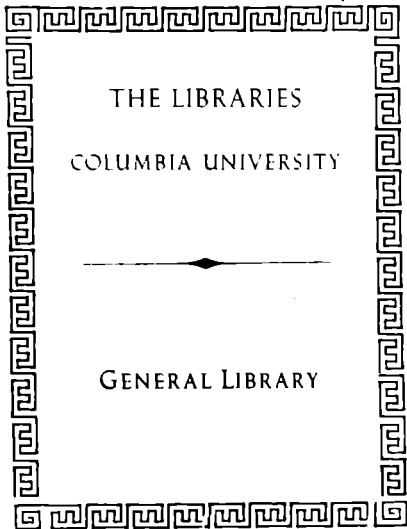
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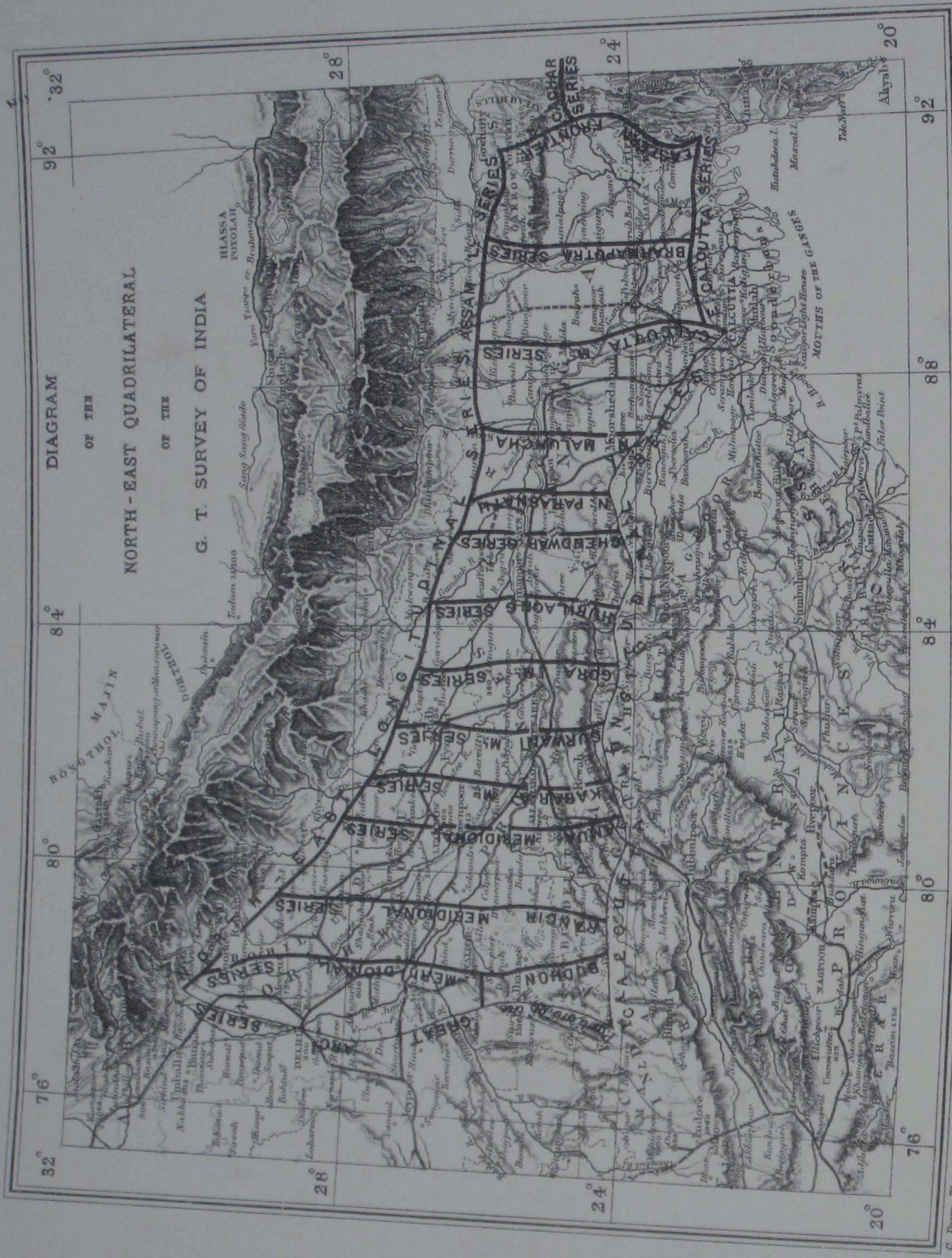


DIAGRAM
OF THE
NORTH-EAST QUADRILATERAL
OF THE
G. T. SURVEY OF INDIA

C. Dixon, Photo.

Photoincographed at the Office of the Triangulation Branch, Survey of India, Dehra Dun, November 1938.

C. G. Ottensbach, Engr.

SYNOPSIS OF THE RESULTS OF THE OPERATIONS OF
THE GREAT TRIGONOMETRICAL SURVEY OF INDIA
VOLUME XIX.

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DESCRIPTIONS AND CO-ORDINATES
OF THE
PRINCIPAL AND SECONDARY STATIONS AND OTHER FIXED POINTS OF
THE NORTH PARASNATH MERIDIONAL SERIES
OR SERIES R
AND THE NORTH MALUNCHA MERIDIONAL SERIES
OR SERIES S
OF THE
NORTH-EAST QUADRILATERAL.

PREPARED BY
J. B. N. HENNESSEY, M.A., F.R.S., &c., OFFG. DEPUTY SURVEYOR GENERAL,
IN CHARGE OF TRIGONOMETRICAL SURVEYS, AND HIS ASSISTANTS,

AND PUBLISHED UNDER THE ORDERS OF
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B. V. HUGHES.

1883.

NORTH MALÚNCHA MERIDIONAL SERIES—(Continued).

	PAGE.
Description of Principal Stations	3— <i>s.</i>
Addendum to Description of Principal Stations	7*— <i>s.</i>
Principal Triangles	7— <i>s.</i>
Secondary Triangles connecting Principal-Auxiliary Stations and Intersected Points ..	10— <i>s.</i>
„ Monghyr Series	11— <i>s.</i>
Azimuths of Surrounding Stations and Points, at Principal, Principal-Auxiliary and Secondary Stations	12— <i>s.</i>
Co-ordinates and Descriptions of all Stations and Points	15— <i>s.</i>

CHART

CORRIGENDA.

v

12—R. to 16—R. The following stations of the Ganges River Triangulation are given by their adopted local names, whereas they ought to have been arranged by their numbers in the River Triangulation. This arrangement is supplied in the following table.

Stations of the Ganges River Triangulation.	
Name in Co-ordinate List.	Proper Number of the Station.
A ₂ s.	Ganges River No. 271 s.
Gogri s.	" No. 272 s.
B s.	" No. 273 s.
Latra Balolpur s.	" No. 274 s.
Maniár Chak s.	" No. 275 s.
C s.	" No. 276 s.
Bishnupur s.	" No. 277 s.
Goria Tola s.	" No. 278 s.
Bhairo Tola s.	" No. 279 s.
Pulkáha s.	" No. 280 s.
No. 15 s.	" No. 281 s.
Agwáni s.	" No. 282 s.
Kolgaona s.	" No. 283 s.
No. 14 s.	" No. 284 s.
No. 13 s.	" No. 285 s.
No. 12 s.	" No. 286 s.
No. 11 s.	" No. 287 s.
Sirámpur s.	" No. 288 s.
No. 16 s.	" No. 289 s.
No. 17 s.	" No. 290 s.
Murkáha s.	" No. 291 s.
No. 9 s.	" No. 292 s.
No. 21 s.	" No. 293 s.
No. 22 s.	" No. 294 s.
No. 23 s.	" No. 295 s.
No. 6 s.	" No. 296 s.
No. 20 s.	" No. 297 s.
No. 7 s.	" No. 298 s.
No. 18 s.	" No. 299 s.
No. 10 s.	" No. 300 s.
No. 8 s.	" No. 301 s.
Dudhela s.	" No. 302 s.
Hariharpur s.	" No. 303 s.
No. 4 s.	" No. 304 s.
No. 5 s.	" No. 305 s.
Soubarsa s.	" No. 306 s.
No. 3 s.	" No. 307 s.
Mohanpur s.	" No. 308 s.
No. 2 s.	" No. 309 s.
Bairia s.	" No. 310 s.
No. 24 s.	" No. 311 s.
No. 25 s.	" No. 312 s.
No. 26 s.	" No. 313 s.
Dildárpur s.	" No. 314 s.
A ₁ s.	" No. 315 s.
No. 1 s.	" No. 316 s.

15—s, to 21—s. The following stations of the Ganges River Triangulation are given by their adopted local names, whereas they ought to have been arranged by their numbers in the River Triangulation. This arrangement is supplied in the following table.

Stations of the Ganges River Triangulation.	
Name in Co-ordinate List.	Proper Number of the Station.
Bihat s.	Ganges River No. 228 s.
Baro s.	" No. 229 s.
Gangáprasád s.	" No. 230 s.
Mahendrapur s.	" No. 231 s.
Simária s.	" No. 232 s.
Málipur s.	" No. 233 s.
Kasáha s.	" No. 234 s.
Rúpaspur s.	" No. 235 s.
Ráandiri s.	" No. 236 s.
Kapsia s.	" No. 237 s.
Dumri s.	" No. 238 s.
Siáma No. 1 s.	" No. 239 s.
" No. 2 s.	" No. 240 s.
" No. 3 s.	" No. 241 s.
Sadhar s.	" No. 242 s.
Badalpur s.	" No. 243 s.
Bisanpur s.	" No. 244 s.
Saidpur s.	" No. 245 s.
Bindoli s.	" No. 246 s.
Patuha s.	" No. 247 s.
Rámchandrapur s.	" No. 248 s.
Ekbarpur s.	" No. 249 s.
Ráhatpur s.	" No. 250 s.
Sanáha s.	" No. 251 s.
Súrajgarh s.	" No. 252 s.
Samo No. 1 s.	" No. 253 s.
" No. 2 s.	" No. 254 s.
Ánandpur s.	" No. 255 s.
Abgil s.	" No. 256 s.
Haibatganj s.	" No. 257 s.
Rámnáthpur s.	" No. 258 s.
Katalúpur s.	" No. 259 s.
Pahárpur s.	" No. 260 s.
Bahádurnagar s.	" No. 261 s.
Sápur s.	" No. 262 s.
Dhanotala s.	" No. 263 s.
Parora s.	" No. 264 s.
Parida No. 2 s.	" No. 265 s.
" No. 1 s.	" No. 266 s.
Sardátala s.	" No. 267 s.
Dakra Nála s.	" No. 268 s.
Raghunáthpur s.	" No. 269 s.
Tikúpur s.	" No. 270 s.

July, 1883.

W. H. COLE,
In charge of Computing Office.

REFERENCES.



The abbreviations employed in the text are as follows:—

h.s. denotes hill station secondary,

s. „ station secondary.

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, and in such cases numerical values of azimuths are not given. For other points, difficult to identify or of comparatively less accuracy, numerical values of triangles or azimuths are not given.

July, 1883.

W. H. COLE,

In charge of Computing Office.

P R E F A C E.

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The North Párasnáth and the North Malúcha Meridional Series are the ninth and the tenth meridional series from the west of the sixteen chains of triangles included in the Section of the Principal Triangulation of the Survey of India which has been named the North-East Quadrilateral. This Section embraces the area within the Meridians of  $78^\circ$  and  $92^\circ$  and the Parallels of  $23^\circ$  and  $30^\circ$ ; and for reasons explained in Section 7 of Chapter I of Volume II of the *Account of the Operations of the Great Trigonometrical Survey*, its general reduction was postponed till that of the neighbouring Quadrilaterals, *viz.*, the North-West and South-East, had been completed, whereby two of the Series, the Great Arc, Section  $24^\circ$  to  $30^\circ$ , and the Calcutta Longitudinal, entering the periphery of the North-East Quadrilateral, became finally fixed. The general principles of the Simultaneous Reduction, and the procedure followed in carrying it out, are the same as have been explained in Volume II of the *Account of the Operations, &c.*, and full details of the whole of the principal triangulation which is at present included in the Quadrilateral, will be found in Volumes VII and VIII 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 triangulations, 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;—

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------------|
| <p>For the several Series forming the North-West Quadrilateral,</p> <ul style="list-style-type: none"> <li>I. Great Indus Series.</li> <li>II. Great Arc, Section <math>24^\circ</math> to <math>30^\circ</math>.</li> <li>III. Karáchi Longitudinal Series.</li> <li>IV. Gurbágarh Meridional Series.</li> <li>V. Rahún Meridional Series.</li> <li>VI. Jogi-Tíla and Sutlej Series.</li> <li>VII. North-West Himalaya Series.</li> </ul> <p>For those forming the South-East Quadrilateral,</p> <ul style="list-style-type: none"> <li>VIII. Great Arc, Section <math>18^\circ</math> to <math>24^\circ</math>.</li> <li>IX. Jabalpur Meridional Series.</li> <li>X. Bider Longitudinal Series.</li> <li>XI. Biláspur Meridional Series.</li> <li>XII. Calcutta Longitudinal Series.</li> <li>XIII. East Coast Series.</li> </ul> <p>And for the following Series of the North-East Quadrilateral,</p> <ul style="list-style-type: none"> <li>XIV. Budhon Meridional Series.</li> <li>XV. Rangír Meridional Series.</li> <li>XVI. Amua and Karára Meridional Series.</li> <li>XVII. Gurwáni and Gora Meridional Series.</li> <li>XVIII. Huriláong and Chendwár Meridional Series.</li> </ul> | } | Already published. |
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The present is the 19th Synoptical Volume and the sixth of those appertaining to the North-East Quadrilateral; and it has been made to include both the North Párasnáth and the North Malúncha Meridional Series in one volume, because the available matter is insufficient for two volumes.

It gives the results of the whole of the triangulation executed in connection with these series, both the principal, which was executed with theodolites having azimuthal circles of 15, 18 and 24 inches in diameter read by 3 micrometer microscopes, and the secondary, which was executed with smaller theodolites read by verniers.

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 North-East Quadrilateral. All secondary triangulations which emanate from one side of the principal series and close on another side thereof, or on a contiguous series, have also been made consistent throughout.

As regards the general arrangement of this volume, it is necessary to point out that the several sections have been prepared and printed at different times, and that the work has extended over several years. The Introductions to each series and the Names and Descriptions of the Principal Stations were originally prepared for Volume VIII 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 the present Synopsis. The Alphabetical and Numerical Lists of Principal Stations, pages 1—*R.* and 2—*R.* and 1—*S.* and 2—*S.*, were printed prior to the year 1868, when the general programme for the final reduction of the whole of the Triangulation of India was drawn up; there was then a long pause in the printing, while the Simultaneous Reductions of the North-West, South-East and North-East Quadrilaterals were being completed; this was done by the year 1877, when the secondary triangulation was adjusted in accordance with the principal, and then the printing of this volume was resumed.

The paging of each series starts from unity and is therefore not continuous throughout this volume. This was necessitated by the order of routine which had to be adopted in printing the successive subjects embraced in each and which is the same for all. The paging of each series is however distinguished by using a capital letter as a subscript to the numerals; thus all the paging which has reference to the North Párasnáth Meridional Series has the subscript *R.*, and that to the North Malúncha Meridional Series the subscript *S.*

The data given in this volume are the following:—

*First* (pages 1—*R.*, 1—*S.*), alphabetical lists of the names of the principal stations, showing the numbers assigned to them, which were employed in the reductions as being more convenient to use than names.

*Second* (pages 2—*R.*, 2—*S.*), numerical lists giving the names corresponding to the numbers.

*Third* (pages 3—*R.*, 3—*S.*), descriptions of the principal stations—of their structure and positions—as taken from the original records of the observations, and supplemented by Addenda (pages 7\*—*R.*, 7\*—*S.*) giving the most recent information of their condition which has been received up to date.

*Fourth* (pages 7—*R.*, 7—*S.*), the angles and sides of the principal triangles, numbered and arranged in order from south to north.

*Fifth* (pages 9—*R.*, 10—*S.*), 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.

*Sixth* (pages 10—*R.*, 12—*S.*), the azimuths of surrounding stations and points, at principal, principal-auxiliary, and secondary stations, the latter arranged in alphabetical order.

*Seventh* (pages 12—*R.*, 15—*S.*), the co-ordinates and descriptions of all stations and points arranged in alphabetical order.

The heights of the stations of the North Párasnáth Meridional Series depend in the first instance on the finally determined values of the stations of Bámani and Ghorajji of the Calcutta Longitudinal Series (of the

South-East Quadrilateral), and on the spirit-leveled height of Basantpur, Chotaipati and Harpur of this Series; Chandarsanpur and Bheria Bisanpur appertain to the North-East Longitudinal Series. The heights of the North Malúncha Meridional Series depend on the finally determined values of the stations of Durgapur and Malúncha of the Calcutta Longitudinal and on the spirit-leveled height of Barári and Dighi of this Series and on that of Rámnagar of the North-East Longitudinal Series and on the finally determined value of the station of Manula of the latter Series. The manner in which the heights of the remaining stations have been made to accord with those above designated, is explained in Section 7 of Chapter II, Part I of Volume VII of the *Account of the Operations, &c.* The datum to which all heights have been referred is the mean sea level of Karáchi (Kurrachee). It may be here stated that all trigonometrically determined heights invariably refer to the upper surfaces of the central masonry pillars which are constructed for the instruments to stand on. Spirit-leveled values sometimes refer to the upper surface and sometimes to the basement of the pillar, whichever the leveling staff was set on; a description of the exact point referred to is given in each instance in footnotes to the pages of the Co-ordinate Lists, commencing on pages 12—z, and 15—g, respectively.

It has not been considered necessary to publish the whole of the details of the secondary triangulation, portions having been executed originally for preliminary geographical purposes, to facilitate the construction of a first map of India, and the objects observed having in many instances been flags and temporary marks which must long since have disappeared. The sides and angles of 7 triangles for the North Párasuáth Meridional Series and of 31 triangles for the North Malúncha Meridional 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 number of other points the co-ordinates only have been given. With the aid of Nos. X, XI and XII of the *Auxiliary Tables to facilitate calculations of the Survey Department of India*, Dehra Doon 1868, local surveyors, working on a system of rectangular co-ordinates, can readily transform the spheroidal co-ordinates here given to suit their own requirements.

The Longitudes depend on an astronomically determined value of the longitude of the Madras Observatory,  $80^{\circ} 17' 21''$ , which was deduced about the year 1815. There has long been reason to believe that this value was about 3' too great; but, pending the final determination of the longitude of the Madras Observatory, it has not been considered desirable to alter the value, which has therefore been maintained up to the present time. An electro-telegraphic determination of the longitude of Madras from Greenwich, commencing with the difference between Suez and Greenwich—determined, in 1874, under the superintendence of the Astronomer Royal—was completed in 1877 by the determination of the difference between Suez and Madras, by Captains Campbell and Hearside, as a part of the operations of this Survey. The combined result places the Observatory at Madras in Long.  $5^{\text{h}} 20^{\text{m}} 59^{\text{s}} 42 = 80^{\circ} 14' 51'' 30$ . Thus the following precept may be accepted with considerable confidence,—

**All the values of longitude in this volume require a constant correction,  
probably of  $- 2' 30''$ .**

As regards the orthography of Indian names in the present volume. The Alphabetical and Numerical Lists of Principal Stations, for each series, were printed before the year 1868, in accordance with the rules introduced by Colonel Everest for use in the Survey Department. Subsequently, in 1874, several provincial lists of spellings, constructed under the immediate orders of the Government of India, were received; and thereafter 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 List for Bengal*. As a general rule the pronunciations of the vowels are as follows:—*a* has a variable sound as in woman, rural, paltry; *á* as in tartan; *í* as in bit; *í* as in ravine; *u* as in bull; *ú* as in rural; *o* as in note; *e* as *a* in say; *au* as *ou* in cloud; *ai* as *i* in ride.

The Charts accompanying this volume show the whole of the principal stations and triangulation, the positions of all the 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 is to 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 this volume and the preparation of the data which it contains have been the work, at different times, of Major Herschel, B.E., F.R.S., Mr. Cole, M.A., and myself. Major Herschel moreover supervised the Simultaneous Reduction of the North-East Quadrilateral of which these Series form a portion, while the Introductions to both the Series were written by Mr. C. Wood. Great pains have been taken to secure the utmost accuracy in preparing the data and passing them through the press.

M R S S O O B E E E , }  
*July, 1863.* }

J. B. N. HENNESSEY,  
*Offg. Dy. Surveyor General,*  
*In charge Trigonometrical Surveys.*



**NORTH PARASNATH MERIDIONAL SERIES.**



## NORTH PARASNATH MERIDIONAL SERIES—(LONG. 86° 11').

## INTRODUCTION.

The North Párasnath Series is the ninth, reckoning eastwards from the Great Arc, of the several meridional chains of triangles included in the North-East Quadrilateral. It was carried out under the instructions of Colonel Waugh, who was then the Surveyor General. It emanated from the side Chendwár-Párasnath (LVII-LVIII) of the Calcutta Longitudinal Series as originally executed; but in 1867, during the revision of that series, the first two triangles of the North Párasnath were remeasured and incorporated with the revisionary triangulation.\* As now constituted, the North Párasnath Series is based on the side Bámani-Ghoránji (LVI-LIX) of the revised Calcutta Longitudinal Series. It is constructed throughout its entire course as a single chain; and is comprised of twenty triangles covering a meridional distance of 135 miles. The first 45 miles stretch across the hilly ground between the Barákar river and the Ganges, the average side-length in the first four triangles being 23 miles. The Series then descends into the valley of the Ganges where, natural elevations being no longer available, recourse was had to towers† which were mostly of an average height of 20 feet: here the side-lengths were gradually reduced down to an average of about 10 miles.

The triangulation was accomplished in two field seasons, 1850-52. All the Principal observations were made with Barrow's 24-inch theodolite No. 1, a description of which will be found on pages 46 to 49 of the Appendices to Vol. II. In measuring the rounds of horizontal angles with this instrument, the ordinary method of 'changing zero'—which was introduced by Colonel Everest and is described in Chapter IV of Vol. II—was discarded for a method of changing the reference station for zero settings when half the observations were completed, which was temporarily introduced by Colonel Waugh for reasons which will be found in Appendix No. 5 to Vol. II.

Mr. Nicolson, with a party of Survey Officers as detailed in the margin and a sufficient

Season 1850-51.

## PERSONNEL.

Mr. J. O. Nicolson, Senior 1st Class Sub-Asst.  
 " J. M. Dunlop, 2nd Class Sub-Assistant.  
 " T. A. Berrill, 3rd " "  
 " J. P. Dunlop, 3rd " "

native establishment, commenced field operations on the 1st October 1850 by reconnoitering the hilly tract between Monghyr—where the party was formed—and Párasnath. The country being densely wooded and otherwise difficult, a few elephants were borrowed from the Commissariat Department to aid in traversing the jungles; but they did

not prove very effective, being weak and small animals. Mr. Nicolson reached his first station

\* See pages 20 and 21 of Volume II of the *Account of the Operations*, &c. † The average cost of these structures was Rs. 90.

Párasnáth (LVII of the Calcutta Longitudinal Series) on the 27th November 1850; and, having found the old mark-stone uninjured, he at once proceeded to build a *paka* pillar and widen the path leading to the summit of the hill to admit of the large theodolite being carried up. This occupied him till the 13th of December. Meanwhile Mr. J. M. Dunlop had visited Chendwár (LVIII of the Calcutta Longitudinal Series) and erected a *paka* pillar over the original mark. Mr. Nicolson commenced operations at Párasnáth on the 18th December by taking a set of circumpolar-star observations to  $\delta$  Ursæ Minoris for the determination of his initial azimuth: these occupied him till the end of the month. Up to this time no stations had been selected; for, owing to the persistent prevalence of westerly winds with concomitant haze and dust in the atmosphere, it had been found impracticable to see objects even at a distance of only 4 or 5 miles. Seeing no chance of a favorable change in the weather, Mr. Nicolson moved to Chendwár where he arrived on the 16th January. After a few days' detention a shower of rain fell and cleared the atmosphere, which enabled him to reconnoitre the country to the north. Having selected Bámani (LVI of the Calcutta Longitudinal Series), he detached Mr. J. M. Dunlop to continue the selection, and returned to Chendwár where he completed the measurement of the horizontal and vertical angles by the 2nd of February. He then advanced to Bámani; and, having completed his observations there by the 14th, returned to Párasnáth where, being again hampered by unfavorable weather, he was unable to finish work before the 3rd of March. Up to this time it had been Mr. Nicolson's intention to throw a double polygon over the hilly tract of country for which purpose extra stations were selected and the necessary observations at Párasnáth were completed. But on arrival at Ghoránji (LIX of the Calcutta Longitudinal Series) after a harassing march of seven days, he was constrained to abandon this plan and confine himself to a single series, in consequence of the advanced state of the season and the necessity for quitting as speedily as possible a tract of country which was then very unhealthy. The weather continuing unfavorable, and a violent fever—from which both Mr. Nicolson and his assistant suffered—breaking out in camp, the observations at Ghoránji were with much difficulty completed by the 28th of the month. Without attempting to go to the station of Rheowa (I), the route to which lay through very heavy jungle, the party at once crossed the Batia range, and entering the open country to the north arrived at Ekgora (II) after a tedious march of five days. But the fever was fast gaining upon the party, so that within three days of their arrival at Ekgora only seven men out of the entire native establishment remained on the effective list. Under these circumstances, Mr. Nicolson was compelled to retire from the field. Advancing northwards by slow marches, himself and his assistants suffering severely from fever, he reached Súrajgarh on the Ganges; here, having taken to boats, the whole party dropped down the river and arrived at Monghyr about the 15th of April. Forty-five men of the establishment were at once admitted into hospital and seven of them almost immediately after died of fever and cholera.

The party under Mr. J. M. Dunlop had selected stations and cleared the rays up to the side Matiháni-Malti (VI-VII), and the towers at Barbaia (V) and Matiháni (VI) were well advanced, when Mr. Dunlop found himself too ill to continue any longer in the field. He accordingly retired for medical aid to Monghyr where he arrived on the 17th April,—too late, however, for any material benefit, as after a long and painful illness he died on the 8th July.

The main party left recess quarters at Monghyr on the 11th November; and as neither

Season 1851-52.

PERSONNEL.

Mr. J. O. Nicolson, Senior 1st Class Sub-Assst.  
 „ T. A. Berrill, 3rd Class Sub-Assistant.  
 „ J. P. Dunlop, 3rd „ „

of his assistants had any previous experience in selecting Principal stations, it was Mr. Nicolson's first care to take up this part of the work in person and at the same time to train his assistants. After satisfying himself that, apart from unforeseen accident, nothing would impede the progress of selecting and building stations and clearing the rays between them, Mr. Nicolson returned southwards to begin observations at Rheowa (i). Having concluded these on the 12th December, he advanced to Bichwi (iv) where between the 17th and 30th, besides the horizontal and vertical angles, he took a set of circumpolar-star observations for azimuth. By the 1st of March, observations had been completed up to Bandwár (viii). The next month sufficed to complete the observations as far as Singhia (xii). But beyond this the progress was much interrupted, partly because of the difficulty of selecting stations and clearing rays through this portion of the country which was highly wooded, and partly because Mr. J. P. Dunlop to whom this duty had been entrusted had to struggle against repeated attacks of illness. Nevertheless, by the 1st of June Mr. Nicolson had the satisfaction of bringing the operations to a close. His terminal stations were Chandarsanpur—Bheria Bisanpur, now stations xcix-xciii of the North-East Longitudinal Series.

On the completion of the Simultaneous Reduction of the North-East Quadrilateral it was found that the errors which had actually been dispersed over the North Párasnáth Series, between the origin Bámani—Ghoránji and terminus Chandarsanpur—Bheria Bisanpur, were as follow :—

|                                 |   |              |   |                      |
|---------------------------------|---|--------------|---|----------------------|
| In Logarithm of the latter side | + | 0.000,0097,6 | = | 1.4 inches per mile. |
| „ Azimuth                       | „ | + 2".236     |   |                      |
| „ Latitude of Bheria Bisanpur   | + | 0.074        |   |                      |
| „ Longitude                     | „ | + 0.057      |   |                      |

The trigonometrical heights were checked in subsequent years at three points by connection with the Spirit-levelling Operations of this Survey, see page 35—*x* [of Vol. VII]. This connection shows that in the section ending at Basantpur (xv), a distance of 115 miles, the cumulative error was — 5.3 feet; the errors in the trigonometrical determinations of height on the rays xv-xvii and xvii-xviii amounted to 2.3 and 2.9 feet respectively. For further details see page 41 of Part I of Vol. VII.

*Secondary Triangulation.*

During the first season (1850-51), Mr. Nicolson and his two junior assistants, while marching between the stations of the first two Principal triangles, were enabled to carry a series of secondary triangles—chiefly with a 12-inch theodolite—along the side Chendwár-Bámani (on which this triangulation is based), while another chain—also chiefly executed with a 12-inch theodolite and based on a side furnished by the extension of this triangulation

to Párasnáth—was carried up with the view of fixing the Kurhurbaree coal mines and eventually closing on the station of Ghoránji. The latter connection had however to be abandoned owing to the illness of Mr. J. P. Dunlop and Mr. Nicolson's inability to detach an assistant to supply his place. Both these series have determined several permanent points whose position-values have been adjusted between those of the Principal stations Chendwár, Párasnáth, and Bámani. As the triangulation south of the side Bámani-Ghoránji has been assigned to the Calcutta Longitudinal Series, the results of these secondary operations are exhibited in the Synoptical volume for that series.

*The Monghyr Series.*—This was executed in 1851-52 by Mr. Nicolson assisted by Mr. J. P. Dunlop—chiefly with a 24-inch theodolite—as a chain of first class secondary triangles, partly to furnish bases for connecting the town of Monghyr with the principal triangulation, and partly to afford means for checking the Ganges River Survey. It emanated from the side Bichwi-Matiháni (iv-vi), and was continued eastwards to the side Sakma-Pírdauri (x-xi) of the North Malúncha Series. The triangulation has been adjusted between the final position-values of these sides, and the part of it to the east of the side Maira-Pírpahár will be found in the Synoptical volume of the North Malúncha Series.

*The Ganges River Survey.*—This was executed in three sections as follows:—1st, the triangulation from Monghyr eastwards to the North Malúncha Series was done in October and November 1850 by Mr. J. M. Dunlop, with a 12-inch theodolite, and has been adjusted between the final position-values of Pírpahár (as determined by the Monghyr Series) and Pírdauri (xi) of the North Malúncha Series in the Synoptical volume of which the portion to the east of Monghyr is exhibited. 2nd, the triangulation from Monghyr westwards to Matiháni (vi) was executed in September and October 1851 by Mr. J. P. Dunlop, with a 12-inch theodolite, and has been adjusted between the final position-values of Pírpahár and Matiháni (vi). And 3rd, the triangulation from Matiháni (vi) to Malti (vii) was executed in June 1852 by Mr. T. A. Berrill, chiefly with a 12-inch theodolite.

By these operations the course of the Ganges was determined for a distance of about 70 miles. As, however, the stations of this river-survey were not permanently marked, they are not now forthcoming; hence the usual data of the triangles are not given, but merely the latitudes and longitudes of the stations and of all the permanent points whose positions were determined.

