

GENERAL REPORT

ON THE

Topographical Surveys of India,

AND OF THE

SURVEYOR GENERAL'S DEPARTMENT,

FOR SEASON

1875-76.

BY

COLONEL H. L. THULLIER, C.S.I., F.R.S., &c.,

SURVEYOR-GENERAL OF INDIA.

SUBMITTED TO THE GOVERNMENT OF INDIA. DEPARTMENT OF REVENUE,
AGRICULTURE AND COMMERCE

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CALCUTTA :

OFFICE OF SUPERINTENDENT OF GOVERNMENT PRINTING.

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GENERAL REPORT

ON THE OPERATIONS OF THE

Topographical Surveys of India,

AND OF THE

SURVEYOR GENERAL'S DEPARTMENT

FOR SEASON

1875-76.

Dated Calcutta, 4th December 1876.

THE operations of the Imperial Topographical Surveys in India for the season 1875-76 and the work in the several branches of the head-quarters Office, in geographical compilations and publications, for a portion of the year 1876 (up to 30th September), have progressed in the following manner since the last report.

Introductory remark.

2. The Government of India having directed that the reports of the Survey Department should be submitted two months earlier than usual, or by the 1st February of each year, it has been found necessary to close the statements of the head-quarters Offices on the 30th September, to make them correspond with those of the Executive Establishments for Professional or Survey Years, beginning 1st October and ending 30th September.

3. The number of field parties, from 1 to 7, continue to operate in the ground allotted to each as described in paragraph 2 of the last printed report, dated 20th January 1876 (*vide* Index map of each party given in the Appendix); but in addition to these, two new parties, Nos. 8 and 9, were organized from the 1st October 1875* for the new Topographical Survey of the province of Mysore, the cost of which will be defrayed by that Native State.

Number of parties employed.

* *Vide* letter from Revenue, Agriculture and Commerce Department No. 433, dated 23rd June 1875.

4. The new parties have been formed, No. 8, by transfers from the existing strength of the Topographical Surveys, and No. 9, by transfers from the Trigonometrical Survey, in order to relieve the budget estimates of each branch of the Department proportionately; but for the season under review these establishments were necessarily of only half strength, and were employed solely in commencing the skeleton Triangulation necessary as a ground work for the after Topographical delineation of the country. The increased number of parties, therefore, are formed from the existing machinery of the Department, as in force the previous season, without any extraneous aid, or new additions, to the European strength.

5. In many of the printed reports on the administration and progress of the Topographical Surveys in India, submitted since 1861, the nature and object

of Topographical Surveys generally, and description of country to be dealt with by this branch of the Department have been fully described, and the large area which is rendered by it annually has, within the last sixteen or twenty years, most materially helped towards increasing our Geographical and Physical knowledge of vast tracts in India which were almost totally unknown before.

6. The areas thus dealt with by the modern Topographical Surveys extend through nearly every Province and Native State above the parallel of 16 north latitude (*vide* Map of India attached illustrating the progress of the Imperial Surveys, portion tinted green), and embrace every variety of ground, but chiefly Native States and non revenue-paying British districts, such as are mountainous or rugged, forest clad, sandy desert, and, in many instances, ground fatal to health; tracts which have never been visited or explored by Europeans.

7. For Frontier expeditions and explorations, where rapid progress is essential; for the Independent Native States in which the use of the chain by our Surveyors is ill adapted or objected to; for forest-clad, rugged and mountainous country; and for poorly populated, non revenue-yielding and insalubrious or inhospitable districts and States; and, in fact, wherever a first and speedy survey, at a moderate cost, is necessary for Administrative, Military, and Geographical purposes, the Indian Topographical Survey method of surveying by theodolite and plane-tableing, based on the Great and Minor Triangulation, cannot be excelled for general accuracy, rapidity and cheapness, if the agency employed is well trained and trustworthy.

8. Of late years many improvements and refinements have been introduced, which have greatly enhanced the accuracy and practical value of these operations; with a slower rate of progress and consequent higher average mileage cost, it is, of course, possible to improve still further the character and style of these Surveys, if the nature and importance of the parts of the country so affected were worth it, which is not the case; but then the original and chief purposes for which they were organized, and have hitherto been conducted, would be materially changed, and the primary object of the completion of the first Survey of all India would be delayed, which is by no means desirable.

9. During the season under review, the total area of final topography

Results of the season's operations.	
13,658 sq. miles on the scale of 1	inch=1 mile.
4,488 " " "	$\frac{1}{2}$ " =1 " "
885 " " "	2 inches=1 " "
95 " " "	4 " =1 " "
62 " " "	$\frac{1}{4}$ inch=1 " "

19,188 TOTAL SQ. MILES.

* Nos. 1 to 7 parties, 19,430 sq. miles of triangulation.

Nos. 8 and 9 parties 9,812 sq. miles in Mysore.

TOTAL SQ. MILES 29,242

completed by Nos. 1 to 7 parties covers 19,188 square miles on the several scales detailed in the margin, the variation in the scales being regulated according to the peculiar circumstances and requirements of each case. The triangulation completed in advance of Topography, inclusive of the outturn by Nos. 8 and 9, new parties, in the Province of Mysore, aggregates 29,242* square miles, in which area, observations were taken at 522 stations, from which 3,618 points and 2,295 elevations were Trigonometrically

determined, yielding an average rate of one fixed point for 8 square miles, and one elevation for $12\frac{1}{2}$ square miles, which affords satisfactory evidence that the country has been well prepared in advance for the detail Surveyors.

10. The Topography completed during the season has been minutely delineated and carefully supervised by each Executive Officer, and has satisfactorily stood the checks by *in situ* examination in the field, and by lines of route survey, of which 573 linear miles were run in Nos. 1, 2, 4 and 5 parties. In the Nágá Hills' exploration, owing to the hostile attitude of the semi-independent Nágá tribes, and in the wilds of Western Bastar, the work on the half-inch scale is, strictly speaking, only a good Military reconnoissance based on Triangulation. Almost the whole of this ground has for the first time been thoroughly explored, and extends to the known geographical limits of our Eastern Frontier.

11. The total cost of the season's operations for Nos. 1 to 7 parties, from 1st April 1875 to 31st October 1876, debitable against the Imperial estimates for Topographical Surveys, amounts to Rs. 3,86,332, from which an average rate of Rs. 20-2-2 per square mile is obtained, inclusive of the cost of triangulation in advance for the work of the season. The cost of the triangulation in Mysore, by Nos. 8 and 9 parties, amounts to Rs. 81,356, paid from Provincial funds.

12. The out-turn of work of Nos. 1 to 7 parties for the season under review, taking all circumstances into consideration, is highly satisfactory. Compared with the previous season, it shews a decrease of 2,543 square miles of Topography, and a decrease of Rs. 28,012 in the expenditure; but an increase of Rs. 1-1-2 in the general average mileage rate of the operations. The Statements A and B, given in the Appendix, furnish detailed information regarding the out-turn and cost of each party and the results of the season's triangulation; and in Statement C (Appendix), a comparison is given of the total results, expenditure, and average mileage rates for 1874-75 and 1875-76.

13. The decrease in Topography by the regular or old parties is due to the following causes: (1), the reduction of the old establishments for the formation of No. 8 party in Mysore by the same number of Surveyors and Assistants as last season, and consequent large increase of triangulation in advance; (2), small out-turn of area in the Nágá Hills' exploration, which was unavoidable, owing to the hostile attitude of the Nágá semi-independent tribes, the attack on the party in the early part of the season resulting in the death of Captain John Butler, and the delay caused thereby; (3), increase of scale in No. 2 party for the plains portion of Khandesh and consequent smaller out-turn of area.

14. The decrease in the expenditure of Nos. 1 to 7 parties by Rs. 28,012 is mainly due to the reductions which have been carried out in the estimates of this branch of the Department to meet the orders of the Government of India, which still have my earnest consideration, and as has already been reported, Nos. 3 and 4 parties will, at the close of the current field season, be entirely broken up and absorbed in May and June next.