With the object of fixing the position of Durbhunga a short series of triangles was extended to the west of the side Basantpur-Chotaipati (xv-xvii), between the final position-values of which stations it has been adjusted. This series was executed in May 1852 by Mr. T. A. Berrill, with a 12-inch theodolite; and though it furnishes the positions of only two permanent points in and near Durbhunga, it afforded at the time valuable preliminary data for topographical purposes by determining *en route* the position of several villages.

DEHRA DUN: }  
March 1852. }

C. WOOD,  
Surveyor, 2nd Grade.

## NORTH PARASNATH MERIDIONAL SERIES.

## ALPHABETICAL LIST OF STATIONS.

|                                                                   |        |                                                          |        |
|-------------------------------------------------------------------|--------|----------------------------------------------------------|--------|
| Achalpúr . . . . .                                                | XVI.   | Dihí . . . . .                                           | X.     |
| Akáha . . . . .                                                   | IX.    | Elgora . . . . .                                         | II.    |
| Bámáni . . . . .<br>(of Calcutta Longitudinal Series).            | LVI.   | Ghoranji . . . . .<br>(of Calcutta Longitudinal Series). | LIX.   |
| Bandwár . . . . .                                                 | VIII.  | Harpúr . . . . .                                         | XVIII. |
| Barhaia . . . . .                                                 | V.     | Máti . . . . .                                           | VII.   |
| Básatpúr . . . . .                                                | XV.    | Matiháni . . . . .                                       | VI.    |
| Bhería Bisanpúr . . . . .<br>(of North-East Longitudinal Series). | XCIII. | Rheowa . . . . .                                         | I.     |
| Bichwi . . . . .                                                  | IV.    | Saiár . . . . .                                          | XI.    |
| Chandarsanpúr . . . . .<br>(of North-East Longitudinal Series).   | XCI.   | Sajanpúra . . . . .                                      | XIV.   |
| Chotáipáti . . . . .                                              | XVII.  | Shekpúra . . . . .                                       | III.   |
| Damra . . . . .                                                   | XIII.  | Singhía . . . . .                                        | XII.   |

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## NORTH PARASNATH MERIDIONAL SERIES.

## NUMERICAL LIST OF STATIONS.



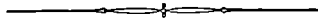
|      |   |   |   |                                                 |       |   |   |   |   |                                                          |
|------|---|---|---|-------------------------------------------------|-------|---|---|---|---|----------------------------------------------------------|
| LVI  | . | . | . | Bámani.<br>(of Calcutta Longitudinal Series).   | X     | . | . | . | . | Dihí.                                                    |
| LIX  | . | . | . | Ghoranji.<br>(of Calcutta Longitudinal Series). | XI    | . | . | . | . | Saiár.                                                   |
| I    | . | . | . | Rheowa.                                         | XII   | . | . | . | . | Singhía.                                                 |
| II   | . | . | . | Ekgora.                                         | XIII  | . | . | . | . | Damra.                                                   |
| III  | . | . | . | Shekpúra.                                       | XIV   | . | . | . | . | Sajanpúra.                                               |
| IV   | . | . | . | Bichwi.                                         | XV    | . | . | . | . | Básatpúr.                                                |
| V    | . | . | . | Barhaia.                                        | XVI   | . | . | . | . | Achalpúr.                                                |
| VI   | . | . | . | Matiháni.                                       | XVII  | . | . | . | . | Chotáipáti.                                              |
| VII  | . | . | . | Máti.                                           | XVIII | . | . | . | . | Harpúr.                                                  |
| VIII | . | . | . | Bandwár.                                        | XCI   | . | . | . | . | Chandarsanpúr.<br>(of North-East Longitudinal Series).   |
| IX   | . | . | . | Akáha.                                          | XCIII | . | . | . | . | Bhería Bisanpúr.<br>(of North-East Longitudinal Series). |





## NORTH PARASNATH MERIDIONAL SERIES.

## DESCRIPTION OF PRINCIPAL STATIONS.



Of the 18 Principal Stations composing this Series, the first 4 at the southern extremity are situated on hills. Each consists of a stone platform of about 12 to 14 feet square, enclosing a solid, isolated pillar of masonry, in the centre of which is placed a mark (circle and centre) either engraved on a stone or on the rock *in situ*. When the Series entered the plains, suitable artificial elevations had to be constructed, as usual, to admit of overlooking the curvature of the earth. Of these structures each of those built at stations V to IX and at XI consisted of a tower of either sun-dried or kiln-burnt bricks, from 16 to 30 feet in height, enclosing a central, hollow pillar of masonry, having a mark-stone imbedded at about the ground level and in some cases a second mark transferred to the top of the pillar by the plumb-line: access to the ground level mark was obtained through a passage which was left expressly for the purpose. It is believed that stations XII to XVIII were of the same construction. Station X consisted of a platform of sun-dried bricks enclosing a pillar (probably perforated) of masonry, having a mark-stone imbedded in the floor and a dot on the summit on which the theodolite was centered.

The following descriptions have been compiled from those given in the MS. General Report and the original records of the Series. The information as to the local sub-divisions in which the several stations occur has been derived from the latest Annual Reports received from the District Officers to whose charge the stations have been committed.

LVI.—(*Of the Calcutta Longitudinal Series*). Bámáni Hill Station, lat.  $24^{\circ} 27'$ , long.  $85^{\circ} 49'$ —observed at in 1851 and 1867—is on a small conical, detached, sandstone hill, which rises about 250 feet above the surrounding country, about 2 miles S.E. of Dargaon village on the road from Masnudih to Doranda; the hill derives its name from the god Bráhma who, according to native tradition, once occupied its summit: thána Kodarma, pargana Kharagdiha, district Hazáribágh.

The station consists of a square stone platform enclosing a central, isolated pillar of masonry  $3\frac{1}{2}$  feet in diameter, and contains two marks, the upper 3.75 feet above the lower which is the same as that fixed in 1851 by the North Párasnath Meridional Series, and was found engraved on the rock *in situ*; the lower mark was the only one employed in 1851. The directions and approximate distances of the circumjacent villages are:—Domcháncho N. W., miles  $4\frac{3}{4}$ ; Kharkhár W., mile  $\frac{3}{4}$ ; and Khismi S. E., miles  $2\frac{1}{4}$ .

LIX.—(*Of the Calcutta Longitudinal Series*). Ghoranji Hill Station, lat.  $24^{\circ} 34'$ , long.  $86^{\circ} 11'$ —observed at in 1851 and 1867—is on a conspicuous peak of a range of hills forming the boundary between the districts of Hazáribágh and Monghyr, about  $1\frac{1}{2}$  miles N. of road from Gumgi to Baijnáth: thána and pargana Kharagdiha, district Hazáribágh.

The station consists of a stone platform about 16 feet square, enclosing a solid, circular pillar of masonry  $3\frac{1}{2}$  feet in diameter, and contains two marks, the upper 3.00 feet above the lower, which is the same as that established by the North Párasnath Meridional Series in 1851, and which was found engraved on the rock *in situ*. The upper mark-stone of the station of 1851 appeared undisturbed in 1867 but a new pillar was then built to the same height as before. The directions and approximate distances of the circumjacent villages are:—Ghoranji S.S.E., miles  $2\frac{1}{4}$ ; Bhandári W., miles 7; Beriah S.S.W., miles  $4\frac{1}{4}$ ; and Chauki N. E. by N, mile 1.

I. Rheowa Hill Station, lat.  $24^{\circ} 48'$ , long.  $85^{\circ} 52'$ —observed at in 1851—is situated on one of the peaks of a range of hills, which runs in a winding direction from west to south-east and terminates at the Sakri river about 5 miles to the west. The station is named after a pass which is a mile to the east of it, and there is a small spring about 300 feet below the station, on the northern side of the hill: thána Gánwán, district Hazáribágh.

The station is built on a cluster of sandstone rocks and consists of a stone platform  $11\frac{1}{2}$  feet square, enclosing an isolated pillar of masonry 1 foot in height, and is marked by a circle and dot engraved on the rock *in situ*. The directions and approximate distances of the circumjacent villages are:—Katani N., miles  $1\frac{1}{2}$ ; Balwa N.N.E., miles 3; Khulwar N.N.E., mile 1; Rajabar S.E., miles  $2\frac{3}{4}$ ; Sheopur village, on left bank of the Sakri, miles  $4\frac{3}{4}$ ; and the large village of Marchori S.W., miles 4.

II. Ekgora or Dhumna Hill Station, lat.  $24^{\circ} 52'$ , long.  $86^{\circ} 11'$ —observed at in 1852—is situated on a mass of hills which extends about 20 miles in a direction nearly east and west and bears the local name of Gidhaur derived from a town of that name lying about  $3\frac{1}{2}$  miles to E. by S. The peak on which the station is fixed rises 2,900 feet above the level of the plain, and is distant about 2 miles from the western extremity of the range where there are the remains of a small fort called Naulakha. There is a small spring on the north side about 400 feet below the station: thána Jamooce, pargana Gidhaur, district Monghyr.

The station consists of a platform of stones, 12 feet square, enclosing an isolated pillar of masonry in which “is imbedded a mark-stone about 5 feet in length”. The directions and approximate distances of the circumjacent villages are:—Bariarpur N.E., miles  $1\frac{1}{2}$ ; Domarkola N.E. by E., miles  $1\frac{1}{2}$ ; Samaria N.W., miles 4; Dhanbaria E., miles 4; Khasmir N.E., miles 2; and the large village of Jamooce N.E., miles 6.

III. Shaikhpara (*Shekpúra*) Hill Station, lat.  $25^{\circ} 8'$ , long.  $85^{\circ} 53'$ —observed at in 1852—is on the extremity of an isolated range of hills, which stands in an extensive, cultivated tract of country, and extends about 6 miles in length; the range is of sandstone and quite bare of vegetation. The station is on the highest swell, about 500 feet above the surrounding country, having the town of Shaikhpara immediately below it on the north side and about 16 miles W. by S. of the Railway Station of Luckeeserai: thána Shaikhpara, pargana Málda, district Monghyr.

The station consists of a platform of stones set in mortar, 12 feet square, having an isolated pillar of brick-work with a mark-stone in the centre, 4 feet in length; imbedded to a level with the surface. The directions and approximate distances of the circumjacent places are:—The town of Málda W.N.W., miles  $6\frac{1}{4}$ ; Hasanganj village S.W., mile 1; and Jamálpur W.N.W., mile 1.

IV. Bichwi Hill Station, lat.  $25^{\circ} 10'$ , long.  $86^{\circ} 11'$ —observed at in 1851—is on a detached old grey sandstone hill which rises some 180 feet above the surrounding plain and is entirely bare of vegetation, about  $1\frac{1}{4}$  miles E. of the Kial nadi, a tributary of the Ganges, and  $8\frac{1}{2}$  miles S.W. of the large village of Súrajgarh on the high road to Monghyr which keeps along the right bank of the Ganges: thána Luckeeserai, pargana Salembad, district Monghyr.

The station consists of a stone platform 1 foot in height and 14 feet square, enclosing a central, isolated pillar of masonry, in the centre of which is imbedded a stone 2 feet in length having the usual circle and dot engraved thereon. The azimuths and perambulated distances of the circumjacent villages are:—Rámpur  $216^{\circ} 10'$ , miles 1.39; Singarpur  $236^{\circ} 17'$ , mile 0.28; Luckeeserai  $134^{\circ} 44'$ , miles 2.41; and Garhi Bazar  $160^{\circ} 24'$ , miles 1.50.

V. Barhaia Tower Station, lat.  $25^{\circ} 18'$ , long.  $86^{\circ} 1'$ —observed at in 1852—stands in an extensive, cultivated plain which appears to have been once the bed of the Ganges river, about  $2\frac{1}{2}$  miles W. by N. of the large village of Barhaia on the high road from Monghyr to Mokameh: thána Begoo Serai, pargana Balia, district Monghyr.

The station consists of a tower 20.17 feet in height, constructed of burnt bricks, with a central pillar of the same material, having a stone with circle and dot engraved thereon sunk to a level with the floor. The azimuths and perambulated distances of the circumjacent villages are:—Rámpur Dumra  $240^{\circ} 45'$ , miles 2.53; and Henja  $245^{\circ} 40'$ , miles 2.41.

VI. Matiháni Tower Station, lat.  $25^{\circ} 22'$ , long.  $86^{\circ} 12'$ —observed at in 1852—stands on a small mound close to and on the northern side of the village of Matiháni which is on the road from Begoo Serai to Chak, and about 4 miles S.S.E. of the former place: thána Begoo Serai, pargana Balia, district Monghyr.

The station consists of a tower of sun-dried bricks 18.9 feet in height, having a central, isolated pillar of masonry with a central mark-stone sunk in the ground. The azimuths and perambulated distances of the circumjacent villages are:—Bakhada  $213^{\circ} 3'$ , mile 0.79; Sudhar  $109^{\circ} 59'$ , miles 1.42; Suidpur  $277^{\circ} 7'$ , miles 1.72; Maheshpur (on the left bank of the Ganges)  $100^{\circ} 23'$ , mile 0.80; and Bájitpur  $179^{\circ} 50'$ , miles 2.40.

VII. Malti (*Málti*) Tower Station, lat.  $25^{\circ} 28'$ , long.  $86^{\circ} 3'$ —observed at in 1852—stands in the midst of a mango grove at the southern extremity of Malti village and about  $4\frac{1}{2}$  miles E.S.E. of the large village of Gaura: thána Tegra, pargana Malki, district Monghyr.

The station consists of a tower of sun-dried bricks, having a central, hollow pillar of masonry, with two archways at its base for access to the mark-stone sunk in the ground: the distance between the lower and upper marks is 19.79 feet. The azimuths and perambulated distances of the circumjacent villages are:—Hajipur  $306^{\circ} 55'$ , mile 0.45; Pipra  $289^{\circ} 45'$ , mile 0.56; Thakuri Chak  $33^{\circ} 19'$ , mile 0.35; Rajaura  $63^{\circ} 37'$ , mile 0.56; and Fulbaria  $99^{\circ} 13'$ , miles 1.64.

VIII. Bandwár Tower Station, lat.  $25^{\circ} 31'$ , long.  $86^{\circ} 12'$ —observed at in 1852—stands on the southern bank of the Búr (or little) Gunduk river and at the south-western extremity of the village of Bandwár: thána Begoo Serai, pargana Balía, district Monghyr.

The station consists of a tower of sun-dried bricks enclosing a pillar of masonry of the same description as at the adjacent stations: the distance between the mark-stone imbedded in the floor and the one at summit of the pillar is 16.0 feet. The azimuths and perambulated distances of the circumjacent villages are:—Mohanpur  $94^{\circ} 18'$ , miles 1.48; Ajhaur  $288^{\circ} 19'$ , miles 1.28; and Tikanpura  $149^{\circ} 31'$ , mile 0.90.

IX. Akaha (*Akáha*) Tower Station, lat.  $25^{\circ} 36'$ , long.  $86^{\circ} 4'$ —observed at in 1852—stands on slightly elevated ground on the southern bank of the Búr (or little) Gunduk river and derives its name from a village on the same bank lying about half a mile to the east: thána Tegra, pargana Malki, district Monghyr.

The station consists of a tower 21.29 feet in height, but no details of its construction are forthcoming. The azimuths and perambulated distances of the circumjacent villages are:—Sanjat  $115^{\circ} 27'$ , miles 1.60; Usichak  $49^{\circ} 44'$ , miles 1.01; Isapur  $351^{\circ} 10'$ , miles 1.88; and Bisanpur  $328^{\circ} 1'$ , mile 0.66.

X. Dihl Platform Station, lat.  $25^{\circ} 40'$ , long.  $86^{\circ} 12'$ —observed at in 1852—is on a small hillock of about 20 feet in height, at a distance of about 150 yards E. of the village of Dihl and some 4 miles N.E. of the lake locally known as Khabar Tál: thána Begoo Serai, pargana Bhúsári, district Monghyr.

The station consists of a platform of sun-dried bricks enclosing a pillar of masonry. A mark-stone is imbedded in the floor and the distance between it and the dot on which the theodolite was centered is 7.95 feet. The azimuths and perambulated distances of the circumjacent villages are:—Kanausi  $333^{\circ} 56'$ , miles 1.57; Parora  $96^{\circ} 26'$ , mile 0.99; Ekamba  $359^{\circ} 23'$ , mile 0.34; Dharampur  $243^{\circ} 3'$ , mile 0.99; and the factory at Garpura  $272^{\circ} 46'$ , miles 1.89.

XI. Saiár Tower Station, lat.  $25^{\circ} 45'$ , long.  $86^{\circ} 5'$ —observed at in 1852—stands in cultivated lands appertaining to the village of Saiár, about 1.37 miles S.E. by E. of the well known town of Roserha on the left bank of the Búr (or little) Gunduk river and 1.84 miles N.N.E. of the Daulatpur factory: thána Roserha, pargana Kasma, district Durbhanga.

The station consists of a tower of sun-dried bricks 20.3 feet in height, enclosing a pillar of masonry which is hollow in the centre, and has archways at its base for access to the lower mark. The azimuths and perambulated distances of the circumjacent villages are:—Thathia  $42^{\circ} 59'$ , miles 1.11; Gobindpur  $309^{\circ} 1'$ , mile 0.95; Hiranía  $183^{\circ} 48'$ , miles 1.44; and Roserha (temple)  $108^{\circ} 45'$ , miles 1.37.

XII. Singhia (*Singhia*) Tower Station, lat.  $25^{\circ} 49'$ , long.  $86^{\circ} 12'$ —observed at in 1852—stands in cultivated lands, within a few yards of the hamlet (called Musapur) of the village of Singhia which lies N. at a distance of 1.08 miles from the station: thána Roserha, pargana Kasma, district Durbhanga.

The station consists of a tower 24.63 feet in height, built entirely of burnt bricks, but no other details of its construction are forthcoming. The azimuths and perambulated distances of the circumjacent villages are:—Dihla Bisanpur  $253^{\circ} 31'$ , miles 1.16; Sansa  $45^{\circ} 26'$ , miles 2.16; and Agraul  $53^{\circ} 13'$ , mile 0.99.

XIII. Dumra (*Damra*) Tower Station, lat.  $25^{\circ} 54'$ , long.  $86^{\circ} 4'$ —observed at in 1852—stands on an elevated spot in the village of Dumra on the road from Hajipur to Rasulpur Baheri, about  $2\frac{3}{4}$  miles from the former and  $3\frac{1}{2}$  miles from the latter village: thána Roserha, pargana Jakhalpur, district Durbhanga.

The station consists of a tower of sun-dried bricks and encloses an isolated pillar of masonry 18.29 feet in height, but no details of its construction are forthcoming. The azimuths and perambulated distances of the circumjacent villages are:—Parmana  $267^{\circ} 18'$ , miles 1.38; Rámhadarpur  $298^{\circ} 41'$ , mile 0.76; Bahádurpur  $69^{\circ} 15'$ , miles 1.05; Akhatwára  $170^{\circ} 42'$ , mile 0.95; Balipur  $58^{\circ} 49'$ , miles 2.04; and Hatauri (factory)  $149^{\circ} 9'$ , miles 3.94.

XIV. Sajanpura (*Sajanpúra*) Tower Station, lat.  $26^{\circ} 0'$ , long.  $86^{\circ} 11'$ —observed at in 1852—stands at the side of an extensive jhál or marsh, about  $2\frac{1}{4}$  miles from the large villages of Havidí, Mainan and Saho Ulsi,

which lie respectively to the W. by N., N.E. and S.S.E.: pargana Aghára, thána and district Durbhunga.

The station consists of a tower of burnt and sun-dried bricks 21·69 feet in height, but no details of its construction are forthcoming. The azimuths and perambulated distances of the circumjacent villages are:—Seouagar  $33^{\circ} 11'$ , mile 0·82; Bijulia  $72^{\circ} 18'$ , miles 1·66; Kanauli  $291^{\circ} 40'$ , miles 1·18; Bahera (Bazar)  $169^{\circ} 15'$ , miles 4·92; and Mainan (temple S.W. of village)  $199^{\circ} 23'$ , miles 1·54.

XV. Basantpur (*Básatpúr*) Tower Station, lat.  $26^{\circ} 4'$ , long.  $86^{\circ} 2'$ —observed at in 1852—stands in the centre of a grass jungle, about 1·32 miles N.W. of the large village of Aghára and 7 miles nearly S.E. of the civil station of Durbhunga: pargana Aghára, thána and district Durbhunga.

The station consists of a tower of brick-work  $22\frac{1}{2}$  feet in height, but no details of its construction are forthcoming. The azimuths and perambulated distances of the circumjacent villages are:—Andama  $166^{\circ} 43'$ , miles 1·09; Joghara  $117^{\circ} 8'$ , miles 2·13; Madoban  $72^{\circ} 45'$ , miles 1·08; Basantpur  $41^{\circ} 26'$ , mile 0·47; Pansilia  $20^{\circ} 1'$ , mile 0·96; and Kokat  $252^{\circ} 4'$ , mile 0·51.

XVI. Achalpur (*Achalpúr*) Tower Station, lat.  $26^{\circ} 8'$ , long.  $86^{\circ} 11'$ —observed at in 1852—stands in the cultivated lands of Achalpur village, about 5 miles N. by W. of Bahera village and 13 miles E. of the civil station of Durbhunga: thána Bahera, pargana Laowán, district Durbhunga.

The station consists of a tower of brick-work  $22\frac{1}{2}$  feet in height, but no details of its construction are forthcoming. The azimuths and perambulated distances of the following villages are:—Bilahi  $164^{\circ} 13'$ , miles 1·11; Achalpur  $82^{\circ} 29'$ , mile 0·59; and Maujampur  $21^{\circ} 38'$ , miles 1·08.

XVII. Chotaipati (*Chotáipáti*) Tower Station, lat.  $26^{\circ} 14'$ , long.  $86^{\circ} 1'$ —observed at in 1852—stands in the cultivated lands of the village of Chotaipati, about 7 miles N.E. of the civil station of Durbhunga and  $1\frac{1}{2}$  miles N.W. by N. of the large village of Laowán: thána Durbhunga, pargana Gopálpur, district Durbhunga.

The station consists of a tower of burnt and sun-dried bricks 24·88 feet in height, but no details of its construction are forthcoming. The azimuths and perambulated distances of the circumjacent villages are:—Bedaul  $48^{\circ} 3'$ , mile 0·63; Dhoobgaon  $84^{\circ} 31'$ , miles 1·88; Tilakwára  $114^{\circ} 3'$ , mile 0·99; Balia  $144^{\circ} 48'$ , mile 0·78; and Chotaipati  $276^{\circ} 27'$ , mile 0·98.

XVIII. Harpur (*Harpúr*) Tower Station, lat.  $26^{\circ} 15'$ , long.  $86^{\circ} 11'$ —observed at in 1852—stands within a few yards of the residence of Bábu Harmanjha, about 7 miles S.E. of the Bhowareh Police Station and  $3\frac{1}{2}$  miles E. of Pandaub on road to the civil station of Durbhunga, thána Mudhoobunnee pargana Háti, district Durbhunga.

The station consists of a tower of burnt bricks 29·67 feet in height but no details of its construction are forthcoming. The azimuths and perambulated distances of the circumjacent villages are:—Harpur  $41^{\circ} 40'$ , mile 0·64; Bhaur  $223^{\circ} 53'$ , miles 1·20; and gurmha  $130^{\circ} 12'$ , mile 0·46.

XCI.—(*Of the North-East Longitudinal Series*). Chandarsanpur (*Chandarsanpúr*) Tower Station, lat.  $26^{\circ} 23'$ , long.  $86^{\circ} 1'$ —observed at in 1849 and 1852—stands about  $\frac{1}{4}$  of a mile to S.W. of a portion of the straggling village of that name, about 6 miles S.E. of the Khajauli Police Station and the same distance W.N.W. of Mudhoobunnee: thána Benipati, pargana Tajpore, district Durbhunga.

The station consists of a tower of sun-dried bricks enclosing a central pillar of masonry 24 $\frac{3}{4}$  feet in height having mark-stones at top and bottom. The azimuths and perambulated distances of the circumjacent villages are:—Chaudarsanpur  $223^{\circ} 55'$ , mile 0·32; Tigra  $123^{\circ} 54'$ , miles 1·13; Kamalpur  $313^{\circ} 17'$ , mile 0·73.

XCIII.—(*Of the North-East Longitudinal Series*). Bheria Bisanpur (*Bhería Bisanpúr*) Tower Station, lat.  $26^{\circ} 23'$ , long.  $86^{\circ} 11'$ —observed at in 1849 and 1852—takes its name from the villages of Bheria and Bisanpur, the latter being 0·4 of a mile to W., about 5 miles N.E. of the large village of Mudhoobunnee and  $1\frac{3}{4}$  miles S.E. of the large village of Parihárpur Jabdi: thána Mudhoobunnee, pargana Háti, district Durbhunga.

The station consists of a tower of sun-dried bricks enclosing a central pillar of masonry 25 $\frac{1}{2}$  feet in height, with mark-stones at top and bottom. The azimuths and perambulated distances of the circumjacent villages are:—Bisanpur  $85^{\circ} 40'$ , mile 0·38; Karaia  $184^{\circ} 51'$ , miles 1·94; and Ramkhetari  $323^{\circ} 14'$ , miles 1·44.

NOTE.—In a few instances, the names of principal stations, occurring in the foregoing descriptions, are given by two methods of spelling distinguished from one another by the use of Roman and Italic type: as in III. Shaikhupura (*Sháikhpúra*); the latter spelling is taken from the Alphabetical and Numerical lists which precede the descriptions, and which were printed in 1869; the spelling in Roman type is in accordance with the method authorized by the Government and illustrated in lists of Indian proper names published in 1874 and subsequently. It will be seen that the two methods differ but slightly; notwithstanding where differences exist, both renderings are given, so as to remove all possible doubt as to the identity of a station. The method of spelling authorized by the Government, is hereafter exclusively adopted in the publication of this Series.

## NORTH PARASNATH MERIDIONAL SERIES.

## PRINCIPAL TRIANGULATION. ADDENDUM TO DESCRIPTION OF STATIONS.

NOTE.—Consequent on modern alterations of district and other boundaries, the sites occupied by the stations are in some instances now included in civil divisions of territory which differ from the district, pargana, or village, recorded in the preceding descriptions of stations: a complete list of all the stations of the Series including a suitably modified statement of the altered subdivisions in question is accordingly given in the following table, and is derived chiefly from the annual reports, up to 1881, made by the Civil Officials to whose care the stations have been committed. The statement also gives present condition of certain of the stations; where no entry regarding present condition is made against a station it is to be assumed that the station when last reported on by the district Official was in good order.

The spelling of names is in accordance with that given in the lists of more important places published under the orders of Government whenever such names occur in the lists.

| No. of Station | Local name  | District   | Pargana, &c.                  | Village in which the Station lies | Remarks on the Construction and Condition of the Station                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------|-------------|------------|-------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LVI            | Bámani      | Hazáribágh | P. Kodarma                    | Bámani                            | In 1867 a square protecting pillar of masonry was built over the circular pillar on which the large theodolite stood and which carries the true mark-stone. The square pillar is $3\frac{1}{2}$ feet high, 28 inches square at base and 20 inches at top, and bears a sufficiently accurate mark for Topographical and Revenue Survey purposes, so that it is unnecessary to refer to the mark-stone which thus remains concealed and protected. A pyramidal pile of earth and stones, 7 feet square at base and 6 feet high, covers the protecting pillar. |
| LIX            | Ghoranji    | Hazáribágh | P. Kharagdila                 | Ghoranji                          | Ditto.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| I              | Rheowa      | "          | Thá. Gánwán                   | Fularia                           | Pillar injured and thoroughly repaired as reported in 1874.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| II             | Khasmir     | Monghyr    | P. Gidhaur, Thá. Jamooce      | Khasmir                           | ... ..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| III            | Shaikh-pura | "          | P. Málida, Thá. Shaikh-pura   | Shaikh-pura                       | ... ..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| IV             | Bichwa      | "          | P. Salemabad, Thá. Luckeserai | Bichwa                            | ... ..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| V              | Barhaia     | "          | P. Salemabad, Thá. Mokameh    | Barhaia                           | One side of pillar fallen down as reported in 1873.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| VI             | Matihári    | "          | P. Balia, Thá. Begoo Serai    | Matihári                          | ... ..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| VII            | Burj        | "          | P. Malki, Thá. Tegra          | Malti                             | ... ..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

NOTE.—Stations LVI and LIX appertain to the Calcutta Longitudinal Series of the South-East Quadrilateral.

P. stands for pargana and Thá. for thána.

| No. of Station | Local name    | District  | Pargana, &c.                  | Village in which the Station lies | Remarks on the Construction and Condition of the Station        |
|----------------|---------------|-----------|-------------------------------|-----------------------------------|-----------------------------------------------------------------|
| VIII           | Bandwár       | Monghyr   | P. Balia, Thá. Begoo Serai    | Bandwár                           | ... ..                                                          |
| IX             | Burj          | "         | P. Malki, Thá. Tegra          | Akaha                             | ... ..                                                          |
| X              | Dihi          | "         | P. Bhúsári, Thá. Begoo Serai  | Dihi                              | ... ..                                                          |
| XI             | Saiár         | Durbhunga | P. Kasma, Thá. Roserha        | Saiár                             | Reported in 1875 as partly washed down, and only 16 feet high.  |
| XII            | Singhia       | "         | P. Kasma, Thá. Nagar-basti    | Singhia                           | Reported in 1875 as partly fallen down, and 20 feet high.       |
| XIII           | ...           | "         | P. Jákhara, Thá. Roserha      | Dumra                             | Reported in 1875 as partly fallen down, and 18 feet high.       |
| XIV            | ...           | "         | P. Hávi, Thá. Bahera          | Sujanpur                          | Reported in 1875 as partly fallen down, and 17 feet high.       |
| XV             | Kokat         | "         | P. Aghára, Thá. Durbhunga     | Kokat                             | Reported in 1875 as partly fallen down, and 12 feet high.       |
| XVI            | Paiktola      | "         | P. Gopálpur, Thá. Bahera      | Paiktola                          | Reported in 1875 as partly fallen down, and only 12½ feet high. |
| XVII           | Chotaipati    | "         | P. Gopálpur, Thá. Durbhunga   | Chotaipati                        | Reported in 1875 as partly fallen down, and 23¼ feet high.      |
| XVIII          | Harpur        | "         | P. Gopálpur, Thá. Mudhobunnee | Harpur                            | Reported in 1875 as partly fallen down, and 24 feet high.       |
| XCI            | Chandarsanpur | "         | Thá. Benipati, P. Jarel       | Chandarsanpur                     | ... ..                                                          |
| XCIII          | Simri         | "         | P. Háti, Thá. Mudhobunnee     | Simri                             | ... ..                                                          |

NOTE.—Stations XCI and XCIII appertain to the North-East Longitudinal Series.

P. stands for pargana and Thá. for thána.

September, 1862.