15. The saving effected in the estimates of the Imperial Survey Department by the transfer of one Officer

Savings effected by reductions in the Topographical Surveys.

and three Assistant Surveyors for the Topographical Survey of Mysore (No. 8 party), for which the Mysore Government is to pay, is given in the margin (a). A second party (No. 9) has also been formed in Mysore, by transfers from the Great Trigonometrical Survey,

(a) FOR SIX MONTHS OF 1875-76.			
<i>Transfers from the Topographical Branch.</i>		Pay and field allowance.	
Captain George Strahan, R. E., Deputy Superintendent	...	Rs.	
2nd grade, ...	...	8,598	
Messrs. Kitchen and Stotesbury, Assistant Surveyors	...		Rs.
1st grade, ...	...	5,820	14,418
Mr. W. McNair, Assistant Surveyor, 2nd grade,	...		
(b) <i>Transfers from the Great Trigonometrical Survey.</i>			
Captain J. R. McCullagh, R. E., Officiating Deputy Superintendent, 3rd grade, ...	...	Rs.	
Mr. L. Pocock, Surveyor, 4th grade, ...	...	7,040	
„ J. McDougall, Assistant Surveyor, 1st grade ...	...		Rs.
„ E. Connor, ditto ...	...	6,420	13,460

as per margin (b). Both these parties have, during the current field season, been raised to full strength, thus reducing still further the estimates of both the Topographical and Trigonometrical branches for the financial year 1876-77

• Topographical Branch	—	...	...	Rs.	24,988
Trigonometrical Branch	...	...	...	—	23,472
				TOTAL	48,460

by a sum estimated at Rs. 48,460.* But, in addition to this, owing to the reduction in strength of the

parties from which the transfers have been made for the formation of the Mysore Survey, there will be a proportionate reduction in the Native establishments and contingent expenditure, which, however, cannot be estimated with any approach to accuracy at present.

16. To shew how any changes in the constitution, strength and condition under which the Topographical Survey parties work affects both the out-turn and average mileage rates, the following statement of the areas accomplished, the cost and average mileage rate for the ten years, 1866-67 to 1875-76, is given to shew the several conditions which effect out-turn, cost, and the general mileage rate of survey operations in this country :—

Seasons.	Final Topography in square miles.	Triangulation in square miles.	Total expenditure.		Average mileage rate per square mile.	REMARKS.
			Rs.	Rs. A. P.		
1866-67 ...	14,630	25,165	4,05,514	26 10 0	Seven parties employed. Decrease of Topography caused by No. 2 party changing ground. Small out-turn of work in No. 5 party due to the prostration of the Assistants from fever in the jungles of Rewah, south of the Kymore hills. Increase of expenditure due to the re-organisation of the Department and consequent increase of salaries.	
1867-68 ...	20,201	14,332	3,64,211	20 0 0	Seven parties employed. Increase of Topography and decrease of expenditure due to the reduction of the scale of survey in No. 6 party, Khási, Gáro and Nágá Hills Survey.	
1868-69 ...	16,801	15,592	3,68,608	21 15 0	Seven parties employed. Decrease of topography and small increase of cost due to the famine and scarcity in Rajputana, Central India and Bundelcund, owing to which the duration of the field season was reduced.	
1869-70 ...	16,195	13,218	3,54,407	21 8 0	Seven parties employed. Decrease in area and cost due to No. 6 party being diverted into new ground; Nos. 2 and 6 parties reduced to meet the orders of Government for the reduction of the estimates of the Department.	
1870-71 ...	14,592	20,742	3,24,225	22 4 0	Six parties employed. Decrease in Topography and increase in average mileage rate due to the abolition of No. 2 party.	
1871-72 ...	17,910	16,336	3,71,616	20 10 0	Six and half parties employed. Increased out-turn and decreased average rate due to the large out-turn obtained in the Lushai Hills on the small scale of $\frac{1}{4}$ -inch = 1-mile. Increase of expenditure caused by the re-suscitation of No. 2 party for the Survey of Khundesh.	
1872-73 ...	25,327	18,930	4,49,896	17 12 0	Seven parties employed. Increase of Topography due to the large area on the small scale of $\frac{1}{4}$ inch = 1 mile, and the out-turn of No. 2 party, which was raised to full strength. The increase of expenditure was caused by the excessive cost of carriage, provisions, &c., in the Nágá and Lushai Hills Survey expedition.	
1873-74 ...	24,103	19,623	4,25,041	17 10 0	Seven parties employed. The minimum average mileage rate of Rs. 17-10 per square mile is due to the general efficiency of all the parties, notwithstanding the increased rates of salary by the consolidated pay scheme.	
1874-75 ...	21,731	22,644	4,14,344	19 1 0	Seven parties employed. Increased mileage rate caused by reduction of establishments and by vacancies, which, under the orders of Government for the reduction of the Department, were not filled.	
1875-76 ...	19,188	19,430	3,86,332	20 2 0	Seven parties employed; one of only half strength. Decrease in Topography due to the difficulties experienced in the Nágá Hills exploration. Decrease of expenditure and increase of average mileage rate due to reductions in the strength of the Department.	

of Rs. 9,40,795. In addition to the above, 2,014 linear miles of Spirit leveling was executed, and 1,425 permanent bench marks were erected in the Punjab and North-West Provinces, at an average cost of Rs. 8-3-4 per linear mile.

21. The Cadastral Survey in the North-West Provinces and Punjab, on the scale of 16 inches=1 mile, covered 1,713 square miles of country, or 10,96,605 acres, and contained 1,287 villages, in which were 11,61,881 fields or distinct holdings. In Bengal or Bebar the Cadastral Survey, on 32 inches=1 mile, covered 599 square miles, or 3,83,625 acres, containing 936 villages, and 11,98,457 fields or holdings, from which it appears that in the areas respectively brought under Survey in the two Provinces, the size of the fields or separate holdings in Bengal are very considerably smaller than in the North-West; but this is believed to be due chiefly to irrigation requirements.

22. During the season, in compliance with the orders of Government for the reduction of four Survey establishments as soon as the current work in hand with each was finished, the number of Revenue Survey parties was at once reduced from fourteen to twelve, and another has since been absorbed on the completion of the Cadastral work in the Permanently-settled district of Azimgurh in the North West Provinces, thus leaving only eleven parties at work during the now current season of 1876-77.

23. On the retirement of Colonel J. E. Gastrell, Superintendent of Revenue Surveys, Upper Circle, on the expiration of the additional period of service granted to him on attaining Colonel's allowances, after a continuous and highly meritorious service of twenty-four years in the Revenue Survey Department, which the Government of India was pleased handsomely to acknowledge, and on the return from furlough of Colonel D. C. Vanrenen, R. A., Superintendent, Lower Circle, the two circles of superintendence were, under the terms of the special orders of Lord Northbrook's government, merged into one, and Colonel D. C. Vanrenen, R. A., is now sole Superintendent of Revenue Surveys from the 1st April 1876.*

24. The report of the Superintendent of Revenue Surveys, which is separately submitted, furnishes full information and details on the progress, cost and rate of all the Revenue and Cadastral Surveys which have been in progress during the season under review.

25. In paragraph 13 of my printed report for 1873-74, and again in paragraph 18 of the report for 1874-75, the effect of the Cadastral operations on the out-turn and expenditure of the ordinary 4-inch Revenue Surveys, and the increased average mileage rate to be anticipated from the reduction of establishments, was prominently noticed, and in connection with the general subject of reductions in the estimates of the Department in its three branches, Topographical, Trigonometrical, and Revenue, an important combined report,† with statements attached, was submitted to Government, as called for by the Secretary of State in his despatch No. 3; dated the 24th February 1876, showing the total and detailed cost of the different branches of the Survey Department during the last ten years (average 24 lakhs of rupees per annum) and what work is likely to remain undone if the extensive reductions of 4 lakhs of rupees, and eight Executive parties, as ordered, are carried out in their entirety. In reply to the above, the Government reiterated their orders for carrying out the reductions to their fullest extent as originally contemplated, which is now being done gradually, so as to bring the estimates eventually down to 20 lakhs of rupees.

26. These reports and tabular statements convey much interesting and useful information regarding the working of the whole Department, at what cost the results are attained during a long period of ten years; 1866-67 to 1875-76, together with a forecast of what still remains to be done in each existing

Vide Revenue, Agriculture and Commerce Department letter No. 482, dated 30th May 1876.

* *Vide* Revenue, Agriculture and Commerce Department No. 712, dated 30th September 1875.

† No. 102 F., dated Simla, 4th July 1876.

Revenue, Agriculture and Commerce Department No. 673, dated 14th August 1876.

division, and in other parts of the Empire not yet touched or allotted for Executive disposal.

27. With the areas thus added during the season under review to the former aggregate results, we obtain the following general out-turn of the modern Topographical and Revenue Surveys, chiefly executed within the last 30 years (with the exception of 24,462 square miles of the old Hyderabad Survey) as fully explained in former Annual Reports—*

* Vide Report for 1866-67, page 7, para. 24.

		Square miles.	Rupees.
Total up to 1875	...	8,26,389	2,29,37,290
Add for 1876	...	30,363	13,27,127
TOTAL TO DATE		8,66,752	2,42,64,417

28. This does not include the Topographical Surveys in the Himalayas and Bombay Presidency under the control of the Superintendent, Great Trigonometrical Survey (colored brown), which have to be added to show the grand area which has been accomplished by the Imperial Survey Department to date, as shown in the map of India attached. The regular Topographical Surveys completed are colored dark green. In progress, light green. Revenue Surveys completed, dark pink. In progress, light pink. Old Topographical Surveys, not conducted under the guidance of this Department, yellow. Remaining for survey, blank. The Southern Peninsula is not included in these remarks, which have reference to Imperial Surveys only.

29. In the Geographical Compiling and Engraving Branches the details of work completed up to 30th September 1876 are given in the statements E and F (Appendix), by Mr. J. O. N. James, Assistant Surveyor General, in charge. The following are the most important Geographical maps which have been published, or are under preparation for publication:—

Cartography—Geographical.

30. *India*.—General Map (standard in outline) scale 32 miles=1 inch. Sheet 4, containing Bengal, Assam, the Eastern Frontier, part of the North-West Provinces and Nepal, Burma, &c., is now in the engraver's hands. Sheet 1, containing the Punjab, North-West Frontier, Kashmir and Afghanistan, has been corrected for the portion beyond the British Frontier, from the best available sources, and is ready for engraving. Sheet 5, Madras, Mysore, Travancore, and part of the Nizam's territory and Ceylon, is well advanced towards completion. Sheet 3, containing Sind, Rajputana, Central India, Bundelcund, Central Provinces, Nizam's territory and Bombay Presidency, is under compilation. This sheet must await the progress of surveys now in hand in the western portion of India. Sheet 2, containing portions of Tibet and China, and sheet 6, containing Tenasserim and part of the Malayan Peninsula, with the Andaman Island, have not yet been commenced.

31. The map of *India*, (outline) scale 64 miles=1 inch, in two sheets, has been transferred from the copper to stone, and all unsurveyed blanks filled up from the most authentic materials in this office for a preliminary issue. The final proofs are under correction, and this very useful and valuable map, which has occupied much anxious thought and attention, will be immediately issued. Under the orders of Government, this map will be utilised at once for the Geological map of India.

32. Hand-map of *India*, scale 128 miles=1 inch. A new edition of this valuable little map with the hills etched on copper, has just been completed in excellent style, and is now available for issue in a complete and final form.

33. The map of *Bengal, Behar and Orissa*, scale 16 miles=1 inch, and of *Assam* on the same scale (in outline) have been corrected up to date and are now engraving in outline. A preliminary edition of both these maps was photozincographed for immediate purposes.

34. The new maps of the Province of *Sind* (outline) and *Oudh* complete with hills, scale 16 miles=1 inch, have been corrected up to date and engraved on copper; the final proofs are under examination.

35. *Baluchistan*, or the territories of the Khan of *Kelat* and adjoining countries, scale 16 miles=1 inch (outline), has been largely corrected from various maps, routes, and sketches lately obtained, and has been photozincographed in outline for immediate purposes. Another edition with hills will be necessary, and this will be published as soon as further expected information is received.

36. Countries between *Hindustan* and the *Caspian Sea*, scale 64 miles=1 inch. This map has been completely revised and re-drawn for the publication of a new edition corrected up to date, and as it is in great demand, it is proposed to photozincograph it in outline and hereafter to lithograph it with hills complete.

37. Divisional maps of *Patna*, *Rajshai*, *Kuch-Bihar*, *Bhagalpur*, *Chota-Nagpur* and *Chittagong*, scale 16 miles=1 inch, for the statistical account of Bengal, by W. W. Hunter, Esq., LL.D., have been compiled with the new orthography and are now engraving on copper for that publication.

38. Map of *Assam* (in 8 sheets), scale 8 miles=1 inch, a continuation or sister-map to that of Bengal on the same scale. Sheets 1, 2, 4, 5, and 8 have been completed with Hills for Lithography from the most recent Revenue and Topographical Surveys, based on the Great Triangulation. Sheets 3 and 6 await the progress of Surveys and Triangulation on the Eastern Frontier.

39. A complete series of Provincial maps, to illustrate the new edition of "Aitchison's Treaties" have been prepared for the Foreign Office by transfers from the copper-plates of the 64 miles map of India with blanks filled in from the best available sources. These are exceedingly useful and clear maps, which the advantage of possessing standards on copper enable us to prepare at short notice, adapted to any special requirements.

40. *Indian Atlas Sheets*.—The following *new* sheets (8 in number) have been taken up; 22 S. W. and S. E.; 35 N. E. and S. E.; 90 S. W.; 92 N. W. and S. W.; 93 N. W.—and are well advanced. Large additions from surveys in progress have been made to the old full size plates Nos. 17, 54, 66, 67, 108, 119, and to the new quarter plates 23 N. W. and S. W.; 33 S. E.; 34 N. W., N. E., S. W.; 36 S. E.; 37 N. E.; 52 S. W., N. W., S. E.; 53 S. E., N. E.; 71 N. E., S. E.; 72 N. W.; 93 S. W., S. E.; 105 S. W.; 124 N. W., S. W., N. E., S. E.; 130 N. W., S. W.; 131 S. W.; and have been handed over to the engravers, and the work performed in the Engraving Branch (*vide* Appendix F) will show the progress made towards the publication of these sheets.

41. Of the old Ganjam and Orissa Survey, the series of maps referred to in paragraphs 29 and 30 of the last report, the following sheets were entirely re-drawn from the original surveys for photozincography during the year in this office. Nos. 22, 24, 42 (old series) and Nos. 10, 31, 33 (new series), 69, 71, 73, 75, 96, 97, 98, 99 and 100 (old series), by No. 3 Topographical Party; in all 15 sheets.

42. In addition to the above, a large amount of the usual miscellaneous map drawing, tracings of maps and charts, correction and examination of proofs, for the three different presses, coloring of engraved, lithographed, and photozincographed maps (an enormous amount of work) has been performed.

43. Great efforts have been made during the past year to keep up the various Geographical publications with the current state of Surveys, and the large number of the sheets of the Indian Atlas (40 old and new sheets) which have been taken up, or to which considerable additions have been made, besides the General and Provincial maps on various scales, completed and in progress, show to what extent this object has been carried out. There is a very extensive amount of Geographical materials of a new and most valuable order which requires to be taken up for further publication on smaller scales for popular use, but the publication of the first Survey of all India is first necessary.

44. The extra demands made on this office during the past year for geographical data and other information, special maps, &c., by officials to whom the work of compiling the various local Gazetteers, both of British Districts and Native States, has been entrusted, have greatly increased. These have been complied with from time to time through the indefatigable exertions of the Assistant Surveyor General, Mr. James, who held charge of the office during the absence of the Surveyor General from head-quarters, and to whom I am greatly indebted for the continued zeal and ability with which he discharges his onerous duties. The services rendered by Mr. James to this Department for the past 31 years are as varied as they have been most valuable.

45. Messrs Baness and Chamarett, Surveyors, 1st grade, in the Geographical Compiling Branch, Mr. Belletty, Surveyor, 1st grade, and Mr. Babonau, in the Assistant and Record Branches, continue, by well-directed industry, to merit favorable mention. They have afforded me great satisfaction.

46. The progress of the engraving has been both considerable and important, and as our completed copper-plates extend, they furnish the very best means of producing various descriptions of maps by means of transfers to the stone, after which all corrections and additions can easily be made, and special requirements can be met at the shortest possible notice if the standards of the geographical results are only available. The rapid prosecution of the engraving I therefore look on as the most desirable point, both with respect to utility and economy, because it saves repeated drawing either for the stone or zinc, and the wants of the public service in India are now so varied, and so numerous, that the advantages of the engraving cannot be over-estimated.