J. B. N. HENNESSEY,  
In charge of Computing Office.

## NORTH PARASNATH MERIDIONAL SERIES.

## PRINCIPAL TRIANGULATION. TRIANGLES.

| No. of Triangle | Station         | Spherical Excess | Corrected Plane Angle |    |       | Distance  |          |        |
|-----------------|-----------------|------------------|-----------------------|----|-------|-----------|----------|--------|
|                 |                 |                  |                       |    |       | Log. feet | Feet     | Miles  |
| 1               | Bāmāni, LVI     | 1'23             | 63                    | 13 | 0'81  | 5'1408665 | 138314'1 | 26'196 |
|                 | Ghoranji, LIX   | 1'23             | 59                    | 30 | 47'36 | 5'1255310 | 133515'3 | 25'287 |
|                 | Rheowa, I       | 1'22             | 57                    | 16 | 11'83 | 5'1150653 | 130336'3 | 24'685 |
| 2               | Ghoranji, LIX   | '94              | 50                    | 45 | 12'95 | 5'0407892 | 109847'2 | 20'804 |
|                 | Rheowa, I       | '94              | 52                    | 3  | 8'61  | 5'0486478 | 111853'0 | 21'184 |
|                 | Etkora, II      | '95              | 77                    | 11 | 38'44 | 5'1408665 | 138314'1 | 26'196 |
| 3               | Rheowa, I       | 1'01             | 73                    | 59 | 38'35 | 5'1432936 | 139089'3 | 26'343 |
|                 | Etkora, II      | 1'01             | 56                    | 37 | 2'00  | 5'0821584 | 120825'5 | 22'884 |
|                 | Shaikhpura, III | 1'00             | 49                    | 23 | 19'65 | 5'0407892 | 109847'2 | 20'804 |
| 4               | Etkora, II      | '80              | 42                    | 40 | 4'96  | 4'9750989 | 94427'6  | 17'884 |
|                 | Shaikhpura, III | '80              | 50                    | 39 | 59'39 | 5'0324729 | 107763'8 | 20'410 |
|                 | Bichwi, IV      | '80              | 86                    | 39 | 55'65 | 5'1432936 | 139089'3 | 26'343 |
| 5               | Shaikhpura, III | '41              | 48                    | 1  | 6'88  | 4'8511711 | 70985'7  | 13'444 |
|                 | Bichwi, IV      | '41              | 50                    | 32 | 51'59 | 4'8676745 | 73735'1  | 13'965 |
|                 | Barhain, V      | '41              | 81                    | 26 | 1'53  | 4'9750989 | 94427'6  | 17'884 |
| 6               | Bichwi, IV      | '32              | 51                    | 11 | 28'91 | 4'7998520 | 63074'2  | 11'946 |
|                 | Barhain, V      | '33              | 67                    | 31 | 40'19 | 4'8738815 | 74796'5  | 14'166 |
|                 | Matihāni, VI    | '33              | 61                    | 16 | 50'90 | 4'8511711 | 70985'7  | 13'444 |

NOTES.—1. The values of the sides are given in the same line with the opposite angle.

2. Stations (Bāmāni, LVI, and Ghoranji, LIX) appertain to the Calcutta Longitudinal Series of the South-East Quadrilateral.

| No. of Triangle | Station                | Spherical Excess | Corrected Plane Angle | Distance  |         |        |
|-----------------|------------------------|------------------|-----------------------|-----------|---------|--------|
|                 |                        |                  |                       | Log. feet | Feet    | Miles  |
| 7               | Barhain, V             | 24               | 57 26 3'01            | 4'7703460 | 58931'3 | 11'161 |
|                 | Matiháni, VI           | 25               | 58 8 26'71            | 4'7737204 | 59391'0 | 11'248 |
|                 | Malti, VII             | 25               | 64 25 30'28           | 4'7998520 | 63074'2 | 11'946 |
| 8               | Matiháni, VI           | 19               | 54 22 44'55           | 4'7063451 | 50856'3 | 9'632  |
|                 | Malti, VII             | 19               | 55 14 16'52           | 4'7109362 | 51396'8 | 9'734  |
|                 | Bandwár, VIII          | 20               | 70 22 58'93           | 4'7703460 | 58931'3 | 11'161 |
| 9               | Malti, VII             | 18               | 62 57 33'09           | 4'7235036 | 52905'9 | 10'020 |
|                 | Bandwár, VIII          | 18               | 58 9 2'12             | 4'7029122 | 50455'9 | 9'556  |
|                 | Akaha, IX              | 18               | 58 53 24'79           | 4'7063451 | 50856'3 | 9'632  |
| 10              | Bandwár, VIII          | 18               | 50 45 41'62           | 4'6680821 | 46567'4 | 8'820  |
|                 | Akaha, IX              | 18               | 67 36 10'77           | 4'7449872 | 55588'8 | 10'528 |
|                 | Dihl, X                | 18               | 61 38 7'61            | 4'7235036 | 52905'9 | 10'020 |
| 11              | Akaha, IX              | 16               | 57 6 33'62            | 4'6800247 | 47865'7 | 9'065  |
|                 | Dihl, X                | 17               | 68 6 42'58            | 4'7234036 | 52893'7 | 10'018 |
|                 | Saiár, XI              | 16               | 54 46 43'80           | 4'6680821 | 46567'4 | 8'820  |
| 12              | Dihl, X                | 18               | 52 54 57'77           | 4'6864738 | 48581'8 | 9'201  |
|                 | Saiár, XI              | 18               | 75 16 16'51           | 4'7700950 | 58897'3 | 11'155 |
|                 | Singhia, XII           | 17               | 51 48 45'72           | 4'6800247 | 47865'7 | 9'065  |
| 13              | Saiár, XI              | 19               | 60 54 41'76           | 4'7274051 | 53383'3 | 10'110 |
|                 | Singhia, XII           | 19               | 66 24 26'69           | 4'7480499 | 55982'2 | 10'603 |
|                 | Dumra, XIII            | 18               | 52 40 51'55           | 4'3864738 | 48581'8 | 9'201  |
| 14              | Singhia, XII           | 22               | 53 51 16'85           | 4'7304411 | 53757'8 | 10'181 |
|                 | Dumra, XIII            | 22               | 72 50 0'86            | 4'8034945 | 63605'5 | 12'046 |
|                 | Sajanpura, XIV         | 21               | 53 18 42'29           | 4'7274051 | 53383'3 | 10'110 |
| 15              | Dumra, XIII            | 22               | 56 56 5'06            | 4'7527691 | 56593'8 | 10'719 |
|                 | Sajanpura, XIV         | 23               | 70 18 37'67           | 4'8033344 | 63582'0 | 12'042 |
|                 | Basantpur, XV          | 22               | 52 45 17'27           | 4'7304411 | 53757'8 | 10'181 |
| 16              | Sajanpura, XIV         | 19               | 61 5 49'40            | 4'7314571 | 53883'7 | 10'205 |
|                 | Basantpur, XV          | 19               | 52 3 14'43            | 4'6860825 | 48538'1 | 9'193  |
|                 | Achalpur, XVI          | 19               | 66 50 56'17           | 4'7527691 | 56593'8 | 10'719 |
| 17              | Basantpur, XV          | 23               | 67 53 5'94            | 4'7990719 | 62961'1 | 11'924 |
|                 | Achalpur, XVI          | 23               | 59 39 40'32           | 4'7682971 | 58653'9 | 11'109 |
|                 | Chotaipati, XVII       | 23               | 52 27 13'74           | 4'7314571 | 53883'7 | 10'205 |
| 18              | Achalpur, XVI          | 18               | 53 31 47'16           | 4'7096570 | 51245'6 | 9'706  |
|                 | Chotaipati, XVII       | 18               | 45 21 8'38            | 4'6564507 | 45336'8 | 8'587  |
|                 | Harpur, XVIII          | 18               | 81 7 4'46             | 4'7990719 | 62961'1 | 11'924 |
| 19              | Chotaipati, XVII       | 21               | 80 20 48'15           | 4'8234905 | 66602'5 | 12'614 |
|                 | Harpur, XVIII          | 21               | 50 19 6'47            | 4'7159520 | 51993'9 | 9'847  |
|                 | Chandarsanpur, XCI     | 20               | 49 20 5'38            | 4'7096570 | 51245'6 | 9'706  |
| 20              | Harpur, XVIII          | 19               | 53 24 11'38           | 4'7301440 | 53721'0 | 10'174 |
|                 | Chandarsanpur, XCI     | 18               | 42 7 1'80             | 4'6520046 | 44875'0 | 8'499  |
|                 | Bheria Bisanpur, XCIII | 19               | 84 28 46'82           | 4'8234905 | 66602'5 | 12'614 |

NOTE.—Stations Chandarsanpur, XCI, and Bheria Bisanpur, XCIII appertain to the North-East Longitudinal Series.

November 1879.

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In charge of Computing Office.



## NORTH PARASNATH MERIDIONAL SERIES.

### SECONDARY TRIANGULATION. TRIANGLES.

#### PRINCIPAL-AUXILIARY STATIONS AND INTERSECTED POINTS.

Differences between the common sides of two triangles to stations and intersected 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: where the difference is small it has usually been apportioned between the triangles, but where it is large no adjustment has been made, as one or other of the two values must be erroneous.

| No. of Triangle          | Station                                                    | Corrected Plane Angle         | Distance    |        |        | No. of Triangle | Station                                                  | Corrected Plane Angle         | Distance    |        |        | No. of Triangle |
|--------------------------|------------------------------------------------------------|-------------------------------|-------------|--------|--------|-----------------|----------------------------------------------------------|-------------------------------|-------------|--------|--------|-----------------|
|                          |                                                            |                               | Log. feet   | Feet   | Miles  |                 |                                                          |                               | Log. feet   | Feet   | Miles  |                 |
| 21                       | Bámani, LVI<br>Ghoranji, LIX<br>Báreesar Hill              | ° ' "<br>30 42 52<br>50 13 52 | 4° 8' 28728 | 67410  | 12.767 | 24              | Matiháni, VI<br>Kajra Hill Mark (heliotrope)<br>Pirpahár | ° ' "<br>53 6 28              | 4° 9' 84586 | 96513  | 18.279 | 24              |
|                          |                                                            |                               | 5° 0' 06229 | 101445 | 19.213 |                 |                                                          |                               | 5° 0' 67546 | 116828 | 22.126 |                 |
|                          |                                                            |                               | 5° 1' 15065 | 130336 | 24.685 |                 |                                                          |                               | 4° 9' 74573 | 94313  | 17.862 |                 |
| 22                       | Ghoranji, LIX<br>Ekgora, II<br>Amkali Hill Mark            | ° ' "<br>19 27 25<br>26 28 49 | 4° 7' 14746 | 51850  | 9.820  | 25              | Bichwi, IV<br>Matiháni, VI<br>Pirpahár                   | ° ' "<br>98 0 47<br>30 12 3   | 5° 0' 67546 | 116828 | 22.126 | "               |
|                          |                                                            |                               | 4° 8' 41401 | 69407  | 13.145 |                 |                                                          |                               | 5° 1' 68024 | 147239 | 27.886 |                 |
|                          |                                                            |                               | 5° 0' 48648 | 111853 | 21.184 |                 |                                                          |                               | 4° 8' 73881 | 74797  | 14.166 |                 |
| <b>MONGHYR*</b>          |                                                            |                               |             |        |        |                 |                                                          |                               |             |        |        |                 |
| <b>SECONDARY SERIES.</b> |                                                            |                               |             |        |        |                 |                                                          |                               |             |        |        |                 |
| 23                       | Bichwi, IV<br>Matiháni, VI<br>Kajra Hill Mark (heliotrope) | ° ' "<br>83 9 4<br>44 54 19   | 4° 9' 74573 | 94313  | 17.862 | 27              | Kajra Hill Mark (heliotrope)<br>Pirpahár<br>Maira        | ° ' "<br>25 50 17<br>105 8 12 | 4° 8' 77868 | 75486  | 14.207 | 24              |
|                          |                                                            |                               | 4° 8' 26449 | 67058  | 12.700 |                 |                                                          |                               | 4° 6' 3237  | 43575  | 8.253  |                 |
|                          |                                                            |                               | 4° 8' 73881 | 74797  | 14.166 |                 |                                                          |                               | 4° 9' 84586 | 96513  | 18.279 |                 |

\* For the continuation of this triangulation see triangles No. 56 and following in the Synopsis of the Results of the North Malúnda Meridional Series.

NOTES.—1. Names followed by Roman numerals are those of Principal Stations. Stations IJnanani, LVI, and Ghoranji, LIX appertain to the Calcutta Longitudinal Series of the S.E. Quadrilateral.

2. The values of the side are given in the same line with the opposite angle.

## NORTH PARASNATH MERIDIONAL 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 | Name of station with azimuths of surrounding points | No. of triangle giving distance | Name of station with azimuths of surrounding points | No. of triangle giving distance |
|-----------------------------------------------------|---------------------------------|-----------------------------------------------------|---------------------------------|-----------------------------------------------------|---------------------------------|
| ACHALPUR, XVI                                       | 65 38 12.47                     | BARAHA, V                                           | 36 24 32.98                     | CHANDRANPUR, XCI†                                   | 268 4 37.46                     |
| Basantpur, XV                                       | 125 17 53.02                    | Shaikhpura, III                                     | 195 0 47.27                     | Bheria Bisantpur, XCIII†                            | 310 11 39.44                    |
| Chotaipati, XVII                                    | 178 49 40.36                    | Malti, VII                                          | 247 26 50.52                    | Harpur, XVIII                                       | 359 31 45.02                    |
| Harpur, XVIII                                       | 358 47 16.11                    | Matihani, VI                                        | 314 58 31.04                    | Chotaipati, XVII                                    |                                 |
| Sajapur, XIV                                        |                                 | Bichwi, IV                                          |                                 |                                                     |                                 |
|                                                     |                                 |                                                     |                                 |                                                     |                                 |
| AKATA, IX                                           | 7 24 45.68                      | BASANTPUR, XV                                       | 177 41 9.45                     | CHOTAIPATI, XVII                                    | 179 31 47.10                    |
| Malti, VII                                          | 183 48 35.98                    | Chotaipati, XVII                                    | 245 34 15.62                    | Chandarsanpur, XCI†                                 | 259 32 35.46                    |
| Saiar, XI                                           | 240 55 9.76                     | Achalpur, XVI                                       | 297 37 30.24                    | Harpur, XVIII                                       | 305 13 44.02                    |
| Dihl, X                                             | 308 31 20.71                    | Sajapur, XIV                                        | 350 22 47.73                    | Achalpur, XVI                                       | 357 40 57.99                    |
| Bandwar, VIII                                       |                                 | Dumra, XIII                                         |                                 | Basantpur, XV                                       |                                 |
|                                                     |                                 |                                                     |                                 |                                                     |                                 |
| BAMANI, LVI*                                        | 187 42 36.37                    | BHERIA BASANTPUR, XCIII†                            | 3 40 12.75                      | DINH, X                                             | 60 58 22.18                     |
| Rheowra, I                                          | 220 12 46                       | Harpur, XVIII                                       | 88 8 59.76                      | Akaha, IX                                           | 129 5 4.03                      |
| Batresar Hill                                       | 250 55 38.41                    | Chandarsanpur, XCI†                                 |                                 | Saiar, XI                                           | 182 0 2.88                      |
| Chorajji, LIX*                                      |                                 |                                                     |                                 | Singhia, XII                                        | 359 20 14.39                    |
|                                                     |                                 |                                                     |                                 | Bandwar, VIII                                       |                                 |
|                                                     |                                 |                                                     |                                 |                                                     |                                 |
| BANDWAR, VIII                                       | 0 2 34.19                       | BICHWI, IV                                          | 84 29 32.07                     | DUMRA, XIII                                         | 170 23 38.72                    |
| Matihani, VI                                        | 70 25 33.32                     | Shaikhpura, III                                     | 135 2 24.07                     | Basantpur, XV                                       | 227 19 44.00                    |
| Malti, VII                                          | 128 34 35.62                    | Baraha, V                                           | 186 13 53.30                    | Sajapur, XIV                                        | 300 9 45.08                     |
| Akaha, IX                                           | 179 20 17.42                    | Matihani, VI                                        | 238 1 3                         | Singhia, XII                                        | 352 50 36.81                    |
| Dihl, X                                             |                                 | Pirpahr                                             | h.s.                            | Saiar, XI                                           |                                 |
|                                                     |                                 | Kajra Hill Mark (heliotrope)                        | 269 22 57                       |                                                     |                                 |
|                                                     |                                 | Ekgora, II                                          | 357 49 35.62                    |                                                     |                                 |

\* Of the Calcutta Longitudinal Series of the South-East Quadrilateral.

† Of the North-East Longitudinal Series.

AZIMUTHS OF STATIONS AND INTERSECTED POINTS.

| Name of station with azimuths of surrounding points                                                                                                                                          | No. of triangle ranging distance                           | Name of station with azimuths of surrounding points                                                                                                                                                                                                                                                                                                                                                     | No. of triangle ranging distance                                                                                                                                                                                                                                                                                     | Name of station with azimuths of surrounding points                                                                                                                                                                                                                                                                              | No. of triangle ranging distance                                                                                                                                                                                                                                               |                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <p>EGGORA, II<br/>Ghoranji, LIX*<br/>Amkali Hill Mark<br/>Rheowa, I<br/>Shaikhpara, III<br/>Bichwi, IV</p>                                                                                   | <p>2<br/>22<br/>2<br/>2<br/>3<br/>4</p>                    | <p>MAITI, VII<br/>Barhaia, V<br/>Akaha, IX<br/>Bandwar, VIII<br/>Mathani, VI<br/>MAITHANI, VI<br/>Bichwi, IV<br/>Barhaia, V<br/>Maiti, VII<br/>Bandwar, VIII<br/>Pirpahar<br/>Maia<br/>Kajra Hill Mark (heliotrope)<br/>PRIPAHAR h.s.<br/>Maia<br/>Kajra Hill Mark (heliotrope)<br/>Bichwi, IV<br/>Mathani, VI<br/>RHEOWA, I<br/>Bamani, LVI*<br/>Shaikhpara, III<br/>Eggora, II<br/>Ghoranji, LIX*</p> | <p>10 1 35'58<br/>187 24 15'07<br/>250 21 48'34<br/>305 36 5'05<br/>6 14 31'08<br/>67 31 22'31<br/>125 39 49'27<br/>180 2 34'01<br/>h.s.<br/>268 13 44<br/>304 32 52<br/>321 20 12<br/>h.s.<br/>11 8 27<br/>36 38 44<br/>58 10 47<br/>88 22 50<br/>7 43 57'38<br/>184 24 55'42<br/>258 24 34'78<br/>310 27 44'33</p> | <p>SATAR, XI<br/>Akaha, IX<br/>Dumra, XIII<br/>Singhia, XII<br/>Dihl, X<br/>SAJANPURA, XIV<br/>Dumra, XIII<br/>Basantpur, XV<br/>Achalpur, XVI<br/>Singhia, XII<br/>SHAIKHUPURA, III<br/>Rheowa, I<br/>Barhaia, V<br/>Bichwi, IV<br/>Eggora, II<br/>SINGHIA, XII<br/>Dihl, X<br/>Saur, XI<br/>Dumra, XIII<br/>Sajanpura, XIV</p> | <p>0 / "<br/>3 48 52'64<br/>172 51 10'04<br/>233 45 51'99<br/>309 2 8'68<br/>47 22 53'57<br/>117 41 31'47<br/>178 47 21'06<br/>354 4 11'07<br/>4 25 38'16<br/>216 21 10'03<br/>264 22 17'32<br/>315 2 17'51<br/>2 0 12'66<br/>53 48 58'55<br/>120 13 25'43<br/>174 4 42'50</p> | <p>11<br/>13<br/>12<br/>11<br/>14<br/>15<br/>16<br/>14<br/>3<br/>5<br/>4<br/>3<br/>12<br/>12<br/>13<br/>14</p> |
| <p>HARPUR, XVIII<br/>Chotaipati, XVII<br/>Chandrasanpur, XCI†<br/>Bheria Bisampur, XCIII†<br/>Achalpur, XVI<br/>MAIRA h.s.<br/>Kajra Hill Mark (heliotrope)<br/>Mathani, VI<br/>Pirpahar</p> | <p>18<br/>19<br/>20<br/>20<br/>18<br/>27<br/>26<br/>26</p> | <p>79 56 40'50<br/>130 15 47'18<br/>183 39 58'75<br/>358 49 35'86<br/>85 59 5<br/>124 40 48<br/>h.s. 191 7 17</p>                                                                                                                                                                                                                                                                                       | <p>26<br/>24<br/>25<br/>24<br/>26<br/>1<br/>3<br/>2<br/>1</p>                                                                                                                                                                                                                                                        | <p>4 25 38'16<br/>216 21 10'03<br/>264 22 17'32<br/>315 2 17'51<br/>2 0 12'66<br/>53 48 58'55<br/>120 13 25'43<br/>174 4 42'50</p>                                                                                                                                                                                               | <p>3<br/>5<br/>4<br/>3<br/>12<br/>12<br/>13<br/>14</p>                                                                                                                                                                                                                         |                                                                                                                |

\* Of the Calcutta Longitudinal Series of the South-East Quadrilateral. † Of the North-East Longitudinal Series.

December 1879.

J. B. N. HENNESSEY,  
In charge of Computing Office.

## NORTH PARASNATH MERIDIONAL SERIES.

## CO-ORDINATES AND DESCRIPTIONS OF ALL STATIONS AND POINTS.

The following table gives the co-ordinates of all the 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. In certain instances numbers are added which have reference to the given data of the triangles by which the station or point has been fixed; when these numbers are omitted it is to be understood that no triangles are given.

Note.— $\lambda$  stands for Latitude North; L for Longitude East of Greenwich; H for Height of station in feet above mean sea level, if determined trigonometrically, H, for the Height when found by spirit leveling, and  $h$  for Height of station tower or pillar. The trigonometrical heights always refer to the upper mark-stone or to the upper surface of the pillar on which the theodolite stood: the spirit leveled heights refer to the points on which the leveling staff stood as indicated in footnotes. For visited stations and for other points of superior accuracy the values of  $\lambda$  and L are given to two places of decimals; for well determined objects to one place, and for the remaining points to the nearest second. Principal stations are distinguished by the Roman numerals I, II, &c., secondary stations by the letters h.s. and s. The names in italics are those of the territories, states or districts in which the stations or points are situated.

| Name of station, district, description,<br>co-ordinates &c.                                                                  | Name of station, district, description,<br>co-ordinates &c.                                                                        | Name of station, district, description,<br>co-ordinates &c.                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Abgil s.<br>( <i>Monghyr</i> ) Or Ganges River No. 256† s; on right bank.<br>o ' "                                           | Ānandpur s.<br>( <i>Monghyr</i> ) Or Ganges River No. 255 s; on right bank, 0.1 of a mile N. of village of the same name.<br>o ' " | Bahādurnagar s.<br>( <i>Monghyr</i> ) Or Ganges River No. 261 s; on right bank, about 2½ miles N.W. of Hemja, and 1¼ miles N. of Bahachauki village.<br>o ' " |
| $\lambda$ 25 16 33.42                                                                                                        | $\lambda$ 25 16 10.56                                                                                                              | $\lambda$ 25 19 17.39                                                                                                                                         |
| L 86 18 13.10                                                                                                                | L 86 17 11.85                                                                                                                      | L 86 23 27.26                                                                                                                                                 |
| Achalpur, XVI.<br>( <i>vide page 6—R.</i> )                                                                                  | Aunta House,<br>( <i>Patna</i> ) Paku.                                                                                             | Bāmāni, LVI*.<br>( <i>vide page 3—R.</i> )                                                                                                                    |
| $\lambda$ 26 7 55.85                                                                                                         | $\lambda$ 25 23 21                                                                                                                 | $\lambda$ 24 26 34.23                                                                                                                                         |
| L 86 10 52.42                                                                                                                | L 85 59 56                                                                                                                         | L 85 48 32.58                                                                                                                                                 |
| H 177                                                                                                                        |                                                                                                                                    | H 1559                                                                                                                                                        |
| $h$ 22                                                                                                                       |                                                                                                                                    | $h$ 4                                                                                                                                                         |
| No. 16                                                                                                                       |                                                                                                                                    | No. 1                                                                                                                                                         |
| Akaha, IX.<br>( <i>vide page 5—R.</i> )                                                                                      | Badalpur s.<br>( <i>Monghyr</i> ) Or Ganges River No. 243 s; on left bank, about ¼ a mile S.W. of Maheshpur village.               | Bandwār, VIII.<br>( <i>vide page 6—R.</i> )                                                                                                                   |
| $\lambda$ 25 36 1.44                                                                                                         | $\lambda$ 25 21 43.15                                                                                                              | $\lambda$ 25 30 34.85                                                                                                                                         |
| L 86 4 28.26                                                                                                                 | L 86 10 59.73                                                                                                                      | L 86 12 0.11                                                                                                                                                  |
| H 159                                                                                                                        |                                                                                                                                    | H 139                                                                                                                                                         |
| $h$ 21                                                                                                                       |                                                                                                                                    | $h$ 16                                                                                                                                                        |
| No. 9                                                                                                                        |                                                                                                                                    | No. 8                                                                                                                                                         |
| Āmkali Hill Mark.<br>( <i>Hazāribāgh</i> ) About 1½ miles S.E. of village of the same name, and 2½ miles W. of Gūli village. | Bahachauki Tree Flag.<br>( <i>Monghyr</i> ) On the high road to Patna.                                                             | Bānresar Hill.<br>( <i>Hazāribāgh</i> ) Sharp rock, about 2½ miles N.E. of the large village of Gaunwa or Gūna.                                               |
| $\lambda$ 24 44 28.04                                                                                                        | $\lambda$ 25 17 52                                                                                                                 | $\lambda$ 24 39 21                                                                                                                                            |
| L 86 6 52.94                                                                                                                 | L 86 23 39                                                                                                                         | L 86 0 23                                                                                                                                                     |
| No. 22                                                                                                                       |                                                                                                                                    | No. 21                                                                                                                                                        |

\* Of the Calcutta Longitudinal Series of the South-East Quadrilateral.

† The elements of the stations appertaining to the portion of the Ganges River Triangulation which falls to the west of that included in this Series will be found in the Co-ordinate List of the Chandwar Meridional Series, and to the east in that of the North Malancha Meridional Series. In the former the names of the stations are entered without their serial numbers: these will be found in a table following the *Errata et Corrigenda*.

| Name of station, district, description,<br>co-ordinates &c.                                                                                           | Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                                                                                                                                                     | Name of station, district, description,<br>co-ordinates &c.                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Barhnia, V.</b><br>( <i>Vide page 4—R.</i> )<br>$\lambda$ 25 18 6'45<br>$L$ 86 1 24'54<br>$H$ 140<br>$h$ 20<br>No. 5                               | <b>Bintoli s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 246 s; on right bank.<br>$\lambda$ 25 17 39'04<br>$L$ 86 11 6'50<br><br><b>Bisanpur s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 244 s; on left bank, 0'2 of a mile W. of village of the same name, and 0'3 of a mile S. of Ajaipur.<br>$\lambda$ 25 19 7'29<br>$L$ 86 11 34'91 | <b>Dumra, XIII.</b><br>( <i>Vide page 5—R.</i> )<br>$\lambda$ 25 53 54'44<br>$L$ 86 3 50'42<br>$H$ 167<br>$h$ 18<br>No. 13                                       |
| <b>Baro s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 229 s; about 1½ miles S.W. of Rájua village.<br>$\lambda$ 25 26 23'20<br>$L$ 86 1 58'95      | <b>Chanchal h.s.</b><br>( <i>Hazáribágh</i> )<br>$\lambda$ 24 29 45'94<br>$L$ 85 50 7'30<br>See Synoptical Volume of the Calcutta Longitudinal Series of the South-East Quadrilateral.                                                                                                                                                          | <b>Dumri s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 238 s; on left bank, about 2½ miles W. of Bájitpur village.<br>$\lambda$ 25 23 49'54<br>$L$ 86 9 27'67 |
| <b>Basantpur, XV.</b><br>( <i>Vide page 6—R.</i> )<br>$\lambda$ 26 4 15'40<br>$L$ 86 1 54'05<br>$H_s$ 148'39*<br>$h$ 22'42<br>No. 15                  | <b>Chandarsanpur, XCI.†</b><br>( <i>Vide page 6—R.</i> )<br>$\lambda$ 26 22 30'86<br>$L$ 86 1 23'35<br>$H$ 202<br>$h$ 25<br>No. 19                                                                                                                                                                                                              | <b>Durbhunga Temple,</b><br>( <i>Durbhunga</i> ) Spiro of centre dome; also called Nar-guana.<br>$\lambda$ 26 10 2'3<br>$L$ 85 56 40'2                           |
| <b>Básdevpur House,</b><br>( <i>Monghyr</i> ) Flagstaff on terracc.<br>$\lambda$ 25 23 14'5<br>$L$ 86 31 34'2                                         | <b>Chotaipati, XVII.</b><br>( <i>Vide page 6—R.</i> )<br>$\lambda$ 26 13 55'89<br>$L$ 86 1 28'04<br>$H_s$ 155'86†<br>$h$ 24'88<br>No. 17                                                                                                                                                                                                        | <b>Ekbarpur s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 249 s; on S. coast of a char.<br>$\lambda$ 25 15 0'09<br>$L$ 86 13 27'37                            |
| <b>Bhág Chapra Factory.</b><br>( <i>Monghyr</i> ) Flagstaff on top of the two-storied dwelling house.<br>$\lambda$ 25 23 16'2<br>$L$ 86 32 27'2       | <b>Dakra Nála s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 268 s; on right bank of nála of the same name, 0'9 of a mile N.W. of Bilimpur village, and 0'3 of a mile N. of the ghát.<br>$\lambda$ 25 20 26'45<br>$L$ 86 30 16'37                                                                                                             | <b>Ekgora, II.</b><br>( <i>Vide page 4—R.</i> )<br>$\lambda$ 24 52 2'35<br>$L$ 86 11 15'55<br>$H$ 1808<br>$h$ 3<br>No. 2                                         |
| <b>Bheria Bisanpur, XCIII.†</b><br>( <i>Vide page 6—R.</i> )<br>$\lambda$ 26 22 48'38<br>$L$ 86 11 13'79<br>$H$ 206<br>$h$ 26<br>No. 20               | <b>Dhanotala s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 263 s; on right bank, about 1½ miles N. of Laguna village.<br>$\lambda$ 25 19 18'17<br>$L$ 86 26 17'29                                                                                                                                                                            | <b>Gangáprasád s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 230 s; on left bank, opposite to Daryapur village.<br>$\lambda$ 25 24 36'53<br>$L$ 86 0 47'36    |
| <b>Bichwi, IV.</b><br>( <i>Vide page 4—R.</i> )<br>$\lambda$ 25 9 49'15<br>$L$ 86 10 31'17<br>$H$ 321<br>$h$ 1<br>No. 4                               | <b>Dihí, X.</b><br>( <i>Vide page 5—R.</i> )<br>$\lambda$ 25 39 45'46<br>$L$ 86 11 53'09<br>$H$ 163<br>$h$ 8<br>No. 10                                                                                                                                                                                                                          | <b>Ganges River Flag.</b><br>( <i>Monghyr</i> ) At the entrance of the Sitokund nála.<br>$\lambda$ 25 24 8'8<br>$L$ 86 30 39'2                                   |
| <b>Bihat s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 228 s; about 2 miles S. of Thákuri Chak village.<br>$\lambda$ 25 25 48'72<br>$L$ 86 3 18'70 | <b>Bindwára Temple,</b><br>( <i>Monghyr</i> ) Spiro.<br>$\lambda$ 25 20 52'3<br>$L$ 86 31 6'4                                                                                                                                                                                                                                                   | <b>Ganges River, b Flagstaff.</b><br>( <i>Monghyr</i> ) On N. coast of Gangáprasád char.<br>$\lambda$ 25 26 7<br>$L$ 86 32 0                                     |
|                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                 | <b>Ganges River, c Flagstaff.</b><br>( <i>Monghyr</i> ) On N. coast of Gangáprasád char.<br>$\lambda$ 25 26 12<br>$L$ 86 32 37                                   |

\* This height refers to the upper surface of the stone let into the ground floor of the tower.

† Of the North-East Longitudinal Series.

| Name of station, district, description,<br>co-ordinates &c.                                                                                                                               | Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                                                      | Name of station, district, description,<br>co-ordinates &c.                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ganges River, d Flagstaff.<br>(Monghyr) On N. coast of Gangáprasád char.<br>o ' "<br>λ 25 26 10<br>L 86 33 22                                                                             | Kajra Hill Mark (heliotrope).<br>(Monghyr) About 5 miles E. of Kajra railway station, 2½ miles S. of Rámchandrapur village, and 1½ miles N.W. of the cold spring.<br>o ' "<br>λ 25 9 55·81<br>L 86 22 41·10<br>H 1444<br>No. 23                  | Malti, VII.<br>(Vide page 5—R.)<br>o ' "<br>λ 25 27 45·81<br>L 86 3 17·23<br>H 146<br>h 20<br>No. 7                                                                                          |
| Ganges River, Junction Flagstaff.<br>(Monghyr) On N.W. corner of a char, about ¼ a mile S.W. of Sápúr s.<br>λ 25 20 18<br>L 86 22 45                                                      | Kapsia s.<br>(Monghyr) Or Ganges River No. 237 s; on left bank.<br>λ 25 24 32·62<br>L 86 8 2·81                                                                                                                                                  | Matiháni, VI.<br>(Vide page 4—R.)<br>λ 25 22 5·71<br>L 86 11 59·69<br>H 149<br>h 19<br>No. 6                                                                                                 |
| Ganges River, Mark No. 1.<br>(Monghyr) On a beacon rock.<br>λ 25 22 18<br>L 86 29 5                                                                                                       | Kasáha s.<br>(Patna) Or Ganges River No. 234 s; on right bank.<br>λ 25 23 43·09<br>L 86 4 51·96                                                                                                                                                  | Mohanpur House.<br>(Monghyr) North corner of a paka house.<br>λ 25 14 24·8<br>L 86 11 4·2                                                                                                    |
| Ganges River, Mark No. 2.<br>(Monghyr) On a beacon rock.<br>λ 25 22 6<br>L 86 29 17                                                                                                       | Katalúpur s.<br>(Monghyr) Or Ganges River No. 259 s; on right bank, about 1½ miles N.W. of Balachmuki village.<br>λ 25 18 28·41<br>L 86 22 15·81                                                                                                 | Monghyr Fort.<br>(Monghyr) S.W. corner.<br>λ 25 22 30·9<br>L 86 30 22·6                                                                                                                      |
| Ganges River, Mark No. 3.<br>(Monghyr) On a beacon rock.<br>λ 25 22 13<br>L 86 29 6                                                                                                       | Khágaria Temple.<br>(Monghyr) In a large basar on the Little Gunduk river.<br>λ 25 30 0·3<br>L 86 30 34·9                                                                                                                                        | Monghyr, House No. 1.<br>(Monghyr) Sháh Hasan Áli's house on the hill above the Protestant Church.<br>λ 25 22 50·3<br>L 86 30 24·2                                                           |
| Ghoranji, LIX.†<br>(Vide page 3—R.)<br>λ 24 33 34·54<br>L 86 10 46·97<br>H 1984<br>h 3<br>No. 1                                                                                           | Mahendrapur s.<br>(Patna) Or Ganges River No. 231 s; on right bank, about 1 mile E. of Daryapur village.<br>λ 25 22 34·63<br>L 86 1 47·92                                                                                                        | Monghyr, House No. 2.<br>(Monghyr) Flagstaff on the terrace of Karamchara house on the hill, north corner of fort, formerly the residence of Warren Hastings.<br>λ 25 23 6·9<br>L 86 30 40·0 |
| Haibatganj s.<br>(Monghyr) Or Ganges River No. 257 s; on right bank, about ¼ a mile N.E. of Haibatganj temple, and 1½ miles W. of Mendonichauki village.<br>λ 25 17 9·06<br>L 86 20 14·34 | Maira h.s.<br>(Monghyr) On a range of hills, about 1½ miles S.E. of Karaili, 7 miles S.E. of Dharhara railway station, and 7 miles N.W. of Khargpur police station; par-gana Khargpur.<br>λ 25 10 26·24<br>L 86 30 34·26<br>H 1528<br>No. 26, 27 | Monghyr, Rajghát,<br>(Monghyr) Flagstaff.<br>λ 25 23 6·9<br>L 86 30 20·7                                                                                                                     |
| Haibatganj Temple,<br>(Monghyr) Centre spire.<br>λ 25 16 49·2<br>L 86 19 57·3                                                                                                             | Málipur House.<br>(Monghyr) Tiled house.<br>λ 25 24 10·8<br>L 86 3 49·8                                                                                                                                                                          | Pahárpur s.<br>(Monghyr) Or Ganges River No. 260 s; on left bank, 0·2 of a mile S. of village of the same name.<br>λ 25 19 50·30<br>L 86 21 30·74                                            |
| Harpur, XVIII.<br>(Vide page 6—R.)<br>λ 26 15 24·81<br>L 86 10 42·23<br>H 163·21†<br>h 29·67<br>No. 18                                                                                    | Málipur s.<br>(Monghyr) Or Ganges River No. 233 s; on left bank, close to and S. of Málipur village.<br>λ 25 24 13·19<br>L 86 3 53·34                                                                                                            | Parída No. 1 s.<br>(Monghyr) Or Ganges River No. 266 s; on right bank, about 1½ miles N. of village of the same name.<br>λ 25 20 18·64<br>L 86 28 13·04                                      |

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| Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                                                                       | Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                        | Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Parida No. 2 s.<br/>(Monghyr) Or Ganges River No. 265 s.; on left bank, about <math>\frac{1}{2}</math> a mile S. of Ismailganj village.</p> <p style="text-align: center;">o ' "</p> <p>λ 25 22 22.32<br/>L 86 27 17.67</p>                                    | <p>Rámdirri s.<br/>(Monghyr) Or Ganges River No. 236 s.; on right bank.</p> <p style="text-align: center;">o ' "</p> <p>λ 25 23 57.11<br/>L 86 7 23.54</p>                                                         | <p>Sanáha s.<br/>(Monghyr) Or Ganges River No. 251 s.; on a char, about <math>\frac{1}{2}</math> a mile S.W. of Bintoli village.</p> <p style="text-align: center;">o ' "</p> <p>λ 25 15 31.56<br/>L 86 14 45.77</p> |
| <p>Parora Factory.<br/>(Monghyr) Tree flag.</p> <p>λ 25 22 57.1<br/>L 86 25 32.0</p>                                                                                                                                                                              | <p>Rámnáthpur s.<br/>(Monghyr) Or Ganges River No. 258 s.; on left bank, about 1 mile S. of village of the same name.</p> <p>λ 25 18 21.30<br/>L 86 18 41.51</p>                                                   | <p>Sápur s.<br/>(Monghyr) Or Ganges River No. 262 s.; on left bank, about 4 miles S.W. of Shamsheerpur village.</p> <p>λ 25 20 44.67<br/>L 86 22 59.88</p>                                                           |
| <p>Parora s.<br/>(Monghyr) Or Ganges River No. 264 s.; on left bank, about <math>\frac{1}{2}</math> miles S. of Parora factory, and 1 mile S.W. of Shamsheerpur village.</p> <p>λ 25 21 56.94<br/>L 86 25 43.08</p>                                               | <p>Rheowa, I.<br/>(Vide page 4—R.)</p> <p>λ 24 48 24.08<br/>L 85 51 47.00<br/>H 1672<br/>h 1<br/>No. 1</p>                                                                                                         | <p>Sardátala s.<br/>(Monghyr) Or Ganges River No. 267 s.; on left bank, <math>\frac{1}{2}</math> of a mile E. of village of the same name.</p> <p>λ 25 23 38.42<br/>L 86 29 15.07</p>                                |
| <p>Patuha s.<br/>(Monghyr) Or Ganges River No. 247 s.; on a char, about <math>\frac{3}{4}</math> miles W. of Bintoli village, and <math>\frac{1}{2}</math> miles N.E. of Alipur village on the other side of the river.</p> <p>λ 25 16 0.56<br/>L 86 11 56.58</p> | <p>Rúpaspur s.<br/>(Monghyr) Or Ganges River No. 235 s.; on left bank.</p> <p>λ 25 25 0.39<br/>L 86 6 11.08</p>                                                                                                    | <p>Shaikhpora, III.<br/>(Vide page 4—R.)</p> <p>λ 25 8 18.38<br/>L 85 53 28.24<br/>H 663<br/>h 1<br/>No. 3</p>                                                                                                       |
| <p>Piri Temple,<br/>(Durbhunga) Spire, on ghát.</p> <p>λ 26 6 48.2<br/>L 86 0 37.1</p>                                                                                                                                                                            | <p>Sadhar s.<br/>(Monghyr) Or Ganges River No. 242 s.; on left bank, close to and N.W. of village of the same name.</p> <p>λ 25 22 38.40<br/>L 86 10 33.08</p>                                                     | <p>Siáma No. 1 s.<br/>(Monghyr) Or Ganges River No. 239 s.; on right bank, about 1 mile E. of village of the same name.</p> <p>λ 25 19 38.97<br/>L 86 10 41.47</p>                                                   |
| <p>Pírpahár h.s.<br/>(Monghyr) On the summit of a high hill on right bank of the Sitakund nála, and about 3 miles E. of Monghyr town.</p> <p>λ 25 22 39.95<br/>L 86 33 13.05<br/>H, 333.63*<br/>Nos. 24, 25</p>                                                   | <p>Saiár, XI.<br/>(Vide page 5—R.)</p> <p>λ 25 44 44.23<br/>L 86 5 6.70<br/>H 160<br/>h 20<br/>No. 11</p>                                                                                                          | <p>Siáma No. 2 s.<br/>(Monghyr) Or Ganges River No. 240 s.; on right bank, about 1 mile N.E. of village of the same name.</p> <p>λ 25 21 16.16<br/>L 86 10 15.35</p>                                                 |
| <p>Raghunáthpur s.<br/>(Monghyr) Or Ganges River No. 269 s.; on left bank, about <math>\frac{1}{4}</math> miles N. of village of the same name.</p> <p>λ 25 26 40.79<br/>L 86 29 11.27</p>                                                                        | <p>Saidpur s.<br/>(Monghyr) Or Ganges River No. 245 s.; on N.W. corner of a char.</p> <p>λ 25 17 25.05<br/>L 86 11 57.86</p>                                                                                       | <p>Siáma No. 3 s.<br/>(Monghyr) Or Ganges River No. 241 s.; on right bank, about <math>\frac{2}{3}</math> miles N.W. by N. of Siáma No. 2 s.</p> <p>λ 25 23 8.85<br/>L 86 8 57.48</p>                                |
| <p>Ráhatpur s.<br/>(Monghyr) Or Ganges River No. 250 s.; on right bank, about <math>\frac{1}{4}</math> miles N.E. of village of the same name.</p> <p>λ 25 14 27.58<br/>L 86 13 55.50</p>                                                                         | <p>Sajanpura, XIV.<br/>(Vide page 5—R.)</p> <p>λ 25 59 55.18<br/>L 86 11 3.67<br/>H 162<br/>h 22<br/>No. 14</p>                                                                                                    | <p>Simária s.<br/>(Monghyr) Or Ganges River No. 232 s.; on left bank, about <math>\frac{1}{4}</math> miles W. of Málipur village.</p> <p>λ 25 24 10.56<br/>L 86 2 41.84</p>                                          |
| <p>Rámchandrappur s.<br/>(Monghyr) Or Ganges River No. 248 s.; on right bank, about <math>\frac{1}{2}</math> a mile N. of village of the same name, and <math>\frac{1}{2}</math> of a mile E. of Alipur village.</p> <p>λ 25 14 47.34<br/>L 86 11 36.86</p>       | <p>Samo No. 1 s.<br/>(Monghyr) Or Ganges River No. 253 s.; on E. bank of a char opposite to Súrjagarh, and about <math>\frac{1}{4}</math> miles N.E. of Bintoli village.</p> <p>λ 25 16 14.87<br/>L 86 16 9.22</p> | <p>Singhia, XII.<br/>(Vide page 5—R.)</p> <p>λ 25 49 28.51<br/>L 86 12 15.60<br/>H 156<br/>h 25<br/>No. 12</p>                                                                                                       |
|                                                                                                                                                                                                                                                                   | <p>Samo No. 2 s.<br/>(Monghyr) Or Ganges River No. 254 s.; on left bank, about <math>\frac{2}{3}</math> miles S.W. of Rámnáthpur village.</p> <p>λ 25 17 23.32<br/>L 86 17 26.58</p>                               | <p>Súrjagarh Mosque No. 1,<br/>(Monghyr) Spire, S. of town.</p> <p>λ 25 15 7.0<br/>L 86 15 50.7</p>                                                                                                                  |

\* This height refers to surface of upper mark-stone. Meridional Series.

† The continuation of this triangulation will be found in the Co-ordinate List of the North Malutcha

| Name of station, district, description,<br>co-ordinates &c.                                                         | Name of station, district, description,<br>co-ordinates &c.                                                                                                        | Name of station, district, description,<br>co-ordinates &c.                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Súrajarh Mosque No. 2,<br>(Monghyr) Centre spiro.    °   '   "<br>λ            25 15 21.7<br>L            86 16 1.9 | Súrajarh s.<br>(Monghyr) Or Ganges River No. 252 s.; on right<br>bank.                            °   '   "<br>λ            25 15 24.22<br>L            86 16 3.12 | Tíkápúr s.<br>(Monghyr) Or Ganges River No. 270 s.; on left<br>bank 0.3 of a mile W. of village of the same name.<br>°   '   "<br>λ            25 27 42.28<br>L            86 34 0.02 |

January 1880.

J. B. N. HENNESSEY,  
*In charge of Computing Office.*



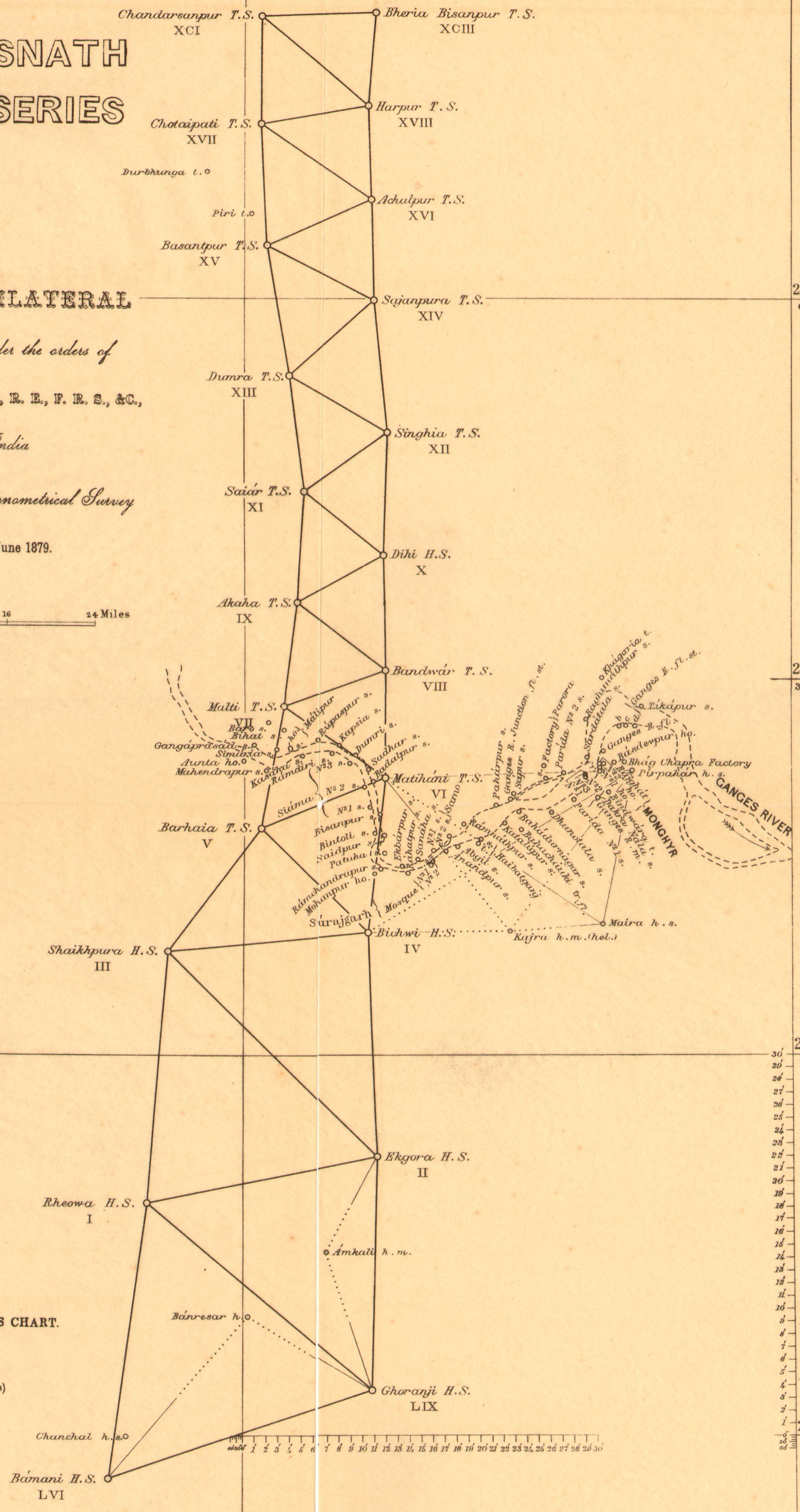
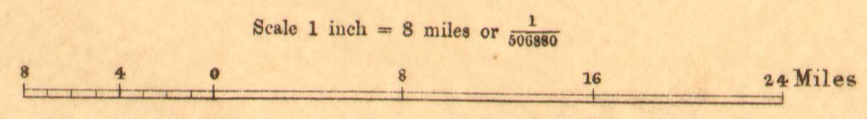
# NORTH PARASNATH MERIDIONAL SERIES

OR  
**SERIES R**

## NORTH-EAST QUADRILATERAL

Compiled and photoznecographed under the orders of  
MAJOR-GENERAL J. T. WALKER, C. E., R. E., F. R. S., & C.,  
Surveyor General of India  
and Superintendent of the Great Trigonometrical Survey

At the Office of the Survey, Dehra Dun, June 1879.



### EXPLANATION OF SYMBOLS USED ON THIS CHART.

- |      |           |                                    |
|------|-----------|------------------------------------|
| H.S. | Signifies | Hill Station (Principal)           |
| T.S. | "         | Tower Station (Principal)          |
| h.s. | "         | Hill Station (Secondary)           |
| s.   | "         | Station (Secondary, in the plains) |
| fl.  | "         | Flag                               |
| h.   | "         | Hill                               |
| hel. | "         | Heliotrope                         |
| ho.  | "         | House                              |
| m.   | "         | Mark                               |
| R.   | "         | River                              |
| st.  | "         | Staff                              |
| t.   | "         | Temple                             |
| tr.  | "         | Tree                               |

**NORTH MALUNCHA MERIDIONAL SERIES.**

## NORTH MALUNCHA MERIDIONAL SERIES—(LONG. 87° 8').

## INTRODUCTION.

In 1843 the Surveyor General directed the survey party under Lieut. Renny, which had recently completed the northern section of the Budhon Series, to commence a chain of meridional triangles at the station of Malúncha, of the Calcutta Longitudinal Series, and carry it northwards up to the Nepal boundary.

Thus was commenced, under the orders of Colonel Everest, to be carried out under those of Colonel Waugh—who succeeded to the Surveyor Generalship in December 1843—the North Malúncha Series, which is the tenth in order, reckoning eastwards from the Great Arc, of the meridional chains of triangles included in the North-East Quadrilateral. It emanates from the side Durgapur-Malúncha (LXII-LXIV) of the Calcutta Longitudinal Series, and is now held to close at the stations Rám Nagar-Manula (CVII-CVIII) of the North-East Longitudinal Series. For about three-fourths of its course the triangulation is disposed as a double chain consisting of two heptagons and a hexagon, the remainder consisting of a chain of six single triangles; the whole covers a meridional distance of 156 miles. For the first 90 miles the Series is carried over the hilly tract now known as the Sonthal Pergunnahs, and over the southern portion of the districts of Bhágapur and Monghyr; all the stations up to x are thus on hills, the view from which being uninterrupted admitted of the sides of the triangles for this portion ranging from  $17\frac{1}{2}$  to 35 miles, and giving an average side-length of 26 miles. The Series then descended into the valley of the Ganges, where natural elevations being no longer available, recourse was had to towers, of which thirteen—averaging 23 feet in height—had to be built. In this portion the side-lengths were gradually reduced till they attained an average length of 11 miles, which experience has shown to be the best for a perfectly level country.

The party was constituted as is detailed in the margin. It was furnished with Cary's

Season 1843-44.

## PERSONNEL.

|                                                   |   |
|---------------------------------------------------|---|
| Lieut. T. Renny, Bengal Engineers, 1st Assistant. |   |
| Mr. R. Clarkson, Senior 1st Class Sub-Assistant.  |   |
| " W. C. Rossenrode, 2nd "                         | " |
| " A. C. Oliver,* 2nd "                            | " |
| " C. R. Webb,* 3rd "                              | " |

\* Joined in February 1844.

15-inch theodolite which will be found described at page 71 of the Appendices to Vol. II. Marching from the Surveyor General's Head Quarters in Dehra Dún, on 1st October 1843, it proceeded by the usual marches to the scene of its operations, and arrived at its first station, Durgapur, on the 7th January. The time occupied on this lengthened march was utilized in bringing up the General Report

and duplicate records of the recently completed Budhon Series. While on the march, Lieutenant Renny was directed to join the army \* then proceeding to Gwalior under the command of Sir Hugh (afterwards Lord) Gough. He accordingly handed over the charge of the party to Mr. Clarkson in whose hands it remained till Lieutenant Renny's return on the 27th March. The stations of Durgapur and Malúncha having been found in good preservation, Mr. Clarkson lost no time in reconnoitering the country to the north; and as this tract abounded with eminences it proved so favorable for the operations that before the end of the month five stations had been selected, and platforms built and approximate angles measured at them. After selecting another station, and thus completing the first figure, Mr. Clarkson returned to begin observing final angles. By the 2nd of March the horizontal and vertical angles were measured at the two base-stations (Durgapur and Malúncha), while the approximate party under Mr. Rossenrode which had been detached towards the end of February reported the selection of one station of the Bharam (VII) heptagon. The next month proved unfavorable for the party; for Mr. Clarkson was unable to do more than complete the angles at Gháti (II) and proceed to Phuljuri (I) where, after nearly three weeks' stay, Lieutenant Renny found him still unable to finish all the necessary observations, partly from the unfavorableness of the weather, and partly from the successive detachments of signallers at Mahuagarhi (VI) being repeatedly struck down with dysentery contracted through having to use water from tanks or stagnant pools in the neighbourhood. Mr. Rossenrode and his assistant were equally unfortunate, for about the middle of March while reconnoitering the country to the north of the side IV-V they were both prostrated with a malarious fever, which it was believed they had contracted at the very station (VI) which had proved so disastrous to the signalling party; this compelled them to seek medical aid at Bhágalpur. Lieutenant Renny on his arrival sent off Mr. Clarkson to continue the selection of stations, and proceeded to Malúncha to take the requisite initial azimuth observations there; these he completed by the 11th April. Advancing to Sathor (III), he had hardly commenced work there when his entire establishment was disabled by jungle-fever, and several of his signallers died; thus he had no alternative but to close work in this malarious part of the country and move off as rapidly as practicable to more open and healthy ground. He accordingly marched to Bhágalpur where he established a depôt for the sick, and left his large theodolite, with the intention of devoting his remaining resources to the selection of stations. By the end of May, the Series was laid out to the side Maisláka-Pureni (XVI-XVII),—the sites of the stations having been fixed by ray-trace traverses. This part of the work required considerable care in the selection of sites, as the country for 30 miles immediately north of the Ganges was subject to annual inundations during the rains, in consequence of which it was necessary to locate the stations on sites where they would stand well above the level of the highest inundation. On the 1st of June Lieutenant Renny handed over charge of the party to Mr. Clarkson and proceeded to Europe on furlough. The latter officer kept the field for another month, engaged on secondary operations along the Ganges, and then returned to recess quarters at Monghyr.

---

\* Lieutenant Renny was appointed Brigade Major of Engineers. He was present at the battle of Maharájpur (29th December 1843), and for his services on that occasion was honourably mentioned in General Orders.

The party took the field on the 11th of October, and started for Bhágalpur to make arrangements for the construction of the towers which were to be built at Pírdauri (xi) and Barári (xii). The Surveyor General having Troughton and Simms' 18-inch theodolite No. 2 (for a description of which see pages 65 and 66

Season 1844-45.

PERSONNEL.

|                     |                            |
|---------------------|----------------------------|
| Mr. R. Clarkson,    | Senior 1st Class Sub-Asst. |
| " W. C. Rossenrode, | Junior 1st " "             |
| " C. R. Webb,       | " 3rd " "                  |

of the Appendices to Vol. II) available for a short time, lent it temporarily to the Malúncha Series in place of the 15-inch by Cary, of which both Lieutenant Renny and Mr. Clarkson had complained that it was deficient in telescopic power.

The mark-stone at the hill station of Satbor (iii) was found to have been removed by the country people since the station was last visited; thus and because of the prevalence of hazy weather and sickness in his camp, Mr. Clarkson was only able by the end of December to complete the measurement of the angles at that station. Mr. Rossenrode had in the meanwhile built the required platforms at the hill stations of the Bháram polygon, and a 32-foot tower at xii. January proved unfavorable for the observations, for owing to the hazy weather and the length of the rays Mr. Clarkson was unable to do more than complete the horizontal and vertical angles at Phuljuri (i); but the tower-building was advanced by the completion of the towers at xi and xiii. The haze cleared off early in February, and Mr. Clarkson having disposed of the observations at Deoli (iv) by the 10th repaired to Bháram (vii) so as to secure the observations there on the very long rays at least before hazy weather should again overtake him. By the 20th of March he was able to complete the observations at vii, v and vi. The 18-inch theodolite being now required elsewhere (on the Chendwár Meridional Series), the 15-inch by Cary was again resumed, and with it all the remaining angles on this Series were measured. Proceeding in succession to the stations ii (where the vertical angles to the northern stations had to be re-measured) viii, x, xi, xii, and ix, Mr. Clarkson succeeded by the first week of June in completing all the observations south of the side Pírdauri-Barári (xi-xii). The rains had now set in, he therefore moved into recess quarters at Monghyr where he arrived on the 23rd. By this time the towers at xiv, xv, and xvi had been built by Mr. Rossenrode, the four rays immediately to the north of the Ganges cleared, and the country reconnoitered for some distance beyond the side Maisláka-Pureni (xvi-xvii). The progress thus made in two seasons was considered highly gratifying by the Surveyor General; and the Government of India in acknowledging his report of the operations were pleased to record their appreciation in the following terms, "The result of their respective exertions, under difficulties so trying and unflinchingly sustained, is creditable in the highest degree to Captain Renny and Mr. Clarkson."

In September 1845 Mr. Clarkson was transferred to the East Coast Series, and Lieu-

Season 1845-46.

PERSONNEL.

|                             |                          |
|-----------------------------|--------------------------|
| Lieutenant Reginald Walker, | Bengal Engineers,        |
| 2nd Assistant.              |                          |
| Mr. G. E. Terry,            | 1st Class Sub-Assistant. |
| " W. C. Rossenrode,         | 1st " "                  |
| " C. R. Webb,               | 3rd " "                  |

tenant R. Walker was appointed to the charge of the North Malúncha Series. The party was further strengthened by the appointment of Mr. Terry. Leaving recess quarters about the 10th of October, Lieutenant Walker determined upon devoting his entire resources during the earlier part of the field season to tower-building and tracing and clear-

ing rays. Thus by the end of the year he was able to report the raising of the towers at XIII, XIV, and XV by 10, 5, and 8 feet respectively, and the completion of the tower-building up to the side Dighi-Mohania (xx-xxi), postponing the ray-tracing and clearing within the limits of the Benádi (xiii) polygon owing to the flooded state of the country. The effects, however, of the inundations were severely felt further north, and very great sickness prevailed in camp till the end of January. Several of the best men of the native establishment died, causing considerable anxiety from the fear of a want of trained signallers. On the day the party crossed the Daus river no less than twenty-two men as well as two of the Sub-Assistants fell ill. Pushing on with the same class of operations, during January the Series was brought up to the Nepal boundary and a triangulation was carried westwards over a portion of the north connecting chains now known as the North-East Longitudinal Series. On receiving an approximate plan of the triangulation as thus laid out, the Surveyor General suggested taking advantage of the bend in the Series, to construct, at a very small additional cost of time, money and labour, another station south-west of the bend so as to convert the seven triangles of the westward continuation into a double polygon of ten symmetrical triangles. The station of Latona (ciii of the N. E. Longitudinal Series) was accordingly selected. After sufficiently advancing the tower-building and ray-clearing, Lieutenant Walker returned southwards to take up the observations.

The progress made during March and April was very slow owing to the length of the sides in the Benádi polygon and the unfavorable state of the weather. The high westerly winds raised clouds of dust and sand which at times obscured the atmosphere so as to render it impossible to distinguish objects even at short distances. The heat too was excessive, the thermometer in the office tent standing at  $110^{\circ}$  for weeks together. A few breaks in the hot winds enabled Lieutenant Walker to get on by degrees; and one, which occurred most opportunely at the precise time required, enabled him to get a complete set of circumpolar star observations for azimuth at Sirkanda (xv). The want of a sufficient number of lampmen aggravated Lieutenant Walker's difficulties at this time, for he was obliged to send the same men from station to station, and was thus much retarded. The bad weather lasted till the end of April, when easterly winds having begun to blow, a favourable change took place, enabling Lieutenant Walker to finish the observations at the stations XI to XVII by the 4th May. There still lay before him a considerable amount of observing, but the sides now were shorter and consequently more favorable for the observations. The near prospect of the rains necessitated vigorous action to make the most of what remained of the season for field work. Thus in the short period of four weeks he took observations at 14 stations, at which he completed the measurement of 42 principal angles, marching a distance of about 160 miles in proceeding from station to station; this achievement is almost without a parallel in the history of the Indian Survey. The operations for the season closed on the 1st of June at Manula (cviii of the North-East Longitudinal Series) just before the setting in of the regular rains. The party immediately started for recess quarters at Darjeeling and arrived there on the 15th of June. The success achieved by Lieutenant Reginald Walker, under very considerable disadvantages, was highly commended by the Surveyor General and approved by the Government.

On the completion of the Simultaneous Reduction of the North-East Quadrilateral it was found that the errors which had actually been dispersed over the North Malúncha Series, between the origin Durgapur-Malúncha and terminus Rámnagar-Manula, were as follow :—

|                                 |   |              |                        |
|---------------------------------|---|--------------|------------------------|
| In Logarithm of the latter side | — | 0.000,0174,0 | = 2.5 inches per mile. |
| „ Azimuth                       | „ | — 2".036     |                        |
| „ Latitude of Manula            |   | — 0.126      |                        |
| „ Longitude                     | „ | — 0.056      |                        |

The trigonometrical heights were checked at three points in subsequent years by connection with the Spirit-Levelling Operations of this Survey, see page 47—*S* [of Vol. VIII]. The sections into which the Series has thus been divided exhibit the following errors :—In the southern section, ending at XII, the cumulative error was found to be — 4.2 feet; in the next section, ending at XX, it amounted to + 6 feet; in the remaining section it was — 2.8 feet. These errors were dispersed in the manner indicated at page 41 of Part I of Vol. VII.