47. The plates of the *Indian Atlas* completed during the year ending 30th September 1876 are 52 S. E.; 53 N. E.; 131 N. W. Large additions from new Surveys have been made to the new quarter plates Nos. 34 N. E., N. W.; 53* S. E.; 124 N. E., S. E.,* N. W., S. W.; 130 S. W.; 131 S. W.; and the hill-etching on three of these plates is in progress. The outlines and writing are in hand in various stages of progress on the new quarter plates 23 N. W., S. W.; † 34 S. W.; † 37 N. E.; 52 N. W., † S. W.; 72 N. E., N. W.; † 93 S. W., S. E., † N. W.; 125 N. W.; 130 N. W., S. E. All these represent the results of surveys completed and in progress.

48. To the following old plates, received from England, large additions and corrections from recent surveys, to fill up to margins, are in progress, Nos. 17, 31, 67, 73, 74, 88, 94, 107, 108, 113, 119 and 121. Small additions and corrections for railways, roads, territorial names, &c., besides repairing the old work on the plates, *viz.*, hills, writing and outline, are completed or in progress on the plates of sheets 2 N. E., 14, 15, 20, 48, 58, 59, 65, 66, 72, 75, 77, 103 and 112; and the projections, with margins, have been cut on copper for the new sheets 61, 63, 77, 78, 79, all four quarters, 36 S. E.; 95 N. E., N. W. and 131 N.-E.; in all 28 new plates.

49. The hill-etching on the map of INDIA No. 2 (Hand Map) has been completed; and the map of OUDU, with the hills on the Nepal Frontier, is nearly ready, but awaits the final orders of the Government of India on the new boundary between Nepal and British territory. Map of SINDH, outlines and writing nearly completed. Map of ASSAM, outlines finished, writing in progress. BENGAL, BEHAR and ORISSA in two sheets, outline well advanced. Sheet four of the Standard Map of INDIA, scale 32 miles=1 inch, outlines commenced. Maps for the Statistical Account of Bengal, Chittagong division, completed in outline and writing. Bhagalpur, Patna, Chota Nagpur and Rajshahi; Kuch-Belhar divisions, outlines completed, writing in progress. Simm's plan of Calcutta, four sheets, heavy corrections made along the Strand Bank, Hastings, Government Dockyard, &c.; plates still awaiting further corrections to be furnished within the City and Strand Road.

50. In addition to the above, various minor jobs, small diagrams and outline sketch maps for other departments, together with such scales, footnotes, headings, &c., useful for employment in the other branches of this office, have been engraved, which are specified in Appendix F.

51. Altogether no less than 123 plates, comprising sheets of the Indian Atlas, miscellaneous maps, and other subjects, have been in the hands of the engravers, and I have every reason to be well satisfied with the out-turn of work completed and in progress.

52. The present state of publication of the sheets of the Indian Atlas is clearly shewn in the small Index map attached to this report, and a comparison with the one given in the report for 1873-74, will illustrate the progress that has been made during the past two years. Where so many plates are in a state of constant progression, by additions from recent surveys, completed and in progress, it is impossible annually to specify clearly the precise state of each plate.

53. In connection with the Engraving Branch, the amount of printing from copper-plates is as follows :—

Proofs taken ... ..	—	...	...	...	1,135
Transfers for stone or zinc ... ..	...	...	...	...	717
Impressions of maps, &c. ... ..	...	...	...	...	6,130
				TOTAL . . .	<u>7,982</u>

54. With the object of saving the engraved plates from the wear caused in printing direct from them, transfers are invariably taken to stone from all such plates as will admit of it; but I regret to add that very many of the old plates received from England are so much worn, that even direct impressions from the plates are with difficulty obtained now, and it has been found necessary to re-cut the outline and writing and repair the hill-etching on most of these plates: a most tedious undertaking, but which is very cheaply accomplished here by means of the trained Native agency, for which it forms very suitable employment. These plates, when thus renovated again, prove valuable records, which it is of the very first importance to perpetuate.

55. The possession in this office, therefore, of all the old or new copper-plates of the Indian Atlas which may have been engraved in England, is highly desirable, and to this end several applications have been made to obtain those still remaining in the India Office.

56. The great difficulty which the Engraving Branch has still to deal with, is the very insufficient staff of fully competent hill-etchers for the immense extent of such work to be done. For delicate work of this nature European artists are almost indispensable, as it demands great taste and skill. The delineation of hilly ground is an art like portrait-painting, and it is beyond the powers almost of a Native to make a likeness even from a tolerable copy. But with the prospects before us as to obtaining sufficient competent European agency, we are, of course, compelled to resort to Native aid, and those apprentices, few in number, who are being taught to etch hills on copper, are making fair progress, and several are now able to contribute to such description of work, but they require constant help and supervision, and take up much of the time of the Superintendent and the European staff, who are in consequence delayed to a certain extent with their own work. Many plates completed in outline and writing, therefore, await the completion of the hills, of which we have a great superabundance.

57. Eventually this difficulty may be overcome, and my earnest attention is given to the subject; but, meanwhile, the progress and completion of many important Atlas sheets and general Maps are necessarily retarded for want of proper hands to execute them as regards the hill-etching, for which we do not possess, a tithe of the hands absolutely required. The Native hill-etchers are steadily improving under the able and efficient tuition of the Superintendent, Mr. C. W. Coard, who is indefatigable in his exertions to maintain a good out-turn of work of superior quality, and merits my warmest approbation. The

European staff, 10 in number, continue to work zealously, and render valuable help in the supervision and tuition of the Native engravers and apprentices, 25 in number, many of whom are now able to complete outlines and lettering in a creditable manner.

58. Details of the work completed [during the nine months, January to September 1876 only (in consequence of the restriction of the period of the report), in this branch, are given in the report by Captain J. Waterhouse, Assistant Surveyor General, in charge (*vide* Appendix G), and the following tabulated statement briefly describes the general results which, however, being only for nine months, are not strictly comparable with the results obtained during the previous twelve months of the year 1875.

Abstract of the work performed in the Surveyor General's Office, Photographic Branch, for nine months, viz., 1st January to 30th September 1876.

SUBJECTS.	NUMBERS.		PRINTS.			Transfers to zinc or stone.	Number of pulls.	Number of complete copies.	REMARKS.
	Sections or sheets.	Negative Plates.	Carbon Prints.	Silver Prints.	Photo. transfer Prints.				
Topographical Maps ...	89	130	...	62	111	52	17,975	19,785	
Revenue Survey Maps ...	159	250	...	...	271	89	31,034	28,864	
District Maps ...	3	8	...	...	15	6	430	400	
General Maps ...	11	37	...	1	33	10	3,347	2,667	
City and Cantonment Plans	22	47	...	..	46	15	5,870	2,675	
Miscellaneous Maps, &c. ...	207	323	...	...	258	105	43,214	77,218	
Silver prints, miscellaneous	...	...	...	421	...	.....	.....	.....
Photographs of life convicts ...	...	...	1,840	...	...	.....	.....	.....
Anastatic transfers	...	...	...	...	...	9	...	.....
Proofs ...	...	...	...	...	...	.....	2,141	.....
TOTAL ...	491	795	1,840	484	734	286	1,04,011	1,31,609	
Cadastral Survey Plans, } North-West Provinces }	1,093	2,721	...	...	2,787	1,115	46,150	25,360	923 sheets printed off.
GRAND TOTAL ...	1,574	3,516	1,840	484	3,521	1,401	1,50,161	1,56,969	

59. These results shew an enormous increase of work performed as contrasted with a similar period of the previous year, and this increase is chiefly due to the Cadastral plans of the North-West Provinces, most of which have been dealt with during extra hours and by extra establishment, and paid

Vide Revenue, Agriculture and Commerce Department No 3, dated 5th January 1876, and paragraph 55 of the printed report for 1874-75.

for by the Local Government by a special grant under the sanction of the Government of India.

60. During the earlier portion of the year, considerable difficulty was experienced in dealing with the re-production of these cadastral plans in such large numbers, owing to the want of large cameras and other appliances, establishment, glass-houses for cameras, chemicals, &c.; but as the money for these essentials was provided by the North-West Government, it was only a matter of time to obtain the plant required, and this has now been done, so that during the next and succeeding years, Captain Waterhouse hopes to render annually a full out-turn of cadastral plans without interference with the regular work hitherto performed in his Branch, but these additional duties are of such a pressing, continuous and increasing nature, as to put a heavy strain on the Department.