### *Secondary Triangulation.*

The secondary triangulation accomplished in connection with this Series was chiefly executed by the measurement—with the large theodolites—of the angles at the principal stations between the surrounding secondary stations and other prominent objects in the hill tracts to the south of the Ganges, and by the measurement—with a 12-inch theodolite—of the angles at the secondary stations which were required for combination with the former, in order to complete the secondary and minor triangles. This work was carried on during the seasons 1843-45 *pari passú* with the principal triangulation. The requisite numerical details of angles and side-lengths, and of latitudes, longitudes, and azimuths are given in the Synoptical Volume for this Series, both for the secondary stations and for the 'intersected' but unvisited points.

In addition to the above, the results of the following chains of secondary triangulation appear either in whole or in part in the Synoptical Volume of this Series.

*The Ganges River Survey.*—This was executed by Mr. Clarkson in June 1844, with a 12-inch theodolite. It emanated from Barári (XII) principal station and following the course of the river, which it lays down for a distance of about 20 miles, closed on the station of Pírdauri (XI). This triangulation has been adjusted between the finally determined position-values of these two stations. The course of the river westwards of Pírdauri and extending to Monghyr, was executed by Mr. J. M. Dunlop, 2nd Class Sub-Assistant, in October 1850, with a 12-inch theodolite, as a part of the operations of the North Párasnáth Meridional Series. This has been fitted in between the position-values of Pírdauri (XI) and Pírpahár h.s. fixed by the Monghyr Secondary Series (see next page); and the portion of it for about 20 miles along the river is exhibited in the Synoptical Volume of the North Malúncha Series, the remainder being given in that of the North Párasnáth Series.

*The Purneah Series.*—In April and May 1849, Mr. J. O. Nicolson, 1st Class Sub-Assistant, was directed to fix the position of Purneah. He accordingly carried a series of triangles—with a 12-inch theodolite—from the side Barára-Mohania (xix–xxi) eastwards, and determined the positions of several permanent buildings in and near the town.

As the stations both of this Series and of the Ganges River Survey were not permanently marked and are now not forthcoming, the usual data of the triangles are not given, but merely the latitudes and longitudes of the stations and of the temples and other permanent points of which the positions were determined.

*The Monghyr Series.*—This was executed in 1851-52—chiefly by Mr. J. O. Nicolson, Civil 2nd Assistant, Survey of India, with a 24-inch theodolite—as a chain of first class secondary triangles designed primarily to furnish bases for connecting Monghyr with the principal triangulation of the North Párasnáth Series from the side Bichwi-Matibáni (iv–vi) of which it emanated. It was then continued eastwards till it closed on the side Sakma-Pírdauri (x–xi) of the North Malúncha Series. The triangulation has been adjusted between the final position-values of these two sides, and the portion of it to the west of the side Maira-Pírpahár will be found in the Synoptical Volume of the North Párasnáth Series.

DEHRA DŪN: }  
 March 1882. }

C. WOOD,  
 Surveyor, 2nd Grade.





## NORTH MALUNCHA MERIDIONAL SERIES.

## ALPHABETICAL LIST OF STATIONS.

|                                    |        |                                      |        |
|------------------------------------|--------|--------------------------------------|--------|
| Barára . . . . .                   | XIX.   | Malúncha . . . . .                   | LXIV.  |
| Barári . . . . .                   | XII.   | (of Calcutta Longitudinal Series).   |        |
| Barkop . . . . .                   | IX.    | Manúla . . . . .                     | CVIII. |
| Benádi . . . . .                   | XIII.  | (of North-East Longitudinal Series). |        |
| Bháram . . . . .                   | VII.   | Mávágarhi . . . . .                  | VI.    |
| Deoli . . . . .                    | IV.    | Mohánia . . . . .                    | XXI.   |
| Dighi . . . . .                    | XX.    | Phúljori . . . . .                   | I.     |
| Durgápúr . . . . .                 | LXII.  | Pirdáori . . . . .                   | XI.    |
| (of Calcutta Longitudinal Series). |        | Púreni . . . . .                     | XVII.  |
| Gádo . . . . .                     | VIII.  | Rámnagar . . . . .                   | CVII.  |
| Gangúra . . . . .                  | XVIII. | (of North-East Longitudinal Series). |        |
| Ghāti . . . . .                    | II.    | Rangsár . . . . .                    | V.     |
| Jargáon . . . . .                  | XIV.   | Sakma . . . . .                      | X.     |
| Maisláka . . . . .                 | XVI.   | Satbor . . . . .                     | III.   |
|                                    |        | Sirkanda . . . . .                   | XV.    |

## NORTH MALUNCHA MERIDIONAL SERIES.

## NUMERICAL LIST OF STATIONS.



|      |   |   |   |   |                                                 |       |   |   |   |   |                                                   |
|------|---|---|---|---|-------------------------------------------------|-------|---|---|---|---|---------------------------------------------------|
| LXII | . | . | . | . | Durgápúr.<br>(of Calcutta Longitudinal Series). | XII   | . | . | . | . | Barári.                                           |
| LXIV | . | . | . | . | Malúncha.<br>(of Calcutta Longitudinal Series). | XIII  | . | . | . | . | Benádi.                                           |
| I    | . | . | . | . | Phúljori.                                       | XIV   | . | . | . | . | Jargáon.                                          |
| II   | . | . | . | . | Ghāti.                                          | XV    | . | . | . | . | Sirkanda.                                         |
| III  | . | . | . | . | Satbor.                                         | XVI   | . | . | . | . | Maisláka.                                         |
| IV   | . | . | . | . | Deoli.                                          | XVII  | . | . | . | . | Púreni.                                           |
| V    | . | . | . | . | Rangsár.                                        | XVIII | . | . | . | . | Gangúra.                                          |
| VI   | . | . | . | . | Mávágarhi.                                      | XIX   | . | . | . | . | Barára.                                           |
| VII  | . | . | . | . | Bláram.                                         | XX    | . | . | . | . | Dighi.                                            |
| VIII | . | . | . | . | Gádo.                                           | XXI   | . | . | . | . | Mobánía.                                          |
| IX   | . | . | . | . | Barkop.                                         | CVII  | . | . | . | . | Rámnagar.<br>(of North-East Longitudinal Series). |
| X    | . | . | . | . | Sakma.                                          | CVIII | . | . | . | . | Manúla.<br>(of North-East Longitudinal Series).   |
| XI   | . | . | . | . | Pirdáori.                                       |       |   |   |   |   |                                                   |



## NORTH MALUNCHA MERIDIONAL SERIES.

### DESCRIPTION OF PRINCIPAL STATIONS.

—————

The 10 southernmost of the 21 Principal Stations of this Series are situated on hills and with two exceptions consist of platforms, for the observatory tent to rest on, in general built round a solid pillar or round a projecting rock. The former have the usual marks, *viz.*, a circle and centre, both at top and bottom: the latter have only one mark on the rock *in situ*. The exceptions are Station VIII, about which no information is forthcoming, and Station IX which is on a large rock having a portion levelled for the instrument to stand on. The remaining stations of the series are in the plains, and artificial elevations had to be constructed to overlook the curvature of the earth. These consisted of solid towers, either circular or square, built of sun-dried bricks, from 20 to 24 feet in diameter at base and 18 feet at top, with a central pillar of masonry carrying marks at top and bottom and also intermediately. An external staircase built round the tower gave access to the top.

The following descriptions have been compiled from those given in the MS. General Report and other original records of this Series, supplemented in respect to the neighbouring villages, &c., by information obtained from the Revenue and Topographical Survey Maps of the country traversed. The information as to the local sub-divisions in which the several stations occur has been derived from the latest Annual Reports received from the District Officers to whose charge the stations have been committed.

LXII.—(*Of the Calcutta Longitudinal Series*). Durgapur (*Durgápúr*) Hill Station, lat. 23° 50', long. 86° 49'—observed at in 1829, 1844 and 1867—is on an isolated hill, about 1½ miles W. of the Barákar river and 6½ miles N. by W. of the Barákar bridge on the Grand Trunk Road: thána Nirsha, pargana Pándra, district Manbhoom.

The pillar is solid and contains two marks, the upper 200 feet above the lower which is engraved on the rock *in situ*, having been placed there in 1829. This station was visited in 1844 for the purpose of originating the North Malúncha Meridional Series when the mark on the rock was the only one found and employed. When again visited in 1867, a second mark is stated to have been met with 2 feet above the one on the rock and a new pillar was built to that height. The directions and estimated distances of the circumjacent villages are:—Pándra S.W., miles 3½; Raghunáthpur E., mile 1; Ubechoria W., miles 4½.

LXIV.—(*Of the Calcutta Longitudinal Series*). Malúncha Hill Station, lat. 23° 54', long. 87° 8'—observed at in 1829, 1844 and 1867-68—is on a high, round-topped, isolated hill, about 8 miles N. by W. of the large village of Alzalpur: táluk Kendowal, pargana Kundabitkareya, district Sonthal Pergunnahs.

The pillar is solid. This station was visited in 1844 for the purpose of originating the North Malúncha Meridional Series when the mark was found to be on a huge rock rising about 4 feet above the surface of the hill. Mr. Taylor used this station for latitude observations during 1864-65, and built a small masonry pillar round the original mark with a triangular aperture and an observatory over the station. In April 1867, Mr. Keelan in revising the Calcutta Longitudinal Series filled up the aperture, placed a mark-stone flush with the floor of the observatory, 1 foot above the original mark, built a pillar 400 feet high above the floor and inserted a mark-stone in its summit in the normal of those below. The directions and estimated distances of the circumjacent villages are:—Siris Kundi S., miles 3; Pakoria N.E., miles 2; Sagaria E.S.E., miles 4; Garjora N.E. by E., miles 8.

I. Phuljuri (*Phúljori*) Hill Station, lat. 24° 14', long. 86° 58'—observed at in 1844-45—is on the summit of a detached hill rising some 1,600 feet above the surrounding plain, about 5 miles W. of the large village of Sárath a little E. of the Adjai river: tahsíl Bámangaon, pargana Deoghur, district Sonthal Pergunnahs.

The station consists of a solid platform and contains two marks, the upper 4·67 feet above the lower which is engraved on the rock *in situ*. The directions and estimated distances of the circumjacent villages are:—Barkarna S.W., miles 4; Bhauradi E.N.E., miles 3½; Barankodi S.S.E., miles 4.

II. Gháti Hill Station, lat. 24° 3', long. 86° 37'—observed at in 1844—is on a low range of sand-stone hills, about 8 miles S.W. of the Railway Station of Kharmátar on the Chord Line and some 4½ miles N. of the Barákar river: táluk Gháti, district Sonthal Pergunnahs.

The station consists of a platform enclosing a central isolated pillar of masonry 6 feet in height and 3·17 feet in diameter, having a mark-stone at its top and another 5·58 feet below which is engraved on the rock *in situ*. The directions and estimated distances of the circumjacent villages are:—Saharpur W.N.W., miles 3; Koridi E. by S., miles 3; Simra S. by W., miles 3.

III. Satbor, locally known as Mankheri, Hill Station, lat. 24° 6', long. 87° 20'—observed at in 1844—is situated on the highest peak of a range of hills running nearly east and west, about 2½ miles W. of the high road from Soory to Nya Doomka and 7 miles S. by E. of the large village of Kumrabad on the left bank of the Mayurákhī or Mayúr river: pargana Muhammadabad, district Sonthal Pergunnahs.

The station consists of a platform enclosing a central isolated pillar of masonry, having a mark-stone at top and another 1·83 feet below which is engraved on the solid rock. The directions and estimated distances of the circumjacent villages are:—Taroni S.S.W., miles 2; Sundardi N.W., miles 2½; Dhajapára (on the high road) N.E. by E., miles 2½.

IV. Deoli Hill Station, lat. 24° 31', long. 86° 38'—observed at in 1845—is situated on the summit of a high hill, about 7 miles W. by N. of the well known town of Deoghur and 3¼ miles S.W. of the Railway Station of Baidya Náth on the Chord Line: tahsíl Rohini, sub-division Deoghur, district Sonthal Pergunnahs.

The station consists of a platform with one mark engraved on the solid rock. The directions and estimated distances of the circumjacent villages are:—Rohini (immediately east of the Railway) S.E., miles 3½; Damarkuri (on the right bank of the Adjai river) S., miles 3; Bhagwánpur W.S.W., miles 3½.

V. Rangsar, locally known as Bhurbhuri, Hill Station, lat. 24° 39', long. 87° 5'—observed at in 1845—is on the highest peak of a small range of hills, about 1 mile E. of the well known village of Sangagotia and 5 miles N.W. by N. of that of Kasdiha on the high road to Soory: thána Bánka, pargana Chándwa, district Bhágalpur.

The station is denoted by a mark on the rock *in situ* surrounded by a platform 3 feet high. The directions and estimated distances of the circumjacent villages are:—Dumri N.W., miles 3; Mohani E., miles 2; Bishanpur N. by E., miles 2½.

VI. Mahuagarhi (*Máwágarhi*), locally known as Makha, Hill Station, lat. 24° 29', long. 87° 26'—observed at in 1845—is situated on a high peak of an extensive range of hills so called, about 3 miles S.E. of the large village of Kendowal. The ascent to the station is from the village of Bora Palári which lies at the western foot of the range: pargana Dáman-i-Koh, sub-division Nya Doomka, district Sonthal Pergunnahs.

The station consists of a platform 5 feet high with two marks, the upper 1·83 feet above the lower which is on the solid rock. The directions and estimated distances of the circumjacent villages are:—Chapria S., miles 1½; Hsaphuli S.W., miles 1½; Dánra N.W., miles 4; Kubari S.W., miles 3½.

VII. Bháram Hill Station, lat. 24° 58', long. 86° 53'—observed at in 1845—is on the eastern peak of a high hill so named, about 10 miles W. by S. of the large village of Dhauni on the road from Beerbhoom to Bhágalpur, and 5 miles W. of the Ghundun stream: thána Amarpur, pargana and district Bhágalpur.

The station is denoted by a mark on the rock *in situ* surrounded by a circular platform 18 feet in diameter. The directions and estimated distances of the circumjacent villages are:—Barko N., miles 3; Lahauk S.E. by E., miles 2½; Tundiario S. by W., miles 3.

VIII. Gado (*Gádo*) Hill Station, lat. 24° 47', long. 86° 31'—observed at in 1845—is on a lofty peak of a range of hills running nearly east and west, and takes its name from a shrine at the eastern foot of the hill called Gado-Thán, where a fair is annually held. It is about 6 miles nearly due east of the Railway Station of Nawádih on the Chord Line: thána Jamooce, pargana Gidhaur, sub-division Jamooce, district Monghyr.

No detail of the construction of this station is forthcoming in the original records, but it may be assumed that it must have been marked in a manner similar to the adjacent stations. The directions and estimated distances of the circumjacent villages are:—Barwa N.E., miles 1½; Hardeh E. by S., miles 2½; Mahápur S.W. by W. (along the Railway), miles 4.

IX. Bárkup (*Barkop*), locally known as Jhandipahár, Hill Station, lat. 24° 56', long. 87° 18'—observed at in 1815—is situated on the highest of a group of low hills east of the large village of Bárkup, about 6¼ miles N.W. of Company Bazar: pargana Tappa-Bárkup, sub-division Godda, district Sonthal Pergunnahs.

The station is denoted by a mark engraved on a huge block of granite and around the mark a space of about 22 inches in diameter was made level for the theodolite to stand on. The directions and estimated distances of the circumjacent villages are:—Gudia N.N.E., miles  $2\frac{1}{2}$ ; Bansipur N.N.W., miles  $3\frac{1}{4}$ ; Pipra S.S.E., miles 3; Khaira S., miles 4.

X. Sakma Hill Station, lat.  $25^{\circ} 4'$ , long.  $86^{\circ} 30'$ —observed at in 1845—is situated on the south-western extremity of a low range of hills running nearly north and south, about 8 miles S.W. by W. of the large village of Khargpur and  $8\frac{1}{2}$  miles E. by S. of the Misri Bungalow: thána and pargana Khargpur, district Monghyr.

The station consists of a platform having a mark-stone at top and another 3 feet below which is engraved on the solid rock. The directions and estimated distances of the circumjacent villages are:—Bhimband W., miles 4; Bansipur E., miles 4; Gaughal E.S.E., miles  $3\frac{1}{4}$ .

XI. Pirdauri (*Pirdáori*) Tower Station, lat.  $25^{\circ} 14'$ , long.  $86^{\circ} 47'$ —observed at in 1845 and 1846—stands on a conical mound formed of the ruins of an ancient fort, which rises some 60 feet above the general level of the surrounding country. It is immediately to the north of the Railway line, about a mile W. of the Railway Station of Sultanganj on the Loop Line: thána and pargana Kámárganj, district Bhálgapur.

The station consists of a circular tower of sun-dried bricks and mud 10 feet high with a central solid masonry pillar having mark-stones at the top and 1, 4, 8 and 14 feet respectively below it. The directions and estimated distances of the circumjacent villages are:—Nawada N.E., miles 2; Sultanganj N., mile 1; Mirchalu E., miles 2. The rocks of Jahangira on the right bank of the Ganges are  $\frac{1}{2}$  a mile N.E.

XII. Barári Tower Station, lat.  $25^{\circ} 16'$ , long.  $87^{\circ} 3'$ —observed at in 1845 and 1846—stands near the village of Barári on the eastern side of the city of Bhálgapur, about  $\frac{1}{2}$  a mile from the right bank of the Ganges and  $1\frac{1}{2}$  miles from the new church in Bhálgapur: thána, pargana and district Bhálgapur.

The station consists of a circular tower of sun-dried bricks and mud cement enclosing a central solid pillar of masonry 80 feet in height which has a mark-stone at top and others at 1, 5, 10, 18, 24 and 32 feet respectively below it.

XIII. Benádi Tower Station, lat.  $25^{\circ} 27'$ , long.  $86^{\circ} 55'$ —observed at in 1846—stands on a small mound which is a few feet above the level of the surrounding country, about half a mile S. of the right bank of the Ghaghri river and  $5\frac{1}{2}$  miles S. E. and N. W. by N. respectively of the large villages of Phulaut and Parmeshwarpur: thána Bibipur, pargana Chhai, district Bhálgapur.

The station consists of a circular tower of sun-dried bricks and mud cement enclosing a central solid brick pillar 33 feet in height which has a mark-stone at top and others at 8, 13, 14, 18, 25 and 34 feet respectively below it. The directions and estimated distances of the circumjacent villages are:—Nagarpara Arazi S.W. by W., miles  $3\frac{1}{4}$ ; Kapasia (on the Ghaghri river) W. by N., miles  $3\frac{1}{4}$ ; Govindpur Govind Arazi E.S.E., miles  $3\frac{1}{4}$ .

XIV. Jargaon (*Jargáon*), locally known as Tuda Jargawan, Tower Station, lat.  $25^{\circ} 27'$ , long.  $86^{\circ} 44'$ —observed at in 1846—stands on a small mound rising a few feet above the surrounding country, about  $6\frac{1}{2}$  miles N.E. of the junction of the Ganges and Gunduk rivers: thána Gogri, pargana Pharkia, district Monghyr.

The station consists of a circular tower of sun-dried bricks and mud cement enclosing a central solid pillar of masonry 23 feet in height, which has a mark-stone at top and others at 5, 6, 10, 16 and 25 feet respectively below it. The directions and estimated distances of the circumjacent villages are:—Gogri S.W. by W., miles  $4\frac{1}{2}$ ; Lewa N., mile 1; Maira E.N.E., miles  $3\frac{1}{4}$ ; Maskipur (Indigo Factory) S. by W., miles  $3\frac{1}{4}$ .

XV. Sirkanda Tower Station, lat.  $25^{\circ} 28'$ , long.  $87^{\circ} 11'$ —observed at in 1846—stands on a mound rising a few feet above the level of the surrounding country, about 3 miles N.W. of junction of the Koosee and Ghaghri rivers, and 5 miles N. of the Bhawánipur Factory: thána Dhándaha, pargana Dharampur, district Purneah.

The station consists of a circular tower of sun-dried bricks and mud cement enclosing a central solid brick pillar 28 feet in height, which has a mark-stone at top and others at 8, 9, 14, 20 and 29 feet respectively below it. The directions and estimated distances of the circumjacent villages are:—Mohampur Istamrar N.W., miles 2; Rijai W., miles  $3\frac{1}{4}$ ; Jahángirpur Baisi S. by W., miles  $3\frac{1}{4}$ .

XVI. Maisláka, locally known as Tuda Sairwia, Tower Station, lat.  $25^{\circ} 37'$ , long.  $86^{\circ} 52'$ —observed at in 1846—stands on a mound rising a few feet above the surrounding country, about  $2\frac{1}{2}$  miles N.W. by W. of the large village of Khorhan Malik: thána Gogri, pargana Pharkia, district Monghyr.

The station consists of a circular tower of sun-dried bricks and mud cement enclosing a central solid pillar of masonry 25 feet in height which has a mark-stone at top and others at 1, 7, 13, 19 and 26 feet respectively below it. The directions and estimated distances of the circumjacent villages are:—Sakrora S.W., mile 1; Bishanwára S.E. by E., miles 2; Gauripur N.E., miles 3; Khásnagar (on the Telewa river) W.N.W., miles 4.

XVII. Pureni (*Púreni*) Tower Station, lat.  $25^{\circ} 37'$ , long.  $87^{\circ} 4'$ —observed at in 1846—stands at a distance of  $\frac{1}{4}$  a mile E. of the village of Chhota Pureni from which it is named, about 8 miles W.S.W. of the large village of Bhawánipur Rajdham immediately W. of the Koosee river: thána Kishanganj, pargana Chhai, district Bhágapur.

The station consists of a circular tower enclosing a central solid pillar of masonry 28 feet in height, which has a mark-stone at top and others at 1, 10, 16, 22 and 29 feet below it. The directions and estimated distances of the circumjacent villages are:—Baghara S.S.W., miles  $1\frac{1}{2}$ ; Nurda N., miles  $1\frac{1}{2}$ ; Raghunáth Patti N.E. by E., miles  $4\frac{1}{2}$ .

XVIII. Gangura (*Gangúra*) Tower Station, lat.  $25^{\circ} 44'$ , long.  $86^{\circ} 58'$ —observed at in 1846—stands at a distance of about half a mile N.W. of the village of Gangura, about  $5\frac{1}{2}$  miles S.W. by S. of the large village of Babhangaon: thána Kishanganj, pargana Nisankhpurkudha, district Bhágapur.

The station consists of a square tower enclosing a central solid pillar 20 feet in height, which has a mark-stone at top and others at 1, 8, 14 and 20.75 feet respectively below it. The directions and estimated distances of the circumjacent villages are:—Birnagar Patti W. by S. miles  $3\frac{1}{2}$ ; Shákpur N.N.W., miles  $2\frac{1}{2}$ ; Bishampur Jaysingh E.S.E., miles  $3\frac{1}{2}$ .

XIX. Barára Tower Station, lat.  $25^{\circ} 45'$ , long.  $87^{\circ} 9'$ —observed at in 1846—is situated about  $1\frac{1}{4}$  miles S. of the large village of Barára, a little W. of the Nagar stream, and  $6\frac{1}{4}$  miles W. of the large village of Dhám-daha between the new and old beds of the Koosee river: thána Dhámdaha, pargana Dharampur, district Purneah.

The station consists of a square tower enclosing a central solid pillar of masonry 21 feet in height which has a mark-stone at top and others at 1, 7, 14 and 21.75 feet respectively below it. The directions and estimated distances of the circumjacent villages are:—Chebacha W. by S., miles  $3\frac{1}{2}$ ; Pattikunt S., miles  $3\frac{1}{2}$ ; Chandrabi E.S.E., miles 5.

XX. Dighi Tower Station, lat.  $25^{\circ} 52'$ , long.  $87^{\circ} 2'$ —observed at in 1846—stands in the centre of the village of Dighi: thána Madhepur, pargana Nisankhpurkudha, district Bhágapur.

The station consists of a square tower with a central solid pillar of masonry 20 feet in height which has a mark-stone at top and others at 1, 8, 14 and 20.75 feet respectively below it. The directions and estimated distances of the circumjacent villages are:—Sáhebganj Itari S. by E., miles  $1\frac{1}{2}$ ; Dinai Patti W.N.W., miles  $3\frac{1}{2}$ ; Sahuria Sabhai E. by N., miles  $3\frac{1}{2}$ .

XXI. Mohania (*Mohánia*) Tower Station, lat.  $25^{\circ} 55'$ , long.  $87^{\circ} 11'$ —observed at in 1846—stands 300 yards S.E. of the hamlet of Mohania, about  $1\frac{1}{4}$  miles W. of the right bank of the Koosee river and the same distance E. of the Nagar stream, a branch of the Koosee: thána Dhámdaha, pargana Dharampur, district Purneah.

The station consists of a square tower with a central solid pillar of masonry 20 feet in height, which has a mark-stone at top and others at 2, 8, 14 and 21 feet respectively below it. The directions and estimated distances of the circumjacent villages are:—Jankinagar W. by N., miles 3; Harpur Mauli N.E. by N., miles  $2\frac{1}{2}$ ; Rámnagar S., miles 2. Mr. Nicolson visited this station in 1849 when the pillar was found uninjured and quite steady, but the uppermost mark-stone had disappeared; he inserted another mark-stone in place of the missing one to correspond accurately with the centre of the circumference of the masonry pillar.

CVII.—(*Of the North-East Longitudinal Series*). Rámnagar Tower Station, lat.  $26^{\circ} 2'$ , long.  $87^{\circ} 4'$ —observed at in 1846—is situated at a distance of  $\frac{1}{4}$  of a mile N.W. of the village of Rhata Rámnagar and about  $6\frac{1}{2}$  miles N.W. of the large village of Birnagar Raghunáth: thána Rániganj, pargana Dharampur, district Purneah.

The station consists of a square tower with an internal solid pillar of masonry 20 feet in height which has a mark-stone at top and others at 1, 7, 14 and 21 feet respectively below it. The azimuths and perambulated distances of the adjacent villages are:—Rámnagar  $326^{\circ} 20'$ , mile 0.81; Purani  $205^{\circ} 36'$ , miles 1.08; Dakania  $95^{\circ} 26'$ , miles 1.31.

CVIII.—(*Of the North-East Longitudinal Series*). Manula (*Maníla*) Tower Station, lat.  $26^{\circ} 5'$ , long.  $87^{\circ} 13'$ —observed at in 1846—is situated about 1 mile N. of the village of Manula Patti after which the station has been named: thána Rániganj, pargana Dharampur, district Purneah.

The station consists of a square tower with an internal solid pillar of masonry 20 feet in height which has a mark-stone at top and others at 1, 7, 13 and 21 feet respectively below it. The azimuths and perambulated distances of the circumjacent villages are:—Manula Patti  $332^{\circ} 37'$ , miles 1.21; Bhargania  $27^{\circ} 18'$ , miles 1.44; Rámganj  $219^{\circ} 31'$ , miles 1.60

NOTE.—In a few instances, the names of principal stations, occurring in the foregoing descriptions, are given by two methods of spelling, distinguished from one another by the use of Roman and Italic type; as in I. Phuljuri (*Phúljori*); the latter spelling is taken from the Alphabetical and Numerical lists which precede the descriptions, and which were printed in 1869; the spelling in Roman type is in accordance with the method authorized by the Government and illustrated in lists of Indian proper names published in 1874 and subsequently. It will be seen that the two methods differ but slightly; notwithstanding where differences exist, both renderings are given, so as to remove all possible doubt as to the identity of a station. The method of spelling authorized by the Government, is hereafter exclusively adopted in the publication of this Series.

## NORTH MALUNCHA MERIDIONAL SERIES.

## PRINCIPAL TRIANGULATION. ADDENDUM TO DESCRIPTION OF STATIONS.

NOTE.—Consequent on modern alterations of district and other boundaries, the sites occupied by the stations are in some instances now included in civil divisions of territory which differ from the district, pargana, or village, recorded in the preceding descriptions of stations: a complete list of all the stations of the Series including a suitably modified statement of the altered subdivisions in question is accordingly given in the following table, and is derived chiefly from the annual reports, up to 1881-82, made by the Civil Officials to whose care the stations have been committed. The statement also gives present condition of certain of the stations; where no entry regarding present condition is made against a station it is to be assumed that the station when last reported on by the district Official was in good order.

The spelling of names is in accordance with that given in the lists of more important places published under the orders of Government whenever such names occur in the lists.

| No. of Station | Local name | District           | Pargana, &c.                        | Village in which the Station lies | Remarks on the Construction and Condition of the Station                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------|------------|--------------------|-------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LXII           | Durgapur   | Manbhoom           | P. Pándra, Thá. Nirsha              | Raghunáthpur                      | In 1867 a square protecting pillar of masonry was built over the circular pillar on which the large theodolite stood and which carries the true mark-stone. The square pillar is 3½ feet high, 28 inches square at base and 20 inches at top, and bears a sufficiently accurate mark for Topographical and Revenue Survey purposes, so that it is unnecessary to refer to the mark-stone which thus remains concealed and protected. A pyramidal pile of earth and stones, 7 feet square at base and 6 feet high, covers the protecting pillar. |
| LXIV           | Malúncha   | Sonthal Pergunnahs | P. Kundahitkareya, Tá-luka Kendowal | Tiljuri                           | In 1868 this station was protected in exactly the same manner as the preceding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| I              | Phuljuri   | "                  | Thá. Sárath, Tá-luka Lakhanpur      | Phuljuri                          | ... ..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| II             | Ghátí      | "                  | P. Ghátí                            | Ghátí                             | ... ..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| III            | Mankheri   | "                  | P. Muhammadabad                     | Satbor                            | ... ..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| IV             | Digriah    | "                  | Thá. Rohini                         | Digriah                           | Platform found reduced to a heap of stones as reported in 1881.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| V              | Bhurbhuri  | Bhágálpur          | Thá. Báuka, P. Chándwa              | Bhurbhuri                         | ... ..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| VI             | Mahuagarhi | Sonthal Pergunnahs | P. Dáman-i-koh                      | Makha                             | ... ..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| VII            | Bháram     | Bhágálpur          | Thá. Amarpur, P. Bhá-gálpur         | Bháram                            | ... ..                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

Note.—Stations LXII and LXIV appertain to the Calcutta Longitudinal Series of the South-East Quadrilateral.

P. stands for pargana and Thá. for thána.

| No. of Station | Local name    | District           | Pargana, &c.                      | Village in which the Station lies | Remarks on the Construction and Condition of the Station                                                                                                                                                                 |
|----------------|---------------|--------------------|-----------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VIII           | Gado          | Monghyr            | Thá. Jamooee, P. Gidhaur          | Gidhaur                           | ... ..                                                                                                                                                                                                                   |
| IX             | Jhandipahár   | Sonthal Pergunnahs | P. Tappa-Bárkup                   | Bárkup                            | ... ..                                                                                                                                                                                                                   |
| X              | Sakma         | Monghyr            | Thá. and P. Kargpur               | Mehmápur                          | ... ..                                                                                                                                                                                                                   |
| XI             | Pirdauri      | Bhágálpur          | Thá. Sultanganj, P. Jahangíra     | Pirdauri                          | Found in utter ruins and 10 feet high as reported in 1879.                                                                                                                                                               |
| XII            | Barári        | "                  | Thá. and P. Bhágálpur             | Barári                            | Upper portion of pillar fallen down, only 14 feet remaining as reported in 1870.                                                                                                                                         |
| XIII           | Benádi        | "                  | Thá. Bibipur, P. Chhai            | Benádi                            | ... ..                                                                                                                                                                                                                   |
| XIV            | Tuda Jargaon  | Monghyr            | Thá. Gogri, P. Pharkia            | Jargaon                           | Tower fallen down as reported in 1867, repaired in 1870, and said to be about 15 feet high in 1882.                                                                                                                      |
| XV             | Sirkanda      | Purneah            | Thá. Dhámdaha, P. Dharrampur      | Boha Bohar Chand                  | ... ..                                                                                                                                                                                                                   |
| XVI            | Tuda Saerhura | Monghyr            | Thá. Gogri, P. Pharkia            | Saerhura                          | Tower fallen down as reported in 1867, repaired in 1870, and said to be about 12 feet high in 1882.                                                                                                                      |
| XVII           | Chhota Purení | Bhágálpur          | Thá. Kishanganj, P. Chhai         | Chhota Purení                     | 24 feet high as reported in 1882.                                                                                                                                                                                        |
| XVIII          | Gangura       | "                  | Ditto.                            | Gangura                           | ... ..                                                                                                                                                                                                                   |
| XIX            | Barára        | Purneah            | Thá. Dhámdaha, P. Dharrampur      | Barára                            | ... ..                                                                                                                                                                                                                   |
| XX             | Bigha         | Bhágálpur          | Thá. Madhepur, P. Nisaukhpurkudha | Harásirpur                        | This station was connected with the G. T. Survey line of levels in 1871-72 when the tower was found washed down and the central solid pillar of masonry only 7 feet 8 inches high. Much dilapidated as reported in 1882. |
| XXI            | Mohania       | Purneah            | Thá. Dhámdaha, P. Dharrampur      | Mohania                           | ... ..                                                                                                                                                                                                                   |
| CVII           | Rámnagar      | "                  | Thá. Rániganj, P. Dharrampur      | Rámnagar Rahta                    | Greater portion of the station fallen down as reported in 1872 and 1873.                                                                                                                                                 |
| CVIII          | Manúlapati    | "                  | Ditto.                            | Manúlapati                        | ... ..                                                                                                                                                                                                                   |

NOTE.—Stations CVII and CVIII appertain to the North-East Longitudinal Series.

P. stands for pargana and Thá. for thána.



## NORTH MALUNCHA MERIDIONAL SERIES.

## PRINCIPAL TRIANGULATION. TRIANGLES.

| No. of Triangle | Station        | Spherical Excess | Corrected Plane Angle | Distance   |           |         |
|-----------------|----------------|------------------|-----------------------|------------|-----------|---------|
|                 |                |                  |                       | Log. feet  | Feet      | Miles   |
| 1               | Durgapur, LXII | 1' 14            | 56 27 4' 60           | 5' 1253642 | 133464' 0 | 25' 277 |
|                 | Malúncha, LXIV | 1' 15            | 80 1 29' 64           | 5' 1978870 | 157720' 1 | 29' 871 |
|                 | Phuljuri, I    | 1' 14            | 43 31 25' 76          | 5' 0425047 | 110282' 0 | 20' 887 |
| 2               | Durgapur, LXII | 1' 07            | 57 36 7' 14           | 5' 1281982 | 134337' 8 | 25' 443 |
|                 | Phuljuri, I    | 1' 07            | 39 57 25' 42          | 5' 0093569 | 102177' 9 | 19' 352 |
|                 | Ghátí, II      | 1' 08            | 82 26 27' 44          | 5' 1978870 | 157720' 1 | 29' 871 |
| 3               | Phuljuri, I    | 1' 49            | 73 43 20' 20          | 5' 2273294 | 168783' 3 | 31' 967 |
|                 | Ghátí, II      | 1' 49            | 56 27 30' 09          | 5' 1659944 | 146552' 9 | 27' 756 |
|                 | Deoli, IV      | 1' 49            | 49 49 9' 71           | 5' 1281982 | 134337' 8 | 25' 443 |
| 4               | Phuljuri, I    | 1' 57            | 61 43 59' 39          | 5' 1891910 | 154593' 4 | 29' 279 |
|                 | Deoli, IV      | 1' 57            | 61 39 24' 98          | 5' 1888799 | 154482' 7 | 29' 258 |
|                 | Rangsár, V     | 1' 57            | 56 36 35' 63          | 5' 1659944 | 146552' 9 | 27' 756 |
| 5               | Malúncha, LXIV | ' 91             | 68 15 0' 75           | 5' 1184066 | 131342' 9 | 24' 876 |
|                 | Phuljuri, I    | ' 90             | 41 2 53' 06           | 4' 9678410 | 92862' 6  | 17' 588 |
|                 | Satbor, III    | ' 91             | 70 42 6' 19           | 5' 1253642 | 133464' 0 | 25' 277 |

NOTES.—1. The values of the side are given in the same line with the opposite angle.

2. Stations Durgapur, LXII, and Malúncha, LXIV appertain to the Calcutta Longitudinal Series of the South-East Quadrilateral.

| No. of Triangle | Station        | Spherical Excess | Corrected Plane Angle | Distance   |           |         |
|-----------------|----------------|------------------|-----------------------|------------|-----------|---------|
|                 |                |                  |                       | Log. feet  | Feet      | Miles   |
| 6               | Phuljuri, I    | "                | ° ' "                 |            |           |         |
|                 | Satbor, III    | 1' 48            | 52 40 30' 58          | 5' 1616204 | 145084' 3 | 27' 478 |
|                 | Mahuagarhi, VI | 1' 49            | 81 16 44' 88          | 5' 2560880 | 180338' 3 | 34' 155 |
| 7               | Phuljuri, I    | 1' 48            | 46 2 44' 54           | 5' 1184066 | 131342' 9 | 24' 876 |
|                 | Phuljuri, I    | 1' 61            | 47 20 16' 33          | 5' 1350829 | 136484' 4 | 25' 849 |
|                 | Mahuagarhi, VI | 1' 62            | 56 20 21' 08          | 5' 1888799 | 154482' 7 | 29' 258 |
| 8               | Rangsár, V     | 1' 62            | 76 19 21' 69          | 5' 2560880 | 180338' 3 | 34' 155 |
|                 | Deoli, IV      | 1' 52            | 43 6 19' 75           | 5' 1041909 | 127113' 3 | 24' 074 |
|                 | Rangsár, V     | 1' 53            | 80 41 7' 30           | 5' 2637872 | 183563' 9 | 34' 766 |
| 9               | Bharam, VII    | 1' 53            | 56 12 32' 95          | 5' 1891910 | 154593' 4 | 29' 279 |
|                 | Rangsár, V     | 1' 16            | 64 45 3' 09           | 5' 1338215 | 136088' 5 | 25' 774 |
|                 | Bharam, VII    | 1' 15            | 57 35 50' 85          | 5' 1039303 | 127037' 0 | 24' 060 |
| 10              | Bárkup, IX     | 1' 15            | 57 39 6' 06           | 5' 1041909 | 127113' 3 | 24' 074 |
|                 | Bharam, VII    | 1' 22            | 66 45 13' 50          | 5' 1561252 | 143260' 1 | 27' 133 |
|                 | Bárkup, IX     | 1' 22            | 52 27 20' 13          | 5' 0921189 | 123628' 6 | 23' 415 |
| 11              | Barári, XII    | 1' 22            | 60 47 17' 37          | 5' 1338215 | 136088' 5 | 25' 774 |
|                 | Bharam, VII    | ' 77             | 46 33 38' 34          | 4' 9683435 | 92970' 1  | 17' 608 |
|                 | Barári, XII    | ' 77             | 58 31 22' 83          | 5' 0382181 | 109198' 9 | 20' 682 |
| 12              | Pirdauri, XI   | ' 78             | 74 54 58' 83          | 5' 0921189 | 123628' 6 | 23' 415 |
|                 | Deoli, IV      | 1' 19            | 50 1 10' 91           | 5' 1494870 | 141087' 0 | 26' 721 |
|                 | Bharam, VII    | 1' 18            | 35 30 51' 87          | 5' 0292149 | 106958' 4 | 20' 257 |
| 13              | Gado, VIII     | 1' 19            | 94 27 57' 22          | 5' 2637872 | 183563' 9 | 34' 766 |
|                 | Bharam, VII    | 1' 02            | 43 26 42' 82          | 5' 0080966 | 101881' 8 | 19' 296 |
|                 | Gado, VIII     | 1' 02            | 64 19 35' 45          | 5' 1255808 | 133530' 6 | 25' 290 |
| 14              | Sakma, X       | 1' 03            | 72 13 41' 73          | 5' 1494870 | 141087' 0 | 26' 721 |
|                 | Bharam, VII    | ' 93             | 53 55 1' 87           | 5' 0498279 | 112157' 4 | 21' 242 |
|                 | Sakma, X       | ' 92             | 51 53 31' 05          | 5' 0382181 | 109198' 9 | 20' 682 |
| 15              | Pirdauri, XI   | ' 93             | 74 11 27' 08          | 5' 1255808 | 133530' 6 | 25' 290 |
|                 | Pirdauri, XI   | ' 52             | 52 46 52' 86          | 4' 9108099 | 81434' 8  | 15' 423 |
|                 | Barári, XII    | ' 53             | 61 49 57' 20          | 4' 9549729 | 90151' 5  | 17' 074 |
| 16              | Benádi, XIII   | ' 53             | 65 23 9' 85           | 4' 9683435 | 92970' 1  | 17' 608 |
|                 | Barári, XII    | ' 48             | 62 23 33' 65          | 4' 9313339 | 85375' 6  | 16' 170 |
|                 | Benádi, XIII   | ' 48             | 59 54 34' 41          | 4' 9209635 | 83361' 1  | 15' 788 |
| 17              | Sirkanda, XV   | ' 47             | 57 41 51' 94          | 4' 9108099 | 81434' 8  | 15' 423 |
|                 | Benádi, XIII   | ' 37             | 47 2 3' 79            | 4' 8116965 | 64818' 1  | 12' 276 |
|                 | Sirkanda, XV   | ' 37             | 58 25 9' 42           | 4' 8777164 | 75459' 9  | 14' 292 |
| 18              | Pureni, XVII   | ' 38             | 74 32 46' 79          | 4' 9313339 | 85375' 6  | 16' 170 |
|                 | Benádi, XIII   | ' 30             | 56 33 43' 86          | 4' 8181609 | 65790' 2  | 12' 460 |
|                 | Pureni, XVII   | ' 30             | 50 16 26' 89          | 4' 7827318 | 60636' 2  | 11' 484 |
| 19              | Maisláka, XVI  | ' 30             | 73 9 49' 25           | 4' 8777164 | 75459' 9  | 14' 292 |
|                 | Pirdauri, XI   | ' 39             | 43 53 57' 48          | 4' 8077560 | 64232' 7  | 12' 165 |
|                 | Benádi, XIII   | ' 39             | 59 23 55' 20          | 4' 9016436 | 79734' 0  | 15' 101 |
| 20              | Jargaou, XIV   | ' 40             | 76 42 7' 32           | 4' 9549729 | 90151' 5  | 17' 074 |
|                 | Benádi, XIII   | ' 29             | 71 42 30' 53          | 4' 8644927 | 73196' 9  | 13' 863 |
|                 | Jargaou, XIV   | ' 29             | 51 51 48' 26          | 4' 7827318 | 60636' 2  | 11' 484 |
| 20              | Maisláka, XVI  | ' 29             | 56 25 41' 21          | 4' 8077560 | 64232' 7  | 12' 165 |

PRINCIPAL TRIANGULATION. TRIANGLES.

9—8.

| No. of Triangle | Station        | Spherical Excess | Corrected Plane Angle | Distance  |         |        |
|-----------------|----------------|------------------|-----------------------|-----------|---------|--------|
|                 |                |                  |                       | Log. feet | Feet    | Miles  |
| 21              | Maislāka, XVI  | 23               | 52 55 23.11           | 4.7405307 | 55021.3 | 10.421 |
|                 | Pureni, XVII   | 23               | 54 31 36.79           | 4.7494533 | 56163.4 | 10.637 |
|                 | Gangura, XVIII | 23               | 72 33 0.10            | 4.8181609 | 65790.2 | 12.460 |
| 22              | Pureni, XVII   | 21               | 60 7 53.88            | 4.7501869 | 56258.3 | 10.655 |
|                 | Gangura, XVIII | 22               | 61 51 44.48           | 4.7574603 | 57208.5 | 10.835 |
|                 | Barāra, XIX    | 21               | 58 0 21.64            | 4.7405307 | 55021.3 | 10.421 |
| 23              | Gangura, XVIII | 21               | 59 22 5.78            | 4.7382873 | 54737.8 | 10.367 |
|                 | Barāra, XIX    | 20               | 58 27 30.83           | 4.7341298 | 54216.3 | 10.268 |
|                 | Dighi, XX      | 21               | 62 10 23.39           | 4.7501869 | 56258.3 | 10.655 |
| 24              | Barāra, XIX    | 19               | 50 56 36.79           | 4.6923244 | 49240.7 | 9.326  |
|                 | Dighi, XX      | 20               | 69 22 37.23           | 4.7734065 | 59348.1 | 11.240 |
|                 | Mohania, XXI   | 20               | 59 40 45.98           | 4.7382873 | 54737.8 | 10.367 |
| 25              | Dighi, XX      | 21               | 63 13 37.72           | 4.7669622 | 58473.9 | 11.075 |
|                 | Mohania, XXI   | 21               | 68 1 27.28            | 4.7834483 | 60736.3 | 11.503 |
|                 | Rāmnagar, CVII | 21               | 48 44 55.00           | 4.6923244 | 49240.7 | 9.326  |
| 26              | Mohania, XXI   | 22               | 51 49 44.67           | 4.7226341 | 52800.0 | 10.000 |
|                 | Rāmnagar, CVII | 23               | 67 38 11.01           | 4.7931595 | 62109.7 | 11.763 |
|                 | Manula, CVIII  | 22               | 60 32 4.32            | 4.7669622 | 58473.9 | 11.075 |

NOTE.—Stations Rāmnagar, CVII, and Manula, CVIII appertain to the North-East Longitudinal Series.

December 1879.

J. B. N. HENNESSEY,  
In charge of Computing Office.

## NORTH MALUNCHA MERIDIONAL SERIES.

## SECONDARY TRIANGULATION. TRIANGLES.

## PRINCIPAL-AUXILIARY STATIONS AND INTERSECTED POINTS.

Differences between the common sides of two triangles to stations and intersected points, are shown by the small figures in the column for "Distance in Feet" between the data of the two triangles, the smaller of which in order has supplied the greater value: where the difference is small it has usually been apportioned between the triangles, but where it is large no adjustment has been made, as one or other of the two values must be erroneous.

| No. of Triangle | Station           | Corrected Plane Angle | Distance  |        |        | No. of Triangle | Station            | Corrected Plane Angle | Distance  |        |        | Theodolite used |    |
|-----------------|-------------------|-----------------------|-----------|--------|--------|-----------------|--------------------|-----------------------|-----------|--------|--------|-----------------|----|
|                 |                   |                       | Log. feet | Feet   | Miles  |                 |                    |                       | Log. feet | Feet   | Miles  |                 |    |
| 27              | Phuljuri, I       | 4 8 42                | 4' 232146 | 17067  | 3.232  | 32              | Phuljuri, I        | 0 1 7                 | 3' 994228 | 9868   | 1.869  | Inch            |    |
|                 | Satbor, III       | 29 39 11              | 5' 067306 | 116817 | 22.121 |                 | Sonátari           | 59 30 53              | 4' 455516 | 28544  | 5.466  |                 | 12 |
|                 | Agwándúri         | h. s.                 | 5' 118407 | 131343 | 24.876 |                 | Rigodi             | 60 33 1               | 4' 401444 | 25203  | 4.773  |                 | "  |
| 28              | Satbor, III       | 36 18 50              | 4' 005177 | 10120  | 1.917  | 33              | Malúncha, LXIV     | 36 59 45              | 4' 995812 | 89503  | 15.247 | 15              |    |
|                 | Agwándúri         | 50 47 13              | 4' 121892 | 13240  | 2.508  |                 | Phuljuri, I        | 46 57 49              | 4' 991774 | 98124  | 18.584 |                 | 18 |
|                 | Sundarú Hill Mark | h. s.                 | 4' 232146 | 17067  | 3.232  |                 | Sápchala Hill      | 5' 125304             | 133464    | 25.277 |        |                 |    |
| 29              | Malúncha, LXIV    | 8 55 10               | 4' 619384 | 41628  | 7.884  | 34              | Phuljuri, I        | 84 37 2               | 4' 715389 | 51926  | 9.835  | " 12            |    |
|                 | Phuljuri, I       | 20 53 19              | 4' 981047 | 95730  | 18.131 |                 | Sonátari           | 66 29 15              | 4' 679665 | 47826  | 9.058  |                 |    |
|                 | Gumru Hill Rock   | h. s.                 | 5' 125304 | 133464 | 25.277 |                 | Pátardha Hill Mark | 4' 401444             | 25203     | 4.773  |        |                 |    |
| 30              | Malúncha, LXIV    | 59 19 52              | 4' 970228 | 93374  | 17.685 | 35              | Phuljuri, I        | 101 53 13             | 4' 617566 | 41454  | 7.851  | 18              |    |
|                 | Satbor, III       | 61 51 48              | 4' 081047 | 95730  | 18.131 |                 | Sonátari           | 41 30 20              | 4' 419147 | 28129  | 5.357  |                 |    |
|                 | Gumru Hill Rock   | h. s.                 | 4' 967841 | 92863  | 17.588 |                 | Sabájor House      | 4' 401444             | 25203     | 4.773  |        |                 |    |
| 31              | Phuljuri, I       | 62 51 37              | 4' 574748 | 37562  | 7.114  | 36              | Ghátí, II          | 3 39 43               | 4' 685822 | 48509  | 9.187  | 15              |    |
|                 | Gumru Hill Rock   | h. s.                 | 4' 401444 | 25203  | 4.773  |                 | Deoli, IV          | 9 10 41               | 5' 083207 | 121143 | 22.944 |                 |    |
|                 | Sonátari          | 80 28 42              | 4' 619384 | 41628  | 7.884  |                 | Jáive              | 5' 227329             | 168783    | 31.967 |        |                 |    |

Notes.—1. Names followed by Roman numerals are those of Principal Stations.

2. The values of the sides are given in the same line with the opposite angle.

Station Malúncha, LXIV appertains to the Calcutta Longitudinal Series of the South-East Quadrilateral.

SECONDARY TRIANGULATION. TRIANGLES.

| No. of Triangle | Station                                               | Corrected Plane Angle<br>° ' " | Distance     |              |        | No. of Triangle | Station                                            | Corrected Plane Angle<br>° ' " | Distance     |              |        | Theodolite used  |
|-----------------|-------------------------------------------------------|--------------------------------|--------------|--------------|--------|-----------------|----------------------------------------------------|--------------------------------|--------------|--------------|--------|------------------|
|                 |                                                       |                                | Log. feet    | Feet         | Miles  |                 |                                                    |                                | Log. feet    | Feet         | Miles  |                  |
| 37              | Deoli, IV<br>Jálve<br>Serka                           | h.s.<br>"                      | 4° 47' 35.5  | 29685        | 5.622  | 48              | Bháram, VII<br>Jataur<br>Kabla Hill Mark           | h.s.                           | 4° 68' 15.61 | 48035        | 9.008  | Inch<br>18<br>12 |
|                 |                                                       |                                | 4° 41' 52.6  | 25794        | 4.885  |                 |                                                    |                                | 4° 58' 09.18 | 38997        | 7.307  |                  |
| 38              | Rangásr, V<br>Mahagarahi, VI<br>Kurma                 | h.s.                           | 4° 15' 06.16 | 14145        | 2.679  | 49              | Bháram, VII<br>Málvi<br>Matáthán Hill Mark         | h.s.                           | 4° 17' 03.25 | 14802        | 2.803  | 18<br>12         |
|                 |                                                       |                                | 5° 12' 13.72 | 132243       | 25.046 |                 |                                                    |                                | 4° 57' 22.33 | 37345        | 7.073  |                  |
| 39              | Deoli, IV<br>Jálve<br>Deoghur Temple                  | h.s.                           | 5° 13' 50.83 | 136484       | 25.849 | 50              | Bháram, VII<br>Jataur<br>Matáthán Hill Mark        | h.s.                           | 4° 47' 09.95 | 30178        | 5.716  | 18<br>12         |
|                 |                                                       |                                | 4° 70' 50.10 | 59700        | 9.602  |                 |                                                    |                                | 4° 67' 83.10 | 47677        | 9.030  |                  |
| 40              | Rangásr, V<br>Mahagarahi, VI<br>Panchapahár Hill Peak | h.s.                           | 4° 95' 09.79 | 91197        | 17.272 | 51              | Bháram, VII<br>Jataur<br>Chorbai Temple            | h.s.                           | 4° 17' 15.47 | 14844        | 2.811  | 18<br>12         |
|                 |                                                       |                                | 4° 67' 09.41 | 47757        | 9.045  |                 |                                                    |                                | 4° 35' 10.75 | 22443        | 4.351  |                  |
| 41              | Rangásr, V<br>Bárkup, IX<br>Mandar Temple             | h.s.                           | 5° 10' 30.30 | 127037       | 24.060 | 52              | Sakma, X<br>Pirdauri, XI<br>Raghunáth              | h.s.                           | 4° 07' 19.97 | 93756        | 17.757 | 15<br>"          |
|                 |                                                       |                                | 4° 00' 87.53 | 81050        | 15.350 |                 |                                                    |                                | 4° 34' 04.17 | 22203        | 4.205  |                  |
| 42              | Bháram, VII<br>Bárkup, IX<br>Mandar Temple            | h.s.                           | 31° 13' 15   | 81050        | 15.350 | 53              | Sakma, X<br>Raghunáth<br>Mozufferganj White Temple | h.s.                           | 4° 31' 67.69 | 20738        | 3.928  | 12<br>12         |
|                 |                                                       |                                | 29° 10' 32   | 4° 88' 34.58 | 76464  |                 |                                                    |                                | 14.482       | 4° 50' 13.10 | 39022  |                  |
| 43              | Rangásr, V<br>Mandar Temple<br>Sindridául             | h.s.                           | 72° 57' 44   | 67743        | 12.830 | 54              | Pirdauri, XI<br>Barari, XII<br>Kurhi               | h.s.                           | 4° 34' 04.17 | 22203        | 4.205  | 15<br>"          |
|                 |                                                       |                                | 4° 84' 54.2  | 70572        | 13.366 |                 |                                                    |                                | 4° 88' 07.94 | 75997        | 14.393 |                  |
| 44              | Rangásr, V<br>Sindridául<br>Shibnagar Temple          | h.s.                           | 48° 28' 31   | 29485        | 5.584  | 55              | Pirdauri, XI<br>Kurhi<br>Dholpahári Temple         | h.s.                           | 4° 73' 07.13 | 54653        | 10.351 | 12<br>12         |
|                 |                                                       |                                | 88° 50' 30   | 4° 59' 52.10 | 39375  |                 |                                                    |                                | 7.457        | 4° 48' 79.59 | 30758  |                  |
| 45              | Bháram, VII<br>Mandar Temple<br>Málvi                 | h.s.                           | 79° 56' 31   | 77146        | 14.611 | 56              | Sakma, X<br>Pirdauri, XI<br>Maira                  | h.s.                           | 4° 06' 18.76 | 91596        | 17.348 | 18<br>12         |
|                 |                                                       |                                | 4° 47' 09.95 | 30178        | 5.716  |                 |                                                    |                                | 4° 61' 54.06 | 41248        | 7.812  |                  |
| 46              | Bárkup, IX<br>Mandar Temple<br>Maheshpur              | h.s.                           | 132° 3' 3    | 81050        | 15.350 | 57              | Pirdauri, XI<br>Maira<br>Pirpahár                  | h.s.                           | 5° 04' 08.28 | 112157       | 21.242 | 12<br>12         |
|                 |                                                       |                                | 45° 11' 49   | 62699        | 11.875 |                 |                                                    |                                | 4° 87' 78.68 | 75486        | 14.297 |                  |
| 47              | Bháram, VII<br>Mandar Temple<br>Jataur                | h.s.                           | 120° 4' 58   | 22454        | 4.253  | 57              | Pirdauri, XI<br>Maira<br>Pirpahár                  | h.s.                           | 4° 35' 12.96 | 38677        | 16.795 | 12<br>12         |
|                 |                                                       |                                | 4° 88' 34.58 | 76464        | 14.482 |                 |                                                    |                                | 4° 06' 18.76 | 91596        | 17.348 |                  |

MONGHYR\*  
SECONDARY SERIES.

\* The preceding portion of this Series will be found in the Synopsis of Results of the North Parasnáth Meridional Series.

J. B. N. HENNESSEY,  
In charge of Computing Office.

**NORTH MALUNCHA MERIDIONAL 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 | Name of station with azimuths of surrounding points | ° ' "        | No. of triangle giving distance | Name of station with azimuths of surrounding points | ° ' "          | No. of triangle giving distance |
|-----------------------------------------------------|--------------|---------------------------------|-----------------------------------------------------|--------------|---------------------------------|-----------------------------------------------------|----------------|---------------------------------|
| AGWANDHARI h.s.                                     | 117 57 25    | 27                              | BENADI, XIII                                        | 32 20 19.06  | 15                              | DEOLI, IV                                           | h.s.           | 37                              |
| Phuljuri, I                                         | 213 22 19    | 28                              | Pirdauri, XI                                        | 91 44 14.65  | 19                              | Senka                                               | 23 47 20       | 12                              |
| Sundardi Hill Mark                                  | 264 9 32     | 27                              | Jargson, XIV                                        | 103 26 45.47 | 18                              | Gado, VIII                                          | 157 1 8.34     | 8                               |
| Satbor, III                                         |              |                                 | Malsiaka, XVI                                       | 220 0 29.63  | 17                              | Bharam, VII                                         | 207 2 20.44    | 2                               |
|                                                     |              |                                 | Pureni, XVII                                        | 267 2 33.79  | 16                              | Kangsar, V                                          | 250 8 41.71    | 4                               |
| BARUA, XIX                                          | 25 2 11.00   | 22                              | Sirkanda, XV                                        | 326 57 8.68  | 15                              | Deoghur Temple                                      | 280 15 39      | 39                              |
| Pureni, XVII                                        | 83 2 32.85   | 22                              | Barani, XII                                         |              |                                 | Phuljuri, I                                         | 311 48 8.26    | 3                               |
| Gangura, XVIII                                      | 141 30 3.88  | 23                              | BHARAM, VII                                         |              |                                 | Jálve                                               | h.s. 332 26 38 | 36                              |
| Dighi, XX                                           | 192 26 40.86 | 24                              | Mátáthán Hill Mark                                  | 2 15 21      | 49                              | DIGRI, XX                                           |                | 25                              |
| Mohaula, XXI                                        |              |                                 | Málvi                                               | 24 29 59     | 45                              | Gangura, XVIII                                      | 23 37 45.04    | 23                              |
|                                                     |              |                                 | Deoli, IV                                           | 27 8 39.88   | 8                               | Rámnagar, CVII*                                     | 188 51 6.08    | 25                              |
| BARABI, XII                                         | 26 39 14.44  | 10                              | Gado, VIII                                          | 62 39 32.93  | 12                              | Mohania, XXI                                        | 252 4 44.01    | 24                              |
| Bharam, VII                                         | h.s.         |                                 | Sakma, X                                            | 106 6 10.77  | 13                              | Barára, XIX                                         | 321 27 21.44   | 23                              |
| Khirbi                                              | 60 17 32     | 54                              | Pirdauri, XI                                        | 160 1 19.57  | 11                              |                                                     |                |                                 |
| Pirdauri, XI                                        | 85 10 38.04  | 11                              | Barani, XII                                         | 206 34 58.68 | 10                              | DUNGAPER, LXIII†                                    |                |                                 |
| Benadi, XIII                                        | 147 0 35.86  | 15                              | Chorbai Temple                                      | 220 44 32    | 51                              | Ghátí, II                                           | 140 35 42.29   | 2                               |
| Sirkanda, XV                                        | 209 24 9.99  | 16                              | Jataur                                              | 259 21 59.47 | 47                              | Phuljuri, I                                         | 198 11 50.50   | 1                               |
| Bárkup, IX                                          | 325 51 55.85 | 10                              | Bárkup, IX                                          | h.s.         |                                 | Phuljuri, I                                         | 254 38 56.24   | 1                               |
|                                                     |              |                                 | Bárkup, IX                                          | 273 20 13.40 | 9                               | Máluncha, LXIV†                                     |                |                                 |
| BARUP, IX                                           |              |                                 | Mandár Temple                                       | 304 33 28    | 42                              |                                                     |                |                                 |
| Kangsar, V                                          | 35 51 28.82  | 9                               | Kangsar, V                                          | 330 56 5.40  | 8                               | GADO, VIII                                          |                |                                 |
| Mandár Temple                                       | 64 14 4      | 41                              | Katila Hill Mark                                    | 358 55 28    | 48                              | Sakma, X                                            | 178 10 24.49   | 13                              |
| Bharam, VII                                         | 93 30 26.03  | 9                               | Deoli, IV                                           |              |                                 | Bharam, VII                                         | 242 30 0.96    | 12                              |
| Maheshpur                                           | 96 52 57     | 46                              | Ghátí, II                                           | 1 37 19.46   | 3                               | Deoli, IV                                           | 336 57 59.37   | 12                              |
| Barani, XII                                         | 145 58 6.38  | 10                              |                                                     |              |                                 |                                                     |                |                                 |

\* Of the North-East Longitudinal Series. † Of the Calcutta Longitudinal Series of the South-East Quadrilateral.