61. The great increase of business thus entailed is rendered the more difficult to carry out properly for want of sufficient space and office accommodation, which is being more felt every year as the demands on us are multiplied. The thousands of cadastral village plans of the North-West Provinces already awaiting re-production are now supplemented by others, as numerous, of Bengal or Behar, which the Irrigation Department are equally anxious to have printed, so that the growing requirements of the public service are far in excess of the means of compliance within a reasonable time.

62. Pigment printing for re-producing photographs of "life convicts" has been conducted with great success; 207 negatives sent by the Jail Department were printed off and supplied by the 24th July 1876, and the Government having sanctioned the continuance of this measure for another year, the prints from the negatives of convicts of the present season are now in progress and have proved very successful. Various experiments in different processes, by which it is hoped to secure improvements in manipulation, or a more moderate cost, have been made by Captain Waterhouse with varying success; these are noted in his report.

63. A very large amount of miscellaneous work for various other Government Departments is annually performed in the Photographic Branch; in fact, nearly as much is done for other Departments as for the Survey.

64. Captain Waterhouse continues to maintain the efficiency and activity of the Photographic Branch in every respect, and to merit the highest commendation. He reports favorably of the good exertions of Messrs. J. Mackenzie, B. Mackenzie, J. Watson, and Sergeants Harrold and Marshall, who all have very arduous duties to perform under trying circumstances in the hot season.

65. The important question of office accommodation, which was noticed in paragraph 52 of the Annual Report for 1873-74, has not, I fear, advanced materially since that date; but the expansion of the Photographic Office above described shows the shifts to which we are put so as to meet the extra calls for the immediate publication of the results of so many Executive Surveys on such huge scales. The design for new offices on the site of the ground purchased for the purpose in Wood Street is still under consideration in the Public Works Department.

66. It was determined by the Government of India that a new building for the Mathematical Instrument Department, Workshops and Store Depôt should be first erected, so as to allow of the demolition of the present house, to make way for the larger premises required for the Survey Offices, but no commencement has been made as yet, and we are anxiously awaiting the action of the Public Works Department.

67. In this Branch the details of work performed during the nine months (1st January to 30th September 1876) are given in the report attached, *vide* Appendix H), by Captain R. V. Riddell, R. E.,* Deputy Superintendent, who relieved Captain Waterhouse of the charge of the Lithographic office on the 25th October 1876, and the following abstract shews briefly the nature and extent of the work completed:—

New drawings executed on transfer paper	...	...	91
" " on stone	...	...	23
Color stones prepared for boundaries, tints, &c.	...	...	144
Subjects printed	...	...	368
Complete copies of maps, plans, &c., printed	...	...	91,165
Number of pulls taken	...	...	1,51,785
Sheets of forms, &c., for type	...	...	2,116
" copies printed	...	...	1,57,186

* Transferred for duty at the Presidency, *vide* Revenue, Agriculture and Commerce Department letter No. 827, dated 21st October 1876.

Some of the principal maps and plans completed are as follows:—

District Sonthal Pergunnahs, scale 1 mile = 1 inch,				
sheets	...	...	...	3, 5, 7, 8, 9, 11, 13, & 15
District Birbhum, scale 1 mile = 1 inch, sheets	...	...	...	1, 2, 3, 5, & 6
Ditto Rungpur	ditto	ditto	...	1
Ditto Dinajpur	ditto	ditto	...	1
Geological map of Wurdah Valley coal field, Chanda and Sasti area, scale 1 mile = 1 inch.				
Ditto	ditto	Warorah and Wun area,	ditto.	
Plan of Simla Hills in chalk, scale 8 inches = 1 mile.				
Maps of the Dacca and Chittagong Divisions, scale 8 miles = 1 inch, by transfers from the general Map of Bengal.				
New district maps of Chumparun and Balasore, scale 4 miles = 1 inch, by transfers from the copper plates of the Indian Atlas.				

68. In addition to which, many maps to illustrate reports have been drawn and printed for various Departments and Local Governments.

69. Color and tint printing have been largely utilised with great advantage and economy for Forest, Cholera, and Geological maps, also for various other maps in which territorial boundaries are essential, and a larger amount of this description of work has been accomplished than usual.

70. The total out-turn of work as compared with the first nine months of the previous year 1875 is most satisfactory and highly creditable to the exertions of Mr. E. Jevezy, Head Assistant. Mr. Niven, the Lithographic Printer, obtained furlough to Europe for eight months, from the 6th April 1876, and his duties were satisfactorily conducted by Mr. J. Watson, Printer, from the Photographic Branch.

71. During the past year (1876), four quarterly despatches to the India Office, of the various publications of this Department in its three branches,—Topographical, Trigonometrical, and Revenue, were punctually made. Every map is furnished, on publication, to the Home Government, both for use and sale in England.

72. The total issue of maps to various Government Departments on service, free of charge, and to local agents in the three Presidencies for the sale to the public, is as follows:—

	No. of Maps.	Selling value.
		Rs.
To Government Officials, <i>bonâ fide</i> on service	...	25,294
,, Geographical Department, India Office, London	...	2,870
,, Six local agents, for sale to the public and local service issue	...	5,278
		7,677
TOTAL	...	33,442
		43,197

73. In continuation of paragraphs 62 and 63 of the last printed report, the usual account current shewing the transactions connected with the sale of maps, and monies realized and paid into the General Treasury from this office, is given in Appendix D of this report. The sums paid into the General Treasury up to 31st December 1876, and for which receipts have duly been forwarded to the Comptroller General, amount to Rs. 5,991-3-5, so that no Government money remains in hand up to date; Rs. 2,471-12-8 still remain to be realized from the agents, which, as soon as recovered, will be treated in the same manner.

EXECUTIVE ESTABLISHMENTS.

No. 1 TOPOGRAPHICAL PARTY.

GWALIOR AND CENTRAL INDIA SURVEY.

74. A comparison of the Index map of No. 1 Party, attached to this report,

In Gwalior territory a portion of the Subbats of Jawad Neemuch, portion of the Udeypur or Mewar State; portions of Pratabgarh and Jowra, and small interlaced portions of Holkar's territory and Tonk State, all within the Rajputana Agency.

with the one given in the report for season 1873-74, will clearly shew the progress of this survey during the past two seasons. The work of the season under review will also best be understood by reference to the Index map.

75. The final topography completed is in continuation of the previous season's work, and covers an area of 2,892 square miles, or about five-eighths of the degree sheet XII formed by the parallels of 24° and 25° and the meridians of 74° and 75°, and furnishes complete materials for the standard sheets 75, 76, 77, 79, 80 and part of 78, embracing chiefly portions of Udeypur, Jawad

TOPOGRAPHY COMPLETED.					Topography.
<i>Strength of Party and Season's Out-turn.</i>					Square miles.
Captain Charles Strahan, R. E., Deputy Superintendent, 3rd grade, in charge	...	...	...	...	73
Lieutenant J. R. Hobday, Assistant Superintendent, 3rd grade	...	...	...	...	2,100
Mr. H. J. Bolst, Surveyor, 1st grade	...	...	...	...	144
" R. D. Farrell, 4th "	...	...	...	...	234
" C. A. R. Scanlan, Assistant Surveyor, 1st grade, on duty at headquarters, rejoined the party 11th April 1876.	...	...	...	...	...
" W. Cornelius, Assistant Surveyor, 2nd grade	...	...	...	...	367
" P. J. Doran, ditto 2nd "	...	...	...	...	316
" C. Templeton, ditto 3rd "	...	...	...	...	373
" W. Knight, ditto 4th "	...	...	...	...	377
Sub-Surveyor Joala Persad	...	...	...	...	226
" Abdul Subhan	...	...	...	...	290
" Abdul Gufar	...	...	...	...	271
" Girdhari Lall	...	...	...	...	221
TOTAL					2,892

Check routes 115.3 linear miles.

lterior territory, and Pratabgarh. To test the accuracy of the work, 115.3 linear miles of check routes were run, and each plane-table was visited in his ground by the Executive officer, who states that he is perfectly satisfied with the accuracy of the work submitted by each assistant. Towards the south a considerable portion of the ground surveyed was exceedingly difficult and forest-clad, needing chain measurements throughout.