AZIMUTHS OF STATIONS AND INTERSECTED POINTS.

| Name of station with azimuths of surrounding points                                                   | No. of triangle giving distance | Name of station with azimuths of surrounding points                                                                                                                         | No. of triangle giving distance              | Name of station with azimuths of surrounding points                                                                                                                      | No. of triangle giving distance                          |
|-------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| GANGURA, XVIII<br>Malslaka, XVI<br>Dighi, XX<br>Barara, XIX<br>Pureni, XVII                           | 21<br>23<br>22<br>21            | MAIRA h.s.<br>Sakma, X<br>Pirpahar<br>Pirdauri, XI                                                                                                                          | 56<br>57<br>56                               | Pirdauri, XI<br>Raghunath<br>Sakma, X<br>Dholpahari Temple<br>Maira<br>Pirpahar<br>Jargaon, XIV<br>Benadi, XIII<br>Barari, XII<br>Khirhi<br>Bharam, VII                  | 52<br>14<br>55<br>56<br>57<br>19<br>15<br>11<br>54<br>11 |
| GHATI, II<br>Deoli, IV<br>Jalve<br>Phuljuri, I<br>Durgapur, LXII*                                     | 3<br>36<br>2<br>2               | MAISLAKA, XVI<br>Jargaon, XIV<br>Gangura, XVIII<br>Pureni, XVII<br>Benadi, XIII                                                                                             | 20<br>21<br>18<br>18                         | Pirpahar h.s.<br>Maira<br>Pirdauri, XI                                                                                                                                   | 57<br>57                                                 |
| JALVE h.s.<br>Ghati, II<br>Serka<br>Deoli, IV<br>Deoghur Temple                                       | 36<br>37<br>36<br>39            | MALVY h.s.<br>Bharam, VII<br>Mandar Temple<br>Matathán Hill Mark                                                                                                            | 45<br>45<br>49                               | PURENI, XVII<br>Benadi, XIII<br>Malslaka, XVI<br>Gangura, XVIII<br>Barara, XIX<br>Sirkanda, XV                                                                           | 17<br>18<br>21<br>22<br>17                               |
| JARGAON, XIV<br>Malslaka, XVI<br>Benadi, XIII<br>Pirdauri, XI                                         | 20<br>19<br>19                  | MAHULA, CVIII†<br>Mohania, XXI<br>Ramnagar, CVIII†<br>Manula, CVIII†                                                                                                        | 26<br>26                                     | RAGHUNATH h.s.<br>Sakma, X<br>Mozuffganj white Temple<br>Pirdauri, XI                                                                                                    | 52<br>53<br>52                                           |
| JAFAR h.s.<br>Katla Hill Mark<br>Matathán Hill Mark<br>Bharam, VII<br>Chorbai Temple<br>Mandar Temple | 48<br>50<br>47<br>51<br>47      | MOHANIA, XXI<br>Barara, XIX<br>Dighi, XX<br>Ramnagar, CVIII†<br>Manula, CVIII†                                                                                              | 24<br>24<br>25<br>26                         | RAMNAGAR, CVIII†<br>Dighi, XX<br>Manula, CVIII†<br>Mohania, XXI                                                                                                          | 25<br>26<br>25                                           |
| KHIRHI h.s.<br>Dholpahari Temple<br>Pirdauri, XI<br>Barari, XII                                       | 55<br>54<br>54                  | PHULJURI, I<br>Sonatari<br>Durgapur, LXII*<br>Ghati, II<br>Patardina Hill Mark<br>Sabjor House<br>Deoli, IV<br>Rangsar, V<br>Mahuagarhi, VI<br>Sajchala Hill<br>Satbor, III | 31<br>1<br>2<br>34<br>35<br>3<br>4<br>6<br>5 | RANGSAR, V<br>Phuljuri, I<br>Deoli, IV<br>Bharam, VII<br>Mandar Temple<br>Barkup, IX<br>Shibnagar Temple<br>Sindriah<br>Panchapahar Hill Peak<br>Mahuagarhi, VI<br>Kurma | 4<br>4<br>8<br>41<br>9<br>44<br>43<br>40<br>38           |
| KURMA h.s.<br>Rangsar, V<br>Mahuagarhi, VI                                                            | 38<br>38                        | PHULJURI, I<br>Sonatari<br>Durgapur, LXII*<br>Ghati, II<br>Patardina Hill Mark<br>Sabjor House<br>Deoli, IV<br>Rangsar, V<br>Mahuagarhi, VI<br>Sajchala Hill<br>Satbor, III | 27<br>29<br>29<br>1                          | RANGSAR, V<br>Phuljuri, I<br>Deoli, IV<br>Bharam, VII<br>Mandar Temple<br>Barkup, IX<br>Shibnagar Temple<br>Sindriah<br>Panchapahar Hill Peak<br>Mahuagarhi, VI<br>Kurma | 32<br>32                                                 |
| MAHESUR h.s.<br>Mandar Temple<br>Barkup, IX                                                           | 46<br>46                        | PHULJURI, I<br>Sonatari<br>Durgapur, LXII*<br>Ghati, II<br>Patardina Hill Mark<br>Sabjor House<br>Deoli, IV<br>Rangsar, V<br>Mahuagarhi, VI<br>Sajchala Hill<br>Satbor, III | 33<br>33<br>34<br>35<br>3<br>4<br>6<br>5     | RANGSAR, V<br>Phuljuri, I<br>Deoli, IV<br>Bharam, VII<br>Mandar Temple<br>Barkup, IX<br>Shibnagar Temple<br>Sindriah<br>Panchapahar Hill Peak<br>Mahuagarhi, VI<br>Kurma | 4<br>4<br>8<br>41<br>9<br>44<br>43<br>40<br>38           |
| MAHUAGARHI, VI<br>Satbor, III<br>Kurma<br>Phuljuri, I<br>Rangsar, V<br>Panchapahar Hill Peak          | 6<br>38<br>6<br>7<br>40         | PHULJURI, I<br>Sonatari<br>Durgapur, LXII*<br>Ghati, II<br>Patardina Hill Mark<br>Sabjor House<br>Deoli, IV<br>Rangsar, V<br>Mahuagarhi, VI<br>Sajchala Hill<br>Satbor, III | 33<br>33<br>34<br>35<br>3<br>4<br>6<br>5     | RANGSAR, V<br>Phuljuri, I<br>Deoli, IV<br>Bharam, VII<br>Mandar Temple<br>Barkup, IX<br>Shibnagar Temple<br>Sindriah<br>Panchapahar Hill Peak<br>Mahuagarhi, VI<br>Kurma | 4<br>4<br>8<br>41<br>9<br>44<br>43<br>40<br>38           |

\* Of the Calcutta Longitudinal Series of the South-East Quadrilateral. † Of the North-East Longitudinal Series.

| Name of station with azimuths of surrounding points | No. of triangle giving distance | Name of station with azimuths of surrounding points | No. of triangle giving distance | Name of station with azimuths of surrounding points | No. of triangle giving distance |
|-----------------------------------------------------|---------------------------------|-----------------------------------------------------|---------------------------------|-----------------------------------------------------|---------------------------------|
| SAKMA, X<br>Mairs                                   | 183 35 35<br>h.s.               | SATROB, III<br>Phuljuri, I                          | 113 49 57 90                    | SIREKANDA, XV<br>Barati, XII                        | 29 27 21 29                     |
| Pirdauri, XI                                        | 234 2 34 88                     | Sundardi Hill Mark                                  | 120 29 37                       | Benadi, XIII                                        | 87 9 13 70                      |
| Mozufferganj White Temple                           | 240 58 12                       | Mahuagarahi, VI                                     | 195 6 44 27                     | Pureni, XVII                                        | 145 34 23 49                    |
| Roghunath                                           | 264 45 24                       | SERKA h.s.                                          | 203 46 33                       | SONATARI h.s.                                       |                                 |
| Bharam, VII                                         | 285 56 26 85                    | Deoli, IV                                           | h.s.                            | Pátardha Hill Mark                                  | 130 12 31                       |
| Gado, VIII                                          | 358 10 9 61                     | Jálve                                               | 325 33 28                       | Sabáfor House                                       | 155 5 26                        |
| SATROB, III                                         |                                 | SINDRIDAUL h.s.                                     |                                 | Phuljuri, I                                         | 196 41 46                       |
| Maliticha, LXIV†                                    | 43 7 50 80                      | Rangsar, V                                          | 86 2 38                         | Gumru Hill Rock                                     | 277 10 28                       |
| Agwándari                                           | 84 10 47                        | Mandar Temple                                       | 159 0 22                        | Rigodi                                              | s. 296 12 39                    |
| Gumru Hill Rock                                     | 104 59 39                       | Shabnagar Temple                                    | 174 53 8                        |                                                     |                                 |

† Of the Calcutta Longitudinal Series of the South-East Quadrilateral.

December 1879.

J. B. N. HENNESSEY,  
In charge of Computing Office.



## NORTH MALUNCHA MERIDIONAL SERIES.

### CO-ORDINATES AND DESCRIPTIONS OF ALL STATIONS AND POINTS.

The following table gives the co-ordinates of all the 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. In certain instances numbers are added which have reference to the given data of the triangles by which the station or point has been fixed; when these numbers are omitted it is to be understood that no triangles are given.

Note.— $\lambda$  stands for Latitude North; L for Longitude East of Greenwich; H for Height of station in feet above mean sea level, if determined trigonometrically,  $H_s$  for the Height when found by spirit leveling, and  $h$  for Height of station tower or pillar. The trigonometrical heights always refer to the upper mark-stone or to the upper surface of the pillar on which the theodolite stood: the spirit leveled heights refer to the points on which the leveling staff stood as indicated in footnotes. For visited stations and for other points of superior accuracy the values of  $\lambda$  and L are given to two places of decimals; for well determined objects to one place, and for the remaining points to the nearest second. Principal stations are distinguished by the Roman numerals I, II, &c., secondary stations by the letters h.s. and s. The names in italics are those of the territories, states or districts in which the stations or points are situated.

| Name of station, district, description, co-ordinates &c.                                                                                                                                                                                                                                                                  | Name of station, district, description, co-ordinates &c.                                                                                                                                               | Name of station, district, description, co-ordinates &c.                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><math>A_1</math> s.<br/>(<i>Bhāgalpur</i>) Or Ganges River* No. 315 s.; on E. extremity of an island.</p> <p style="text-align: center;">o ' "</p> <p><math>\lambda</math> 25 15 49' 57<br/>L 87 1 56' 98</p>                                                                                                          | <p>Andara Hill.<br/>(<i>Southal Pergunnahs</i>) Isolated hill about a mile E. of village so called.</p> <p style="text-align: center;">o ' "</p> <p><math>\lambda</math> 24 3 30<br/>L 87 6 58</p>     | <p>Banbhāg Factory.<br/>(<i>Purneah</i>) Tree Flag, about 2.5 miles W. of Purneah Jnli, and 1 mile S.E. of the village site of Banbhāg.</p> <p style="text-align: center;">o ' "</p> <p><math>\lambda</math> 25 47 42<br/>L 87 28 36</p> |
| <p><math>A_3</math> s.<br/>(<i>Monghyr</i>) Or Ganges River No. 271 s.; on left bank, about <math>\frac{1}{2}</math> a mile N.W. of Nandlāpur village.</p> <p><math>\lambda</math> 25 27 3' 57<br/>L 86 36 19' 16</p>                                                                                                     | <p>B. s.<br/>(<i>Monghyr</i>) Or Ganges River No. 273 s.; on left bank, about <math>2\frac{1}{2}</math> miles W. of Bahādūpur village.</p> <p><math>\lambda</math> 25 23 35' 99<br/>L 86 38 25' 12</p> | <p>Barāra, XIX.<br/>(<i>Idē page 6—s.</i>)</p> <p><math>\lambda</math> 25 45 10' 41<br/>L 87 8 34' 89<br/>H 151<br/>h 21<br/>No. 22</p>                                                                                                  |
| <p>Agwāndūāri h.s.<br/>(<i>Southal Pergunnahs</i>) On hill, about <math>1\frac{1}{2}</math> miles N.W. of Tarum village, the same distance to N.E. of Paulul village, and <math>4\frac{1}{2}</math> miles N.W. of large village of Jagadishpur.</p> <p><math>\lambda</math> 24 5 23' 73<br/>L 87 16 30' 03<br/>No. 27</p> | <p>Bairia Ghāt,<br/>(<i>Bhāgalpur</i>) Flag.</p> <p><math>\lambda</math> 25 16 45<br/>L 86 59 10</p>                                                                                                   | <p>Barāri, XII<br/>(<i>Idē page 5—s.</i>)</p> <p><math>\lambda</math> 25 15 48' 21<br/>L 87 3 24' 15<br/><math>H_s</math> 211' 86†<br/>h 30<br/>No. 10</p>                                                                               |
| <p>Agwāni s.<br/>(<i>Monghyr</i>) Or Ganges River No. 282 s.; on left bank.</p> <p><math>\lambda</math> 25 10 39' 39<br/>L 86 47 50' 75</p>                                                                                                                                                                               | <p>Bairia s.<br/>(<i>Bhāgalpur</i>) Or Ganges River No. 310 s.; on right bank, about 3 miles N.W. of Bhāgūpur town.</p> <p><math>\lambda</math> 25 16 50' 21<br/>L 86 58 48' 47</p>                    | <p>Barāri Temple.<br/>(<i>Bhāgalpur</i>) On right bank of the Ganges, close to Barāri Factory.</p> <p><math>\lambda</math> 25 16 8' 0<br/>L 87 4 0' 5</p>                                                                                |

\* The elements of the stations appertaining to the portion of the Ganges River Triangulation which falls to the west of that included in this Series will be found in the Co-ordinate List of the North Pārasāth Meridional Series. † This height refers to the mark-stone let into the upper surface of the pillar.

| Name of station, district, description,<br>co-ordinates &c.                                                                                                                                 | Name of station, district, description,<br>co-ordinates &c.                                                                                                                                        | Name of station, district, description,<br>co-ordinates &c.                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bárkup, IX</b><br>( <i>vide page 4—s.</i> )<br>$\lambda$ 24 56 12.79<br>$L$ 87 17 57.61<br>$H$ 506<br>$h$ 0<br>No. 9                                                                     | <b>Bháram, VII.</b><br>( <i>vide page 4—s.</i> )<br>$\lambda$ 24 57 33.30<br>$L$ 86 53 21.45<br>$H$ 1156<br>$h$ 0<br>No. 8                                                                         | <b>Chorbni (?) Temple.</b><br>( <i>Bhágálpur</i> ) About midway between the villages of Subhánpur and Katarua.<br>$\lambda$ 25 0 21.7<br>$L$ 86 56 0.7<br>No. 51      |
| <b>Baurria Hill Peak.</b><br>( <i>Sonthal Pergunnahs</i> ) Isolated hill about 1½ miles N. of Kanchan Tikar village.<br>$\lambda$ 24 30 19<br>$L$ 87 16 43                                  | <b>Bháram Range, Peak A.</b><br>( <i>Bhágálpur</i> )<br>$\lambda$ 24 57 43<br>$L$ 86 51 17                                                                                                         | <b>Deoghur Temple,</b><br>( <i>Sonthal Pergunnahs</i> ) Western and highest.<br>$\lambda$ 24 29 31.0<br>$L$ 86 44 35.6<br>No. 39                                      |
| <b>Begampur Mosque,</b><br>( <i>Purneah</i> ) Centre dome spire.<br>$\lambda$ 25 49 21.6<br>$L$ 87 27 37.8                                                                                  | <b>Bháram Range, Peak B.</b><br>( <i>Bhágálpur</i> )<br>$\lambda$ 24 57 55<br>$L$ 86 50 38                                                                                                         | <b>Deoli, IV.</b><br>( <i>vide page 4—s.</i> )<br>$\lambda$ 24 30 34.29<br>$L$ 86 38 14.60<br>$H$ 1716<br>$h$ 0<br>No. 8                                              |
| <b>Beháro Hill.</b><br>( <i>Bhágálpur</i> ) On a range of hills, about 1½ miles N.E. of Basmata village.<br>$\lambda$ 24 50 12<br>$L$ 86 44 39                                              | <b>Bháram Range, Peak C.</b><br>( <i>Bhágálpur</i> )<br>$\lambda$ 24 58 0<br>$L$ 86 51 2                                                                                                           | <b>Dholpahári Temple,</b><br>( <i>Bhágálpur</i> ) Spire, on hill.<br>$\lambda$ 25 11 50.3<br>$L$ 86 41 49.7<br>No. 55                                                 |
| <b>Benádi, XIII.</b><br>( <i>vide page 5—s.</i> )<br>$\lambda$ 25 27 4.62<br>$L$ 86 55 20.35<br>$H$ 153<br>$h$ 33<br>No. 15                                                                 | <b>Bishnupur Indigo Factory.</b><br>( <i>Purneah</i> ) Tree flag, about ½ a mile W. of Debínagar village.<br>$\lambda$ 25 51 49<br>$L$ 87 25 34                                                    | <b>Dighi, XX.</b><br>( <i>vide page 6—s.</i> )<br>$\lambda$ 25 52 14.61<br>$L$ 87 2 21.80<br>$H$ 141.32*<br>$h$ 20<br>No. 23                                          |
| <b>Bhágálpur, Golághát Temple.</b><br>( <i>Bhágálpur</i> ) On right bank of the Chandan nadi.<br>$\lambda$ 25 15 6.2<br>$L$ 87 0 49.5                                                       | <b>Bishnupur s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 277 s.; on left bank, about 2 miles N.W. of Murádpur village.<br>$\lambda$ 25 20 30.68<br>$L$ 86 40 30.65                            | <b>Dildárpur s.</b><br>( <i>Bhágálpur</i> ) Or Ganges River No. 314 s.; on right bank, about a mile N.W. of Bhágálpur town.<br>$\lambda$ 25 16 9.41<br>$L$ 87 0 14.38 |
| <b>Bhágálpur, House No. 1.</b><br>( <i>Bhágálpur</i> ) Major Napleton's house chimney.<br>$\lambda$ 25 15 2.0<br>$L$ 87 0 9.7                                                               | <b>Bodma Hill Mark.</b><br>( <i>Sonthal Pergunnahs</i> )<br>$\lambda$ 23 54 10.88<br>$L$ 86 52 19.70<br>See Synoptical Volume of the Calcutta Longitudinal Series of the South-East Quadrilateral. | <b>Dubrájpur Hill Peak.</b><br>( <i>Sonthal Pergunnahs</i> ) On a range of hills, about 1½ miles N. of Shibthala village.<br>$\lambda$ 24 24 23<br>$L$ 87 29 57       |
| <b>Bhágálpur, House No. 2.</b><br>( <i>Bhágálpur</i> ) Two-storied house in city.<br>$\lambda$ 25 15 19.8<br>$L$ 87 1 27.8                                                                  | <b>C s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 276 s.; on N. end of Binda Diara char where the river branches off into two.<br>$\lambda$ 25 20 5.42<br>$L$ 86 38 56.39                      | <b>Dudhela Ghát,</b><br>( <i>Bhágálpur</i> ) Flag.<br>$\lambda$ 25 19 47<br>$L$ 86 52 56                                                                              |
| <b>Bhágálpur Monument.</b><br>( <i>Bhágálpur</i> ) Cleveland Monument spire.<br>$\lambda$ 25 15 14.5<br>$L$ 87 2 29.7                                                                       | <b>Champanagar Flag.</b><br>( <i>Bhágálpur</i> ) On right bank of the Chandan nadi, about 2 miles W. of Bhágálpur town.<br>$\lambda$ 25 14 55.09<br>$L$ 86 58 21.01                                | <b>Dudhela s.</b><br>( <i>Bhágálpur</i> ) Or Ganges River No. 302 s.; on left bank.<br>$\lambda$ 25 20 4.93<br>$L$ 86 53 17.39                                        |
| <b>Bhairo Tola s.</b><br>( <i>Monghyr</i> ) Or Ganges River No. 279 s.; on S. coast of Binda Diara char, about a mile S. of Larlu Tola village.<br>$\lambda$ 25 16 46.15<br>$L$ 86 38 35.59 | <b>Chichron Factory.</b><br>( <i>Bhágálpur</i> ) Indigo factory chimney.<br>$\lambda$ 25 14 25.1<br>$L$ 86 52 23.0                                                                                 |                                                                                                                                                                       |

\* This height refers to the mark-stone imbedded at ½ foot below the level of the ground.

| Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                      | Name of station, district, description,<br>co-ordinates &c.                                                    | Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Durgapur, LXII†.<br>( <i>Vide page 3—s.</i> )<br>λ 23 49 40·94<br>L 86 49 2·86<br>H 1182<br>h 2<br>No. 1                                                                                                         | Ganges River Island No. 2 Flag.<br>( <i>Bhāgalpur</i> ) Flag on E. extremity.<br>λ 25 16 31<br>L 87 3 52       | Ghāti, II.<br>( <i>Vide page 4—s.</i> )<br>λ 24 2 42·73<br>L 86 37 23·05<br>H 1180<br>h 6<br>No. 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Fulkāha s.<br>( <i>Monghyr</i> ) Or Ganges River No. 280 s.; on S. coast of Binda Dinra char, about a mile N.E. of Gorzhat village which latter is on right bank of the Ganges.<br>λ 25 15 0·33<br>L 86 41 46·42 | Ganges River Island No. 3 Flag.<br>( <i>Bhāgalpur</i> ) Flag on W. extremity.<br>λ 25 16 23<br>L 87 1 55       | Gogri Mosque.<br>( <i>Monghyr</i> ) Spire of mosque, about † a mile S. of Gogri Thāna.<br>λ 25 24 54·9<br>L 86 39 30·1                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Gado, VIII.<br>( <i>Vide page 4—s.</i> )<br>λ 24 46 49·64<br>L 86 30 41·44<br>H 1672<br>h Not forthcoming<br>No. 12                                                                                              | Ganges River j Flagstaff.<br>( <i>Monghyr</i> ) On E. coast of Gangāprasād char.<br>λ 25 23 58<br>L 86 36 56   | Gogri s.<br>( <i>Monghyr</i> ) Or Ganges River No. 272 s.; on left bank, about 1 mile W. of Gogri Thāna.<br>λ 25 25 21·05<br>L 86 38 12·82                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Ganges River a Flagstaff.<br>( <i>Monghyr</i> ) At the mouth of the Gangāprasād khāl.<br>λ 25 23 14<br>L 86 36 52                                                                                                | Ganges River k Flagstaff.<br>( <i>Monghyr</i> ) On E. coast of a char.<br>λ 25 22 8<br>L 86 37 17              | Goria Tola s.<br>( <i>Monghyr</i> ) Or Ganges River No. 278 s.; on N. coast of Binda Dinra char, about 1 mile N.E. of village of the same name.<br>λ 25 17 43·20<br>L 86 42 47·81                                                                                                                                                                                                                                                                                                                                                                                               |
| Ganges River e Flagstaff.<br>( <i>Monghyr</i> ) On Gangāprasād char.<br>λ 25 25 46<br>L 86 34 18                                                                                                                 | Ganges River l Flagstaff.<br>( <i>Monghyr</i> ) On E. bank.<br>λ 25 22 42<br>L 86 38 34                        | Gumru Hill Rock.<br>( <i>Sonthal Pergunnahs</i> ) On western of three isolated hills, about † of a mile E. of Masaudih village, and 1 mile N. of Maholi village.<br>λ 24 9 39·4<br>L 87 3 19·3<br>Nos. 20, 30                                                                                                                                                                                                                                                                                                                                                                   |
| Ganges River f Flagstaff.<br>( <i>Monghyr</i> ) On N. coast of Gangāprasād char.<br>λ 25 25 51<br>L 86 34 33                                                                                                     | Ganges River m Flagstaff.<br>( <i>Monghyr</i> ) On E. bank.<br>λ 25 21 45<br>L 86 39 2                         | Hardigarh Hill.<br>( <i>Sonthal Pergunnahs</i> ) About a mile S. of Bābupur and 2 miles N. of the large village of Kandit.<br>λ 24 0 9<br>L 87 12 32                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Ganges River g Flagstaff.<br>( <i>Monghyr</i> ) On N. coast of Gangāprasād char.<br>λ 25 25 53<br>L 86 36 8                                                                                                      | Ganges River n Flagstaff.<br>( <i>Monghyr</i> ) On E. bank.<br>λ 25 21 2<br>L 86 39 44                         | Hariharpur s.<br>( <i>Bhāgalpur</i> ) Or Ganges River No. 303 s.; on left bank.<br>λ 25 20 41·15<br>L 86 54 45·05                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Ganges River h Flagstaff.<br>( <i>Monghyr</i> ) On E. coast of Gangāprasād char.<br>λ 25 25 22<br>L 86 36 59                                                                                                     | Ganges River o Flagstaff.<br>( <i>Monghyr</i> ) On W. bank.<br>λ 25 17 39<br>L 86 36 58                        | Jahangīra Temple,<br>( <i>Bhāgalpur</i> ) Spire, on rock.<br>λ 25 15 7·1<br>L 86 46 39·6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Ganges River i Flagstaff.<br>( <i>Monghyr</i> ) On E. coast of Gangāprasād char.<br>λ 25 24 47<br>L 86 36 57                                                                                                     | Ganges River No. 10 Flagstaff.<br>( <i>Monghyr</i> ) At mouth of the Sitakund nāla.<br>λ 25 19 5<br>L 86 37 13 | Jālve h.s.<br>( <i>Sonthal Pergunnahs</i> ) On a small conical hill rising about 300 feet above the surrounding country, about 0·7 of a mile S.E. of Gobindapur village, and 1·2 miles E. of Madhupur village. The station is marked by a square, stone platform enclosing a solid, circular pillar of masonry, 2·00 feet in height, which has a mark at top and another below on the rock in situ. This station is identical with Jālve, LX, of the Calcutta Longitudinal Series of the South-East Quadrilateral.<br>λ 24 22 37·87<br>L 86 39 23·60<br>H 1284<br>h 2<br>No. 36 |
| Ganges River Island No. 1 Flag.<br>( <i>Bhāgalpur</i> ) Flag opposite to Māyaganj ghāt.<br>λ 25 16 17<br>L 87 2 47                                                                                               | Ganges River No. 19 Flag.<br>( <i>Bhāgalpur</i> ) On right bank of a nāla.<br>λ 25 17 45<br>L 86 55 20         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                  | Gangura, XVIII.<br>( <i>Vide page 6—s.</i> )<br>λ 25 44 2·55<br>L 86 58 24·13<br>H 144<br>h 20<br>No. 21       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

† Of the Calcutta Longitudinal Series.

| Name of station, district, description, co-ordinates &c.                                                                                                                                                                                                                                                | Name of station, district, description, co-ordinates &c.                                                                                                                                                                                                                                       | Name of station, district, description, co-ordinates &c.                                                                                                                                                                                    |
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| <p><b>Jargaon, XIV.</b><br/>(<i>vide page 5—s.</i>)</p> <p>λ 25 27 23·45<br/>L 86 43 39·78<br/>H 142<br/>h 23<br/>No. 19</p>                                                                                                                                                                            | <p><b>Kolgaona s.</b><br/>(<i>Bhāgalpur</i>) Or Ganges River No. 263 s; on right bank.</p> <p>λ 25 15 34·70<br/>L 86 49 1·53</p>                                                                                                                                                               | <p><b>Maislūka, XVI.</b><br/>(<i>vide page 5—s.</i>)</p> <p>λ 25 36 40·34<br/>L 86 52 11·59<br/>H 144<br/>h 25<br/>Nos. 18, 20</p>                                                                                                          |
| <p><b>Jataur h.s.</b><br/>(<i>Bhāgalpur</i>) On a hill to W. of the Chandan nadi, and which has Ghogchuk at the northern and Bishnupur village at the southern foot.</p> <p>λ 24 58 14·31<br/>L 86 57 21·30<br/>No. 47</p>                                                                              | <p><b>Kurma h.s.</b><br/>(<i>Southal Pergunnahs</i>) On a hill, about a mile E. of the large village of Kubarī.</p> <p>λ 24 27 14·40<br/>L 87 24 29·26<br/>No. 38</p>                                                                                                                          | <p><b>Malūncha, LXIV.*</b><br/>(<i>vide page 3—s.</i>)</p> <p>λ 23 54 29·02<br/>L 87 8 9·04<br/>H 970<br/>h 4<br/>No. 1</p>                                                                                                                 |
| <p><b>Kajra Indigo Factory,</b><br/>(<i>Purneah</i>) Chimney.</p> <p>λ 25 51 12·4<br/>L 87 30 17·6</p>                                                                                                                                                                                                  | <p><b>Lāgoa Hill Rock.</b><br/>(<i>Southal Pergunnahs</i>) Isolated hill about <math>\frac{1}{2}</math> of a mile N.E. of Bechabari village, and <math>\frac{1}{2}</math> a mile S.W. of a fort.</p> <p>λ 24 29 56<br/>L 87 8 59</p>                                                           | <p><b>Mālvi h.s.</b><br/>(<i>Bhāgalpur</i>) On a hill, about 4<math>\frac{1}{2}</math> miles W. of the large village of Dānra, and <math>\frac{1}{2}</math> of a mile S.W. of Janakpur.</p> <p>λ 24 53 1·24<br/>L 86 51 5·53<br/>No. 45</p> |
| <p><b>Kaliānpur Math.</b><br/>(<i>Monghyr</i>) Spire, of temple on right bank of the Ganges.</p> <p>λ 25 15 3·3<br/>L 86 39 46·6</p>                                                                                                                                                                    | <p><b>Latra Balolpur s.</b><br/>(<i>Monghyr</i>) Or Ganges River No. 274 s; about 1 mile S.W. of Chak Ratnapur Kunda village, and 1<math>\frac{1}{2}</math> miles S. of Bahādurpur village.</p> <p>λ 25 22 47·75<br/>L 86 40 35·10</p>                                                         | <p><b>Mandār Temple,</b><br/>(<i>Bhāgalpur</i>) Spire, on detached hill.</p> <p>λ 24 50 23·2<br/>L 87 4 45·1<br/>Nos. 41, 42</p>                                                                                                            |
| <p><b>Kanchanraipur Hill Peak.</b><br/>(<i>Southal Pergunnahs</i>) Isolated hill so called after village which lies about <math>\frac{1}{2}</math> a mile to the north.</p> <p>λ 24 40 23<br/>L 87 16 33</p>                                                                                            | <p><b>Madhani Bazar.</b><br/>(<i>Purneah</i>) Tree flag in centre of the bazar.</p> <p>λ 25 46 57<br/>L 87 30 25</p>                                                                                                                                                                           | <p><b>Mandārda Hill Peak.</b><br/>(<i>Bhāgalpur</i>) Isolated hill, about 1<math>\frac{1}{2}</math> miles W. of Mātāthān Hill Mark, and 2 miles N. of Saunthari village.</p> <p>λ 24 51 37<br/>L 86 52 0</p>                                |
| <p><b>Kanjarpur Ghāt,</b><br/>(<i>Bhāgalpur</i>) Flag.</p> <p>λ 25 15 48<br/>L 87 2 19</p>                                                                                                                                                                                                              | <p><b>Madhani s.</b><br/>(<i>Purneah</i>) On Mr. Palmer's house, about a mile N. of Purneah Collector's Kuchahri.</p> <p>λ 25 47 37·46<br/>L 87 30 44·91</p>                                                                                                                                   | <p><b>Mandārda Hill Peak.</b><br/>(<i>Bhāgalpur</i>) Isolated hill, about 1<math>\frac{1}{2}</math> miles W. of Mātāthān Hill Mark, and 2 miles N. of Saunthari village.</p> <p>λ 24 51 37<br/>L 86 52 0</p>                                |
| <p><b>Katila Hill Mark.</b><br/>(<i>Bhāgalpur</i>) On a hill, about 2<math>\frac{1}{2}</math> miles W. of the large village of Dānra, and the same distance N.W. of Kukwāra village. Mātāthān Hill Mark is also on the same hill.</p> <p>λ 24 51 8·03<br/>L 86 53 29·38<br/>No. 48</p>                  | <p><b>Maheshpur h.s.</b><br/>(<i>Southal Pergunnahs</i>) About 0·3 of a mile S.E. of village of the same name.</p> <p>λ 24 56 46·90<br/>L 87 12 46·87<br/>No. 46</p>                                                                                                                           | <p><b>Maniār Chak s.</b><br/>(<i>Monghyr</i>) Or Ganges River No. 275 s; on a char N. of Sitkund nāla, and close to right bank of the main stream of the Ganges.</p> <p>λ 25 20 53·56<br/>L 86 37 48·05</p>                                 |
| <p><b>Katila Hill Peak.</b><br/>(<i>Southal Pergunnahs</i>) Isolated hill, about 3<math>\frac{1}{4}</math> miles S.E. of the large village of Sārāh, and 2 miles W. of Jarmudih.</p> <p>λ 24 23 18<br/>L 87 4 4</p>                                                                                     | <p><b>Mahuagarhi, VI</b><br/>(<i>vide page 4—s.</i>)</p> <p>λ 24 28 48·46<br/>L 87 26 22·77<br/>H 1659<br/>h 2<br/>No. 6</p>                                                                                                                                                                   | <p><b>Manula, CVIII.†</b><br/>(<i>vide page 6—s.</i>)</p> <p>λ 26 4 46·20<br/>L 87 13 16·55<br/>H 185<br/>h 22<br/>No. 26</p>                                                                                                               |
| <p><b>Khiri h.s.</b><br/>(<i>Bhāgalpur</i>) On a hill, about <math>\frac{1}{2}</math> a mile S.W. of the well known village of Khiri, which lies at the northern extremity of the hill, and close to the S.W. corner of the fort on the same hill.</p> <p>λ 25 9 34·63<br/>L 86 51 25·05<br/>No. 54</p> | <p><b>Maira h.s.</b><br/>(<i>Monghyr</i>) On a range of hills, about 1<math>\frac{1}{2}</math> miles S.E. of Karait, 7 miles S.E. of Dharhara Railway Station, and 7 miles N.W. of Khaugpur Police Station; purgana Khaugpur.</p> <p>λ 25 10 26·24<br/>L 86 30 34·26<br/>H 1528<br/>No. 56</p> | <p><b>Mātāthān Hill Mark.</b><br/>(<i>Bhāgalpur</i>) On the same hill as Katila Hill Mark, and to the N.W. of it.</p> <p>λ 24 51 23·62<br/>L 86 53 5·49<br/>Nos. 49, 50</p>                                                                 |

| Name of station, district, description,<br>co-ordinates &c.                                                                                                     | Name of station, district, description,<br>co-ordinates &c.                                                      | Name of station, district, description,<br>co-ordinates &c.                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Máyáganj House.<br>(Bhágálpur) Chimney of Mr. Stewart's house on<br>ghát.<br>λ 25 15 57'4<br>L 87 2 51'6                                                        | No. 4 s.<br>(Bhágálpur) Or Ganges River No. 304 s.; on left<br>bank.<br>λ 25 20 43'87<br>L 86 56 10'86           | No. 14 s.<br>(Bhágálpur) Or Ganges River No. 284 s.; on left<br>bank.<br>λ 25 16 41'09<br>L 86 49 47'12            |
| Mohania, XXI.<br>(Vide page 6—s.)<br>λ 25 54 44'44<br>L 87 10 54'97<br>H 167<br>h 20<br>No. 24                                                                  | No. 5 s.<br>(Bhágálpur) Or Ganges River No. 305 s.; on<br>right bank.<br>λ 25 19 29'78<br>L 86 56 3'94           | No. 15 s.<br>(Monghyr) Or Ganges River No. 281 s.; on left<br>bank.<br>λ 25 16 38'01<br>L 86 45 23'65              |
| Mohanpur s.<br>(Bhágálpur) Or Ganges River No. 308 s.; on ghát<br>on left bank.<br>λ 25 18 38'65<br>L 86 58 40'40                                               | No. 6 s.<br>(Bhágálpur) Or Ganges River No. 296 s.; on<br>right bank.<br>λ 25 19 25'55<br>L 86 54 34'96          | No. 16 s.<br>(Bhágálpur) Or Ganges River No. 289 s.; on left<br>bank of a nála.<br>λ 25 16 51'99<br>L 86 53 14'90  |
| Mozufferganj White Temple.<br>(Monghyr)<br>λ 25 6 45'9<br>L 86 36 17'4<br>No. 53                                                                                | No. 7 s.<br>(Bhágálpur) Or Ganges River No. 298 s.; on<br>right bank.<br>λ 25 18 32'53<br>L 86 53 31'38          | No. 17 s.<br>(Bhágálpur) Or Ganges River No. 290 s.; on<br>right bank of a nála.<br>λ 25 16 44'23<br>L 86 54 21'90 |
| Murkáha s.<br>(Bhágálpur) Or Ganges River No. 291 s.; on right<br>bank of a nála, about a mile S.W. of Mádhopur vil-<br>lage.<br>λ 25 15 36'56<br>L 86 53 40'95 | No. 8 s.<br>(Bhágálpur) Or Ganges River No. 301 s.; on left<br>bank of a nála.<br>λ 25 19 10'80<br>L 86 52 20'43 | No. 18 s.<br>(Bhágálpur) Or Ganges River No. 299 s.; on left<br>bank of a nála.<br>λ 25 18 3'21<br>L 86 53 49'24   |
| Náráyanpur Factory.<br>(Bhágálpur) Indigo factory chimney.<br>λ 25 23 24'0<br>L 86 54 42'5                                                                      | No. 9 s.<br>(Bhágálpur) Or Ganges River No. 292 s.; on<br>right bank.<br>λ 25 17 18'90<br>L 86 53 12'22          | No. 20 s.<br>(Bhágálpur) Or Ganges River No. 297 s.; on left<br>bank of a nála.<br>λ 25 18 41'86<br>L 86 54 53'13  |
| No. 1 s.<br>(Bhágálpur) Or Ganges River No. 316 s.; on left<br>bank.<br>λ 25 17 13'20<br>L 87 2 46'57                                                           | No. 10 s.<br>(Bhágálpur) Or Ganges River No. 300 s.; on left<br>bank.<br>λ 25 17 50'47<br>L 86 52 10'77          | No. 21 s.<br>(Bhágálpur) Or Ganges River No. 293 s.; on left<br>bank of a nála.<br>λ 25 18 21'97<br>L 86 55 52'44  |
| No. 2 s.<br>(Bhágálpur) Or Ganges River No. 309 s.; on left<br>bank.<br>λ 25 17 34'95<br>L 87 0 13'58                                                           | No. 11 s.<br>(Bhágálpur) Or Ganges River No. 287 s.; on<br>right bank.<br>λ 25 16 7'98<br>L 86 52 28'39          | No. 22 s.<br>(Bhágálpur) Or Ganges River No. 294 s.; on left<br>bank of a nála.<br>λ 25 17 40'72<br>L 86 56 8'64   |
| No. 3 s.<br>(Bhágálpur) Or Ganges River No. 307 s.; on<br>right bank.<br>λ 25 18 32'60<br>L 86 57 24'74                                                         | No. 12 s.<br>(Bhágálpur) Or Ganges River No. 286 s.; on left<br>bank.<br>λ 25 16 53'90<br>L 86 51 46'69          | No. 23 s.<br>(Bhágálpur) Or Ganges River No. 295 s.; on<br>right bank of a nála.<br>λ 25 16 36'27<br>L 86 55 51'72 |
|                                                                                                                                                                 | No. 13 s.<br>(Bhágálpur) Or Ganges River No. 285 s.; on<br>right bank.<br>λ 25 15 46'78<br>L 86 50 49'83         | No. 24 s.<br>(Bhágálpur) Or Ganges River No. 311 s.; on left<br>bank of a nála.<br>λ 25 16 37'40<br>L 86 56 36'80  |

| Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                                                                                                | Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                                  | Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                  |
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| <p>No. 25 s.<br/>(<i>Bhāgalpur</i>) Or Ganges River No. 312 s.; on left bank of a nāla.</p> <p style="text-align: center;">o ' "</p> <p>λ 25 15 26·68<br/>L 86 56 18·19</p>                                                                                                                | <p>Pirdauri, XI.<br/>(<i>Vide page 5—s.</i>)</p> <p style="text-align: center;">o ' "</p> <p>λ 25 14 29·82<br/>L 86 46 35·07<br/>H 190<br/>h 10<br/>Nos. 11, 14</p>                                                          | <p>Purneah, Kamlāpur,<br/>(<i>Purneah</i>) Tree flag in bazar.</p> <p style="text-align: center;">o ' "</p> <p>λ 25 48 21<br/>L 87 33 27</p>                                                                 |
| <p>No. 26 s.<br/>(<i>Bhāgalpur</i>) Or Ganges River No. 313 s.; on right bank of a nāla.</p> <p>λ 25 14 24·01<br/>L 86 56 41·99</p>                                                                                                                                                        | <p>Pirpahār h.s.<br/>(<i>Monghyr</i>) On the summit of a high hill on right bank of the Sitakund nāla, and about 3 miles E. of Monghyr town.</p> <p>λ 25 22 39·95<br/>L 86 33 13·05<br/>H<sub>1</sub> 333·63*<br/>No. 67</p> | <p>Purneah, Karnabāri,<br/>(<i>Purneah</i>) Tree flag in bazar.</p> <p>λ 25 48 39<br/>L 87 33 27</p>                                                                                                         |
| <p>Noni Range, Peak A.<br/>(<i>Sonthal Pergunnahs</i>) On left termination.</p> <p>λ 24 30 1<br/>L 87 13 16</p>                                                                                                                                                                            |                                                                                                                                                                                                                              | <p>Purneah, Smithganj,<br/>(<i>Purneah</i>) Tree flag in bazar.</p> <p>λ 25 48 32<br/>L 87 33 30</p>                                                                                                         |
| <p>Noni Range, Peak B.<br/>(<i>Sonthal Pergunnahs</i>) Centre and highest.</p> <p>λ 24 26 45<br/>L 87 13 44</p>                                                                                                                                                                            | <p>Purneah, XV.<br/>(<i>Vide page 6—s.</i>)</p> <p>λ 25 36 36·90<br/>L 87 4 10·38<br/>H 151<br/>h 28<br/>No. 17</p>                                                                                                          | <p>Purneah, Topkhāna,<br/>(<i>Purneah</i>) Flag on tree in the old Artillery Cantonment.</p> <p>λ 25 48 16<br/>L 87 33 20</p>                                                                                |
| <p>Noni Range, Peak C.<br/>(<i>Sonthal Pergunnahs</i>) On right termination.</p> <p>λ 24 26 47<br/>L 87 15 31</p>                                                                                                                                                                          | <p>Purneah, Ālamganj,<br/>(<i>Purneah</i>) Tree flag in bazar.</p> <p>λ 25 48 25<br/>L 87 33 19</p>                                                                                                                          | <p>Raghunāth h.s.<br/>(<i>Monghyr</i>) On a detached hill, about 1 mile S. of Mohanpur, and <math>\frac{1}{2}</math> of a mile N.E. of Bansipur village.</p> <p>λ 25 3 58·48<br/>L 86 34 6·61<br/>No. 62</p> |
| <p>Pabai Hill Rock.<br/>(<i>Sonthal Pergunnahs</i>) Isolated hill, about <math>\frac{1}{4}</math> a mile W. of Biāhi, and <math>\frac{1}{2}</math> of a mile S. of Tilakpur village.</p> <p>λ 24 23 55<br/>L 86 55 38</p>                                                                  | <p>Purneah, Chāndni Chak.<br/>(<i>Purneah</i>) Tree flag in centre of the principal maballa.</p> <p>λ 25 48 8<br/>L 87 33 26</p>                                                                                             | <p>Rāmnagar, CVII.†<br/>(<i>Vide page 6—s.</i>)</p> <p>λ 26 2 9·05<br/>L 87 4 4·27<br/>H<sub>1</sub> 160·30‡<br/>h 20<br/>No. 25</p>                                                                         |
| <p>Panchapahār Hill Peak.<br/>(<i>Sonthal Pergunnahs</i>) Highest.</p> <p>λ 24 37 30<br/>L 87 12 56<br/>No. 40</p>                                                                                                                                                                         | <p>Purneah House.<br/>(<i>Purneah</i>) Parsonage house chimney.</p> <p>λ 25 46 47·7<br/>L 87 30 34·3</p>                                                                                                                     | <p>Rangūr, V.<br/>(<i>Vide page 4—s.</i>)</p> <p>λ 24 39 12·18<br/>L 87 4 30·89<br/>H 1308<br/>h 0<br/>Nos. 4, 7</p>                                                                                         |
| <p>Pātardha Hill Mark.<br/>(<i>Sonthal Pergunnahs</i>) On a detached hill about 4 miles N.W. of Sārat village and forts, <math>\frac{1}{2}</math> a mile E. of Munjoria, and <math>1\frac{1}{2}</math> miles W. of Dhanuria village.</p> <p>λ 24 15 57·98<br/>L 86 49 28·24<br/>No. 34</p> | <p>Purneah, House s.<br/>(<i>Purneah</i>) On roof of Mr. Cruise's two storied house.</p> <p>λ 25 47 41·62<br/>L 87 32 6·85</p>                                                                                               | <p>Rigodi s.<br/>(<i>Sonthal Pergunnahs</i>) West of village of the same name.</p> <p>λ 24 9 42·84<br/>L 86 58 12·44<br/>No. 32</p>                                                                          |
| <p>Phuljuri, I.<br/>(<i>Vide page 3—s.</i>)</p> <p>λ 24 14 25·19<br/>L 86 57 55·07<br/>H 2312<br/>h 5<br/>No. 1</p>                                                                                                                                                                        | <p>Purneah Jail s.<br/>(<i>Purneah</i>) On the two storied house.</p> <p>λ 25 46 32·34<br/>L 87 30 59·14</p>                                                                                                                 | <p>Sabājor House,<br/>(<i>Sonthal Pergunnahs</i>) S. corner.</p> <p>λ 24 16 38·5<br/>L 86 53 28·1<br/>No. 35</p>                                                                                             |
|                                                                                                                                                                                                                                                                                            | <p>Purneah Kachahri s.<br/>(<i>Purneah</i>) On paka roof of Collector's Kachahri.</p> <p>λ 25 46 13·80<br/>L 87 30 45·25</p>                                                                                                 |                                                                                                                                                                                                              |

\* This height refers to surface of upper mark-stone. † Of the North-East Longitudinal Series. ‡ This height refers to the mark-stone inbedded at 1 foot below the level of the ground.

| Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                                    | Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                                            | Name of station, district, description,<br>co-ordinates &c.                                                                                                                                                                            |
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| <p>Sakma, X.<br/>(<i>Vide page 6—s.</i>)</p> <p style="text-align: center;">o ' "</p> <p>λ 25 3 38'43<br/>L 86 30 6'12<br/>H 828<br/>h 3<br/>No. 13</p>                                                                        | <p>Shibnagar Temple,<br/>(<i>Sonthal Pergunnahs</i>) Western and highest.</p> <p style="text-align: center;">o ' "</p> <p>λ 24 44 21'5<br/>L 87 8 51'1<br/>No. 44</p>                                                                  | <p>Sonbarsa Ghât,<br/>(<i>Bhâgalpur</i>) Flag.</p> <p style="text-align: center;">o ' "</p> <p>λ 25 20 34<br/>L 86 56 45</p>                                                                                                           |
| <p>Sâpçhala Hill.<br/>(<i>Sonthal Pergunnahs</i>) Highest part, about 7 miles<br/>W. of the large village of Kumrabud.</p> <p>λ 24 10 21<br/>L 87 11 43<br/>No. 33</p>                                                         | <p>Sindridaul h.s.<br/>(<i>Sonthal Pergunnahs</i>) On a hill on E. bank of<br/>Dhibri nadi, about 1½ miles N.W. of Ratna, and the<br/>same distance S.E. of Ragu-ka-khol village.</p> <p>λ 24 39 30'51<br/>L 87 9 19'64<br/>No. 43</p> | <p>Sonbarsa s.<br/>(<i>Bhâgalpur</i>) Or Ganges River No. 306 s.: on left<br/>bank of the Ganges, about ¼ of a mile S. of village<br/>of the same name.</p> <p>λ 25 19 59'28<br/>L 86 57 39'59</p>                                     |
| <p>Sarsi Indigo Factory,<br/>(<i>Purneah</i>) Tree flag.</p> <p>λ 25 51 25<br/>L 87 19 44</p>                                                                                                                                  | <p>Sirâmpur s.<br/>(<i>Bhâgalpur</i>) Or Ganges River No. 288 s.: on right<br/>bank of a nala, about 6 miles W. of Bhâgalpur town,<br/>and 2½ miles S.W. of Mâdhapur village.</p> <p>λ 25 14 52'84<br/>L 86 52 44'17</p>               | <p>Soory Jail,<br/>(<i>Beerbhoom</i>) Flag.</p> <p>λ 23 54 19'8<br/>L 87 34 14'3</p> <p>See Synoptical Vol. of the Calcutta Longitudinal<br/>Series of the South-East Quadrilateral.</p>                                               |
| <p>Sarsi Kachahri.<br/>(<i>Purneah</i>) Tree flag close to the Kachahri.</p> <p>λ 25 50 44<br/>L 87 20 13</p>                                                                                                                  | <p>Sirkanda, XV.<br/>(<i>Vide page 6—s.</i>)</p> <p>λ 25 27 47'43<br/>L 87 10 50'75<br/>H 132<br/>h 28<br/>No. 16</p>                                                                                                                  | <p>Sultangunge Mosque,<br/>(<i>Bhâgalpur</i>) Spire, centre dome.</p> <p>λ 25 15 18'9<br/>L 86 46 53'5</p>                                                                                                                             |
| <p>Sathor, III.<br/>(<i>Vide page 4—s.</i>)</p> <p>λ 24 5 40'91<br/>L 87 19 33'28<br/>H 1552<br/>h 2<br/>No. 5</p>                                                                                                             | <p>Sonâtari h.s.<br/>(<i>Sonthal Pergunnahs</i>) On a detached hill, about ¼<br/>of a mile S. of Chândpur village, Sinsia village lies<br/>at the southern foot of the hill.</p> <p>λ 24 10 26'03<br/>L 86 56 36'83<br/>No. 31</p>     | <p>Sundardi Hill Mark.<br/>(<i>Sonthal Pergunnahs</i>) On hill about 1½ miles S.W.<br/>of Kâmârsel village, 1½ miles S. of Falun village,<br/>and 2 miles E. of Puresala village.</p> <p>λ 24 6 47'46<br/>L 87 17 30'12<br/>No. 28</p> |
| <p>Serka h.s.<br/>(<i>Sonthal Pergunnahs</i>) On a detached peak, about a<br/>mile N.E. of Sarokha, 1½ miles E. of Baglo Pâthar,<br/>and 1½ miles W. of Bagmâri village.</p> <p>λ 24 26 40'44<br/>L 86 36 21'99<br/>No. 37</p> | <p>Sonâtari h.s.<br/>(<i>Sonthal Pergunnahs</i>) On a detached hill, about ¼<br/>of a mile S. of Chândpur village, Sinsia village lies<br/>at the southern foot of the hill.</p> <p>λ 24 10 26'03<br/>L 86 56 36'83<br/>No. 31</p>     | <p>Tîrpaçhâr Hill Rock.<br/>(<i>Sonthal Pergunnahs</i>) Known also as Tiur, about<br/>1½ miles E. of Tâsarîo, and the same distance N.E.<br/>of Kharagdiha.</p> <p>λ 24 29 51<br/>L 86 52 50</p>                                       |

January 1880.

J. B. N. HENNESSEY,

In charge of Computing Office.





# NORTH MALUNCHA MERIDIONAL SERIES

OR

## SERIES S

OF THE

### NORTH-EAST QUADRILATERAL

Compiled and photozincographed under the orders of

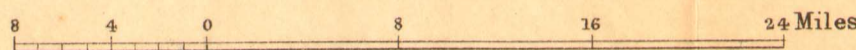
MAJOR GENERAL J. T. WALKER, C. B., R. E., F. R. S., & C.,

Surveyor General of India

and Superintendent of the Great Trigonometrical Survey

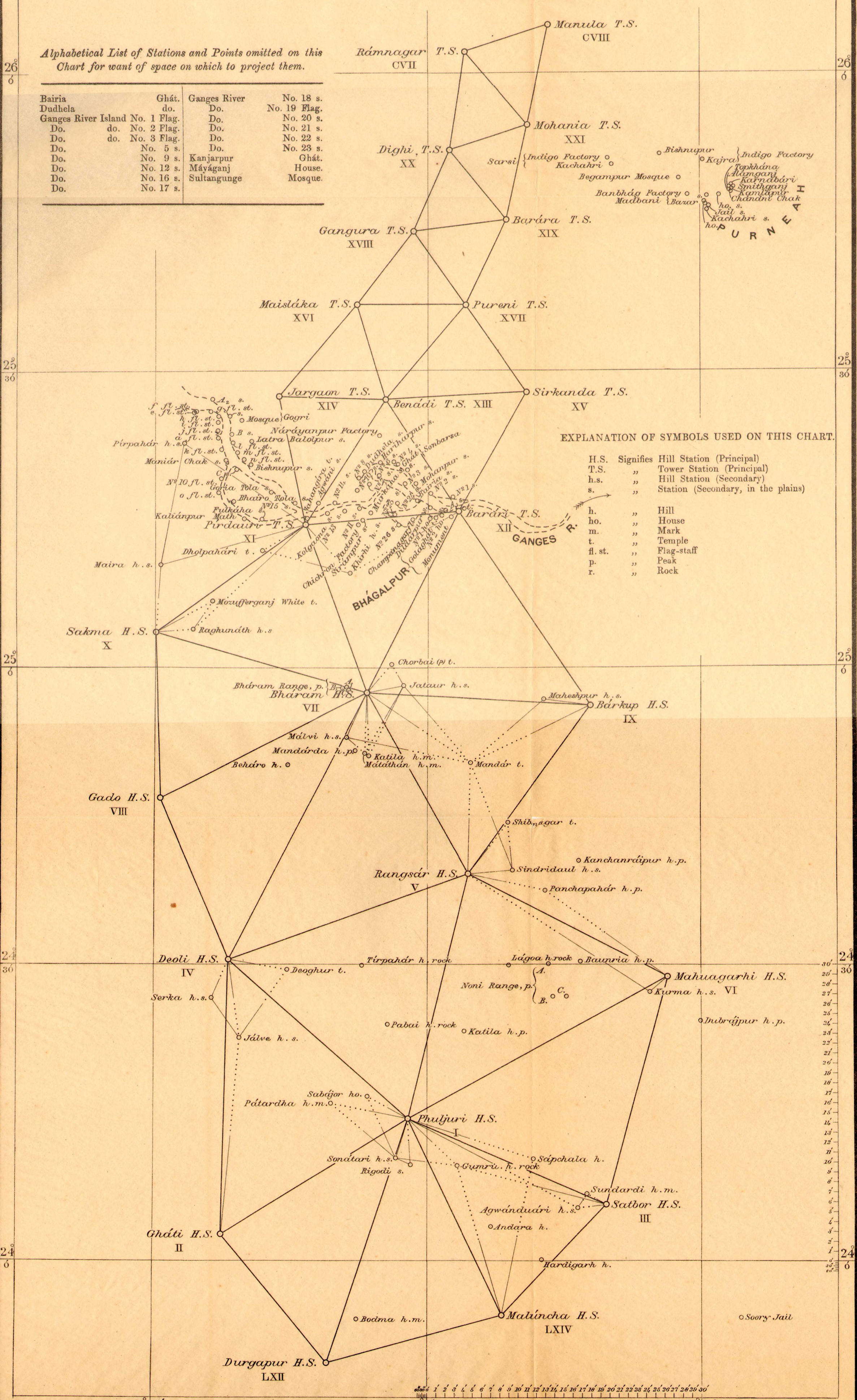
At the Office of the Survey, Dehra Dún, January 1880.

Scale 1 inch = 8 miles or  $\frac{1}{505880}$



Alphabetical List of Stations and Points omitted on this Chart for want of space on which to project them.

|                     |                 |              |              |
|---------------------|-----------------|--------------|--------------|
| Bairia              | Ghát.           | Ganges River | No. 18 s.    |
| Dudhela             | do.             | Do.          | No. 19 Flag. |
| Ganges River Island | No. 1 Flag.     | Do.          | No. 20 s.    |
| Do.                 | do. No. 2 Flag. | Do.          | No. 21 s.    |
| Do.                 | do. No. 3 Flag. | Do.          | No. 22 s.    |
| Do.                 | No. 5 s.        | Do.          | No. 23 s.    |
| Do.                 | No. 9 s.        | Kanjarpur    | Ghát.        |
| Do.                 | No. 12 s.       | Máyaganj     | House.       |
| Do.                 | No. 16 s.       | Sultangunge  | Mosque.      |
| Do.                 | No. 17 s.       |              |              |



EXPLANATION OF SYMBOLS USED ON THIS CHART.

- H.S. Signifies Hill Station (Principal)
- T.S. " Tower Station (Principal)
- h.s. " Hill Station (Secondary)
- s. " Station (Secondary, in the plains)
- h. " Hill
- ho. " House
- m. " Mark
- t. " Temple
- fl. st. " Flag-staff
- p. " Peak
- r. " Rock

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

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An Account of the Measurement of an Arc of the meridian between the parallels of  $18^{\circ} 3'$  and  $24^{\circ} 7'$ , 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.

An Account of the Measurement of two Sections of the Meridional Arc of India, bounded by the parallels of  $18^{\circ} 3' 5''$ ;  $24^{\circ} 7' 11''$ ; and  $29^{\circ} 30' 18''$ . By Lieutenant-Colonel Everest, F.R.S., &c., late Surveyor General of India, and his Assistants. London, 1847.

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

- 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 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  $24^{\circ}$ - $30^{\circ}$ ), Rahún, Gurbágarh and Jogi-Tila 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. 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  $18^{\circ}$  to  $24^{\circ}$ , 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.

*List of Published Works of the Great Trigonometrical Survey of India—(Continued).*

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 Rangir 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 Huriláong 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., Surveyor General of India and Superintendent of the Trigonometrical Survey. Dehra Dún, 1883.

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Synopses of the Results of the Great Trigonometrical Survey of India, comprising Descriptions, Co-ordinates, &c., of the Principal and Secondary Stations and other Fixed Points, of the Several Series of Triangles, as follows;—

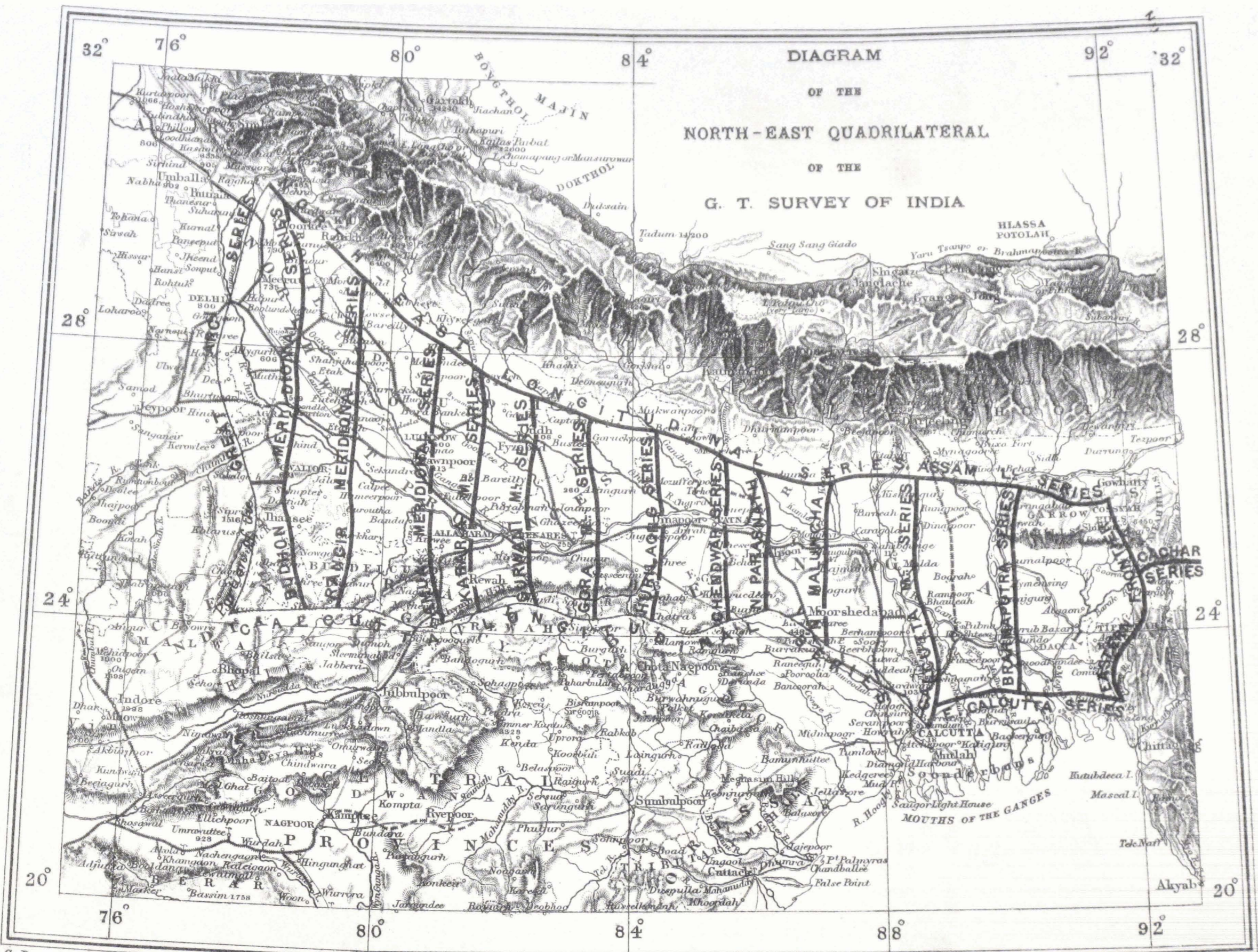
- Volume I. The Great Indus Series, or Series *D* of the North-West Quadrilateral. By Colonel J. T. Walker, R.E., F.R.S., &c., &c., Superintendent of the Survey, and his Assistants. Dehra Dún, 1874.
- Do. II. The Great Arc—Section 24° to 30°, or Series *A* of the North-West Quadrilateral. By Colonel J. T. Walker, R.E., F.R.S., &c., &c., Superintendent of the Survey, and his Assistants. Dehra Dún, 1874.
- Do. III. The Karáchi Longitudinal Series, or Series *B* 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, 1874.
- Do. IV. The Gurbhágárh Meridional Series, or Series *F* 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, 1875.
- Do. V. The Rahún Meridional Series, or Series *E* 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, 1875.
- Do. VI. The Jogí-Tíla Meridional Series, or Series *G*, and the Sutlej Series, or Series *H* 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, 1875.
- Do. VII. The North-West Himalaya Series, or Series *C* of the North-West Quadrilateral, and the Triangulation of the Kashmir Survey. By Major-General 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.

*List of Published Works of the Great Trigonometrical Survey of India—(Continued).*

Synopses of the Results of the G. T. Survey of India, &c.—(Continued).

- Volume VIII. The Great Arc—Section  $18^{\circ}$  to  $24^{\circ}$ , or Series *A* of the South-East Quadrilateral. By Colonel J. T. Walker, C.B., R.E., F.R.S., &c., &c., Superintendent of the Survey, and his Assistants. Dehra Dún, 1878.
- Do. IX. The Jabalpur Meridional Series, or Series *E* of the South-East Quadrilateral. 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, 1878.
- Do. X. The Bider Longitudinal Series, or Series *D* of the South-East Quadrilateral. By Major-General 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, 1880.
- Do. XI. The Biláspur Meridional Series, or Series *F* of the South-East Quadrilateral. By Major-General 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, 1880.
- Do. XII. The Calcutta Longitudinal Series, or Series *B* of the South-East Quadrilateral. By Major-General 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, 1880.
- Do. XIII. The East Coast Series, or Series *C* of the South-East Quadrilateral. By Major-General 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, 1880.
- Do. XIV. The Budhon Meridional Series, or Series *J* of the North-East Quadrilateral. By Lieutenant-General 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, 1883.
- Do. XV. The Rangír Meridional Series, or Series *K* of the North-East Quadrilateral. By Lieutenant-General 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, 1883.
- Do. XVI. The Amúa Meridional Series, or Series *L*, and the Karára Meridional Series, or Series *M* of the North-East Quadrilateral. By Lieutenant-General 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, 1883.
- Do. XVII. The Gurwáni Meridional Series, or Series *N*, and the Gora Meridional Series, or Series *O* of the North-East Quadrilateral. By Lieutenant-General 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, 1883.
- Do. XVIII. The Huríláong Meridional Series, or Series *P*, and the Chendwár Meridional Series, or Series *Q* of the North-East Quadrilateral. By Lieutenant-General 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, 1883.

July, 1883.



C. Dyson, Photo.

C. G. Ollendach, Zinco.

Photocircographed at the Office of the Trigonometrical Branch, Survey of India, Dehra Dún, November 1888.