76. The triangulation for the season in advance of the detail survey was entrusted to Lieutenant J. R. Hobday, Assistant Superintendent, and was carried

west from the meridian of 74° and in the eastern half of degree sheet XIII (*vide* Index map). As this triangulation lay entirely within the stations of the Karachi longitudinal and Jodhpur series Great Trigonometrical Survey, it was only necessary to break down the great triangles into smaller ones. Captain Charles Strahan, R. E., Deputy Superintendent in charge, reports as follows on the work performed by Lieutenant Hobday: "This, however, was an arduous task on account of the extremely rugged nature of the country, and the fact that all the ranges of hills forming the Arvalis run from north to south, forming in many places, for several miles, barriers impassable for any baggage animals, and only accessible on foot. The area of his triangulation is 2,100 square miles, which is a very fair out-turn when the difficulties he had to surmount are taken into consideration." In which opinion I fully concur.

77. Observations were taken at 33 stations, from which 323 points were fixed, giving on an average 1 point to every 6½ square miles of ground, and 218 elevations were trigonometrically determined, giving an average of 1 to every 9½ square miles of ground.

78. The season's out-turn, *viz.*, 2,892 square miles of topography and 2,100 square miles of triangulation, is good. The

Opinion on the season's total out-turn.

ground now under survey and further west, around and south of the city of Udeyppur and between it and Mount Aboo, is exceedingly intricate, difficult of access from the want of even ordinary village roads, and owing to its being forest-clad, will be most difficult to delineate; such large progress as has hitherto been made cannot, therefore, be expected in future seasons.

79. A very full and interesting account of the country, of which the final

Description of country given in the Appendix.

survey has been completed during the season by the Executive officer, Captain Charles Strahan, R. E., together with Lieutenant Hobday's report on the country triangulated, and notes on the ground plane-tabled by Mr. H. J. Bolst, senior Surveyor attached to this party, are given in the Appendix of this Report.

80. The Executive Officer reports well of the continued good service of Messrs. Bolst and Cornelius, both in the field and recess. Mr. Scanlan, who was temporarily detached from the party on duty at head-quarters, rejoined on the 11th April. Messrs. Scanlan and Cornelius are strongly recommended for promotion to a higher grade by Captain Charles Strahan, and are in every way deserving of the same when vacancies will permit.

81. The party was inspected by myself in June last, and I was well pleased

Inspection of party.

with the care with which the field-work had been executed, and to notice the general efficiency of the establishment in all respects, under the good management of Captain Charles Strahan, R. E., who has held charge of it since 1867, and has always conducted his duties with marked ability and zeal. Lieutenant J. R. Hobday, Assistant Superintendent, 3rd grade, has, during this his second season, well borne out the favorable opinion I entertained of his abilities and professional qualifications: he is a most promising officer and highly deserving.

82. Since the party first commenced work in 1860, the total out-turn

Total work completed by the party since it commenced in 1860.

amounts to 46,283 square miles of triangulation as a ground-work for the detail survey, and 43,383 square miles of finished topography, giving a mean annual average progress of 2,711 square miles without a break or failure of any kind, which is highly satisfactory. The remaining area allotted to this party in Meywar and Sirohi up to the borders of the Bombay Presidency, Mahi Kanta, Pahlapur and Thur Parkar, will, it is estimated, take from five to six years to complete.

83. The party has been necessarily reduced in strength by the transfer of Mr.

Strength of party reduced.

R. D. Farrell, Surveyor, 4th grade, and Mr. G. A. Knight, Assistant Surveyor, 4th grade, to meet the requirements of the new Mysore Topographical Survey from the 1st October 1876, so as to relieve the Imperial survey estimates, with the object of carrying out the reductions ordered in this Department. This naturally entails diminished area and consequent higher average cost for the work performed.

84. Lieutenant Hobday, Assistant Superintendent, was also noted for transfer to No. 8 party, but has been directed to continue with No. 1 party, where his services during the field season can be better utilized, in consequence of the famine in Mysore, where it is feared it will be difficult to find occupation for a party of full strength. He must, however, join the Mysore party in May next under the budget provision.

85. During the next season (1876-77) it is expected that the remainder of

Programme for the next season.

degree sheet XII will be completed, together with revised large-scale plans of the fortress of Gwalior and cantonment of Morar, which has been urgently called for by His Excellency the Commander-in-Chief, as explained in my letter marginally cited. The cantonment of

No. 422 F, dated 14th September 1876.

Neemuch has also to be taken up, the survey of which was suspended last season by direction of the Government, but has since been sanctioned. The triangulation in advance of the detail survey will be extended over the southern portion of degree sheet XIII and towards Mount Aboo.

No. 2 TOPOGRAPHICAL PARTY.

KHANDESH AND BOMBAY NATIVE STATES SURVEY.

86. In the reports of previous seasons it has been explained why this party

Detached portions of Gwalior (Sindhia's) territory in the pergannahs of Bag, Baiwari, Tanda and Munoor of Subhat Amjhera.

Portions of Indore (Holkar's) territory in the pergannahs of Chikalda and Singana.

Portion of Dhar State in pergannah Kuksi.

Portion of Barwani State in pergannahs Singania, Barwani and Pati.

Portion of the State of Ali Rajpur in the pergannahs of Babra, Chandpur, Takarbara, Walpur, Jaran, Rat, Nanpur, and Katali.

Portion of the Jabua State, pergannah Kanas.

The lands of the protected Thakurs of Jobat, Biri and Dei.

Portion of the district Khandesh in the taluks of Souda and Bhosawal.

has to work in two detachments and on different scales, and this arrangement must continue until the Sâtpura hill tracts and Native States on either side of the Nerbudda river are surveyed on the one-inch scale, after which the whole strength of the party will be brought to bear on the two-inch scale survey of the revenue-paying district or plains of Khandesh.

87. The topography on the 1 inch=1 mile scale for the season lay in the eastern half of degree sheet VII in the standard sheets numbered 25 and 27 (*vide* Index map of No. 2 party attached) in detached portions of Indore territory north of the Nerbudda and in the Native States of Dhar, Jabua, Barwani and Ali Rajpur, while the work on the scale of two inches to the mile lay in the taluks of Souda and Bhosawal of the British district of Khandesh in the south-west corner of degree sheet II and the south-east corner of degree sheet III. The country to be triangulated in advance of the detail survey was in the northern half of degree sheet VIII, extending from the Tapti to the Nerbudda river and north of the Nerbudda in the western portion of degree sheet VII.

88. To Mr. D. Atkinson was entrusted the triangulation in advance for the

Strength of party and season's out-turn.	Triangulation square miles.	TOPOGRAPHY.		Traversing. Linear miles.
		1 in.=1 mile	2 in.=1 ml.	
F. B. Girdlestone, Esq., Deputy Superintendent, 3rd grade, on furlough.				
H. Horst, Esq., Assistant Superintendent, 1st grade, in charge.				
Mr. D. Atkinson, Surveyor, 2nd grade...	2,240			
" R. W. Chew " " " "	1,056	96		
" A. J. Wilson " 3rd " "	.....		55	294
" A. G. Wyatt " 4th " "	.....	333		
" E. Graham, Asst. Surveyor, 4th grade	.....	166		129.3
Sub-Surveyor Sheik Omar	.....	121		176
" Mr. F. Rozario	.....	275		
" " H. M. Holtham	.....		127	
" " C. George	.....		31	72.3
" Churaman Lal	.....		123	
" Lal Sing	.....		82	
" Hyder Ali	.....	281		
" Vishnu Moreshwar	.....		104	
" Bupu Jadu	.....		62	43.4
TOTAL	3,296	1,272	584	705.0
Linear miles of check routes.	.....			51
Triple-junction village marks fixed.	.....		No.	555

inch scale survey with instructions to complete the connection between the Khanpishura and Singhi series of the Great Trigonometrical Survey, left unfinished last year, and to cover with a net-work of 2nd class triangles all the ground remaining for triangulation in the hilly tracts north and south of the Nerbudda; this notwithstanding the exceedingly difficult nature of the ground, he accomplished in a

satisfactory manner, covering an area of 2,240 square miles.

89. The triangulation for the two-inch scale work in the low and comparatively open ground along the banks of the Tapti river was given to Mr. Chew with instructions to run a minor series along the river between the meridians of 74° and 75°, closing on the Singhi series Great Trigonometrical Survey, and to extend a net-work of triangles north of the Tapti, over open country, so as to effect a good junction with Mr. Atkinson's triangulation in the hills to the north: this work covered 1,056 square miles, and on its completion Mr. Chew was placed on one-inch plane-tableing.

90. The total area of triangulation completed covers 3,296 square miles. Observations were made at 140 stations, by which 507 points were fixed, or 1

to every $6\frac{1}{2}$ square miles, and 340 elevations were trigonometrically determined, giving one height for every $9\frac{1}{2}$ square miles of ground.

91. On the inch scale, 1,272 square miles of final topography, in very difficult ground, was completed, and on the scale of two inches, 584 square miles; with 705 linear miles of chain and theodolite traversing, by which 555 triple-junction village boundary marks were fixed. The executive in charge expresses his entire confidence in all the work of the season.

Topography completed.

92. Since this party was organized and started in 1871-72, the total out-turn up to date is, of finished topography, 8,087 square miles, and triangulation, 13,782 square miles.

Work performed since the party was started.

93. The out-turn for the season, viz., 3,296 square miles of triangulation in advance of the detail survey and 1,856 square miles of final topography on the scales of one and two inches to the mile respectively, is fair, considering the nature of the ground and the delay caused by the training of a portion of the establishment for large scale work. Hereafter it is expected that better progress will be made on the large scale survey, as some experience has now been gained and a larger proportion of the party will be employed on it.

Opinion on the season's out-turn.

94. Mr. Horst, in charge of the party, reports that "in the plain open country the village boundaries have been reduced from the village settlement maps of the Bombay Revenue Survey, but those in hilly ground were actually surveyed by his party."

95. Notes, descriptive of the country and its inhabitants, by the Executive Officer, Mr. H. Horst, and Messrs. Atkinson and Chew, Surveyors attached to the party, are given in the Appendix to this report. The ground triangulated by Mr. Atkinson from the Sâtpuras northwards is extremely wild, rugged and unhealthy, inhabited by Bhils, whose habitations are thinly scattered about the country. The valley of the Tapti river up to about the meridian of $74^{\circ} 30'$ is stated to be flat, highly cultivated and well planted with trees; a few low ranges of hills and isolated mounds bounding the river on both sides are then met with, beyond which, to the west, and in the vicinity of the town of Taloda, the country again is a dead flat, without undulations, and covered with jungle, which terminates further on in dense and almost impenetrable forest.

96. With the object of recruiting the Mysore party and reducing the cost of this party, the two senior Surveyors, Messrs. Atkinson and Chew, have been transferred from the 1st October 1876, the former to No. 5 Bhopal and Malwa survey, and the latter to No. 8 Mysore survey, and to fill their places, Mr. F. E. Warde, Assistant Surveyor, 3rd grade, from No. 7 Rajputana survey, and Mr. T. Downes, Assistant Surveyor, 4th grade, from No. 5 survey, were posted to the party; but I regret to add that Mr. Downes, while on his way to join, died very suddenly at Bhosawal on the 28th October, from fever and dysentery after only a few days' illness. It is not possible to replace this Assistant Surveyor on this party at present, as the distribution and movements of the other parties to the field renders it too late to make a transfer, even if a spare hand were available, which, owing to the drafts taken for Mysore, is not the case.

Changes in the strength and constitution of the party.

97. I have every reason to be well satisfied with the continued good exertions of the officer in charge, Mr. H. Horst, Assistant Superintendent, 1st grade, who is indefatigable in the discharge of very onerous duties of a somewhat complicated character. The Surveyors, Assistant Surveyors and Sub-Surveyors attached to the party, Mr. Horst states, have discharged their duties both in the field and recess in a praiseworthy manner. Mr. A. J. Wilson, Surveyor, 4th grade, is especially mentioned for the zeal and ability with which he performed his duties. Mr. E. Graham, Assistant Surveyor, 4th grade, and Sub-Surveyor Sheik Omar, are also highly commended for devotion to duty, and are recommended for promotion. The recess duties were unusually heavy, but the whole

Good services of the party.

tions of the officer in charge, Mr. H. Horst, Assistant Superintendent, 1st grade, who

party cheerfully worked extra hours throughout the season. The Officer in charge, the senior Surveyor, and several of the assistants suffered much from fever of a malarious type.

98. The triangulation in advance of details being sufficient for the next two seasons, no more will be undertaken at present. During the early part of the programme for the ensuing season. season the whole strength of the party will be employed in traversing and surveying on the two-inch scale in standard sheets 18 and 19 of degree sheet V and standard sheet 33 of degree sheet VIII. About the middle of January half the party will proceed to complete the topography on the inch scale of standard sheets 26 and 28 in degree sheet VII, north of the Nerbudda river, and the remaining half will continue to work on the two-inch scale in the plains of Khandesh, on either side of the Tapti river.

99. Mr. W. C. Barekley, Assistant Surveyor, whose case of being mauled by a bear was described in paragraph 78 of last report, after undergoing numerous operations in the General Hospital at Calcutta, was, on the recommendation of the medical officers, permitted by the Government of India, in letter as per margin,* to proceed to Europe for six months on full pay as a special case, and he accordingly sailed on the 7th April 1876. He has since obtained an extension in England, and I trust, with the excellent advice, care and attention he has been receiving in Guy's Hospital in London, he may recover, and return in a state fit for his duties again.

* No. 263, dated 23rd March 1876.

No. 3 TOPOGRAPHICAL PARTY.

CENTRAL PROVINCES AND VIZAGAPATAM AGENCY SURVEY.

100. In the general report of 1874-75 (*vide* paragraph 98) the programme of this party for the season under review was fully described, and it affords me much satisfaction to be able to state that it was fully carried out, notwithstanding the extremely unhealthy and difficult nature of the country. The field operations will be clearly understood by reference to the Index map of this party, attached.

		Triangulation.	
		Square miles.	
Captain T. H. Holdich, R. E., Officiating Deputy Superintendent, 3rd grade, in charge,	...	2,400	
		Topography } inch scale.	
		Square miles.	
Mr. J. A. May, Surveyor, 3rd grade,	...	450	
" F. Adams, " 4th "	...	470	
" T. E. M. Claudius, Asst. Surveyor, 1st grade	...	510	
" W. F. Pettigrew, " " 2nd "	{	470	Returned from furlough, 17th April 1876.
" A. Cooper, " " 2nd "	"	520	
" J. McCay, " " 3rd "	"	385	
" G. Vanderbeck, " " 4th "	"	514	
" D. Campbell, " " 4th "	"	...	
Total square miles,		...	3,319

101. Starting from Damagudiam, on the Godavari river, Captain Holdich, R. E., Officiating Deputy Superintendent, 3rd grade, in charge, proceeded along the Godavari valley to Sironcha, and then due north to the town of Abiri (the capital of the zemindary of the same name belonging to the Chanda district of the Central Provinces), with the object of obtaining a good base from a side of the Jabalpur series Great Trigonommetrical Survey, for his season's triangulation, which lay in the north-western portion of the Bastar State and approximately between the parallels 19° 30' and 20° 15' and the meridians of 80° 30' and 81°. The detail parties under the senior Surveyor, Mr. J. A. May, also starting from Damagudiam, proceeded *via* Cherla and the valley of the Talperu river, to their respective sections of work in the western zemindaries of Bastar, extending from latitude 18° 15' to 19° 15' and longitude 80° 20' to 81° 15'.

102. The area to be triangulated was not large, but it was desirable to work into this inhospitable country from the west, and to do so it was necessary to obtain a base of extension from the Jabalpur series of the great triangulation which runs along the meridian of 80°; this greatly added to the amount of the triangula-

Triangulation completed.

tion to be completed, but on it depended the value of the work to be performed, by which it was desired to test the triangulation of many previous seasons, with which a junction had to be effected, both on the east and south, as well as to form a good overlap and junction with the Revenue Survey of the Chanda district previously executed. Starting, then, from the side of the Jabalpur series, Polam Rajal, Hill Station, Ghot, to Hill Station, Captain Holdich ran a series of "symmetrical triangles with an average length of side of 20 miles running first north-east, to secure a sufficiency of intersected points in the remaining Bastar area, and then south-east to secure a junction with the side Irkabati-Barmunguta of the previous season's work." The total area covered by this triangulation is 2,400 square miles.

103. Observations were taken at 14 stations, from which 150 points were fixed and 124 elevations trigonometrically determined, or on an average of 1 point to 16 square miles, and 1 elevation to $19\frac{1}{2}$ square miles, for work on the $\frac{1}{2}$ inch scale. The number of trigonometrical heights will be supplemented by others obtained by aneroid observations during the progress of the detail survey.

104. The area finally surveyed on the reduced scale of two miles to the inch, which was deemed sufficient for the valueless nature of the ground traversed, and indeed was as large as the obstacles opposed to both life and cost permitted, covers 3,319 square miles; on the east and south it is limited by the work of previous seasons, on the west by the work of the Hyderabad topographical survey in the Upper Godavari taluks of Cherla, Albaka, Nagar and Sironcha and on the north by the parallel of $19^{\circ} 15'$.

105. The duration of the actual working portion of the field season was about three and a half months only, and for this short period, and considering the difficult and extremely unhealthy nature of the country, from the effects of which the members of the party suffered severely, the out-turn, *viz.*, 2,400 square miles of triangulation and 3,319 square miles of finished topography, is exceedingly good. The executive officer expresses his opinion on the season's topography as follows: "The half-inch maps of this season will be found, I think, to contain fully as much information, as accurately given, as the old one-inch maps which adjoin them on either side."

106. The country triangulated is described by Captain Holdich as wild and unhealthy in the extreme, very sparsely populated by Gonds of the "Gottur or Gottawar" and "Mari" tribes, of whom he remarks as follows: "Their perfect ignorance of the outside world, and total unacquaintance with strangers, was very marked, leading generally to a curious independence of manner amongst them which was not altogether unpleasant to observe. They all, however, with one consent declined to give any sort of useful information, and were the most untrustworthy set of guides that it has ever been my lot to be led astray by. They would frequently disappear entirely in the midst of a march, just when the tortuous paths among the hills and density of the jungle had most effectually obscured one's notions of the right direction to follow. They had a most ludicrous dread of a horse, and I fancy that, in the more inaccessible parts of the hills, a horse had actually never been seen by them. Mounting one's pony was the usual signal for the guides to fly into the jungles."

107. The extract from Captain Holdich's narrative report given in the appendix furnishes further particulars regarding the country visited, the people inhabiting it and their habits, &c. Brief notes by Messrs. May and Campbell on a portion of the ground plane-tabled during the season are also given in the appendix.

108. Notwithstanding all the difficulties which had to be overcome in conducting survey operations through a country clad in primeval forests, hilly and rugged in the extreme, inhabited by people who generally fled into the jungles on the

approach of the Surveyors, and although repeatedly prostrated by attacks of fever, Captain Holdich and his assistants have completed a very satisfactory out-turn of work.

109. All the assistants attached to the party are favorably mentioned by Captain Holdich, and Mr. Adams is strongly recommended for promotion, for which a vacancy exists, as represented in my letter cited in the margin. Mr. Holman, Sub-Surveyor, also receives special mention for good services, rendered both during the field and recess.

110. Mr. Harrison, the Apothecary attached to the party, although suffering severely in health, rendered excellent medical aid throughout the field season; but I greatly regret to add that, on the return of the party to recess quarters, he died at Ootacamund on the 6th June, as reported to Government under my endorsement No. 51F, dated 23rd June 1876. This adds another name to the long list of the many good men who, in the progress of this survey, have fallen victims to the climate of this remarkable tract of country, scarcely ever visited by Europeans before.

111. The area remaining to complete the work of this division is estimated to be 3,150 square miles in the north-west portion of the Bastar State, taluks Parlakot, Pertabpur and Narainpur. This will bring to a conclusion the extensive tract amounting to 52,133 square miles, which has been dealt with by this party, and the larger portion of which was executed under Colonel Saxton's superintendence, commencing in Orissa and Ganjam in the year 1853, as described in my report for 1860-61-62*. It will be a source of extreme congratulation to see this object attained. The whole of the Central Provinces will thus be completed, as well as the small Native States attached to the Vizagapatam Agency, and the map of India is relieved of one of its strongest eye-sores.

112. By the return of Mr. Pettigrew from furlough on the 17th April 1876, the strength of the party is somewhat increased, and every possible measure likely to secure the completion of the remaining areas, so important for filling up the gap in the maps so long existing, has been taken. The field depôt has been removed to Chanda in the Central Provinces, and from it the party can much more easily reach its ground, and also avoid the serious delay and risk of marching up from Rajahmundry as before. No triangulation remains to be provided for, so that the whole time and attention of the establishment will be devoted to the topographical details.

113. Under the orders of Government for the reduction of the department, this party has been already considerably reduced and will be entirely broken up and absorbed soon after the completion of the field-work. Such of the assistants as may be required to bring up the fair mapping will repair to headquarters, and the rest will be transferred to other parties, thus saving several incidental expenses during the ensuing recess. All charges will cease after six months of the ensuing budget, which have been provided for.

No 4 TOPOGRAPHICAL PARTY.

NORTH-EAST DIVISION, CENTRAL PROVINCES SURVEY.

114. The season's operations lay in the western portion of the Mandla district and the northern portion of districts Biláspur and Bálághat of the Central Provinces in the standard sheets Nos. 37, 38, 39, 40 and 32 (*vide* Index map of No. 4 party attached).

Portions of the Tehsils of Biláspur and Mandla of the Mandla district. Part of the Kawarda zemindari, district Biláspur, and the northern portion of district Bálághat.

115. The topography completed covers an area of 2,165 square miles on the one-inch scale, in addition to which the Government reserved forests of Topla and Banjar valley, which were in part surveyed last year, and the Barrila reserve, in all 95 square miles, were completed on the larger scale of four inches to the mile. The Executive officer, Lieutenant-Colonel Depree,

Strength of Party and season's out-turn.

	165.4 linear miles of check routes, 1 forest reserve circuit, observations at 7 stations, &c.	
	Topography 1-inch scale. Square Miles.	Forest reserve 4 inches=1 mile. Square Miles.
Lieutenant-Colonel G. C. Depree, Deputy Superintendent, 1st grade, in charge.	...	...
Mr. G. A. McGill, Surveyor, 2nd grade ...	279	...
" J. Vanderputt " 3rd " ...	108	37.9 and a reserve circuit.
" A. James, Assistant Surveyor, 1st grade ...	285	6.3 linear miles of check route.
" J. H. Wilson, " 3rd " ...	203	15.0
" G. L. Flensing, " 4th " ...	285	...
Baboo M. S. Dutt, Sub-Surveyor ...	291	...
Munshi E. Shariff, " ...	267	3.8
" I. Shariff, " ...	215	12.4
" Sher Shab, " ...	89	25.9
Babu Atma Sing, " ...	143	...
TOTAL SQUARE MILES ...	2,165	95.0

ran 165.4 linear miles of check routes through the field sections of the several Surveyors to test the accuracy of the details, and further examined the work of each Surveyor on the ground. The reserve forest work was also tested by 6.3 linear miles of check routes.

116. In the Barrila forest reserve a few additional points being necessary, observations were taken at 7 stations by which 13 points and 8 elevations were obtained. Aneroid heights were also determined wherever necessary in the season's detail survey to supplement those previously obtained by trigonometrical levelling.

117 The Executive Officer remarks as follows on the country :—

"The country delineated continues to include a portion of the back-bone of India. In standard sheets 38, 39 and 40, the streams run in directly opposite courses; those on the west run into the Godávári and the Bay of Bengal; those on the east run into the Nerbudda and the Gulf of Cambay. Often the streams flowing in directions so divergent take their source from the opposite sides of the same low swell of ground, a few feet of soil only determining whether the rainfall shall go to the one sea or the other.

"It will be noticed that in standard sheets Nos. 24 and 25 exists the watershed between the water systems of the Nerbudda and the Mahánuddy, and in sheet No. 16 at Amarkantak, within a few yards of each other, rise the Nerbudda and the tributaries of the Soane Ganges and those of the Mahánuddy.

"The country under survey was generally of the same forest or grass-clad, billy, uneven and rocky character, with a scanty population of Gonds or other wild tribes. But on the south of Mandla, however, the best cultivated area in the Mandla district was met with, and it was a more interesting tract to work in, as the inhabitants were Hindus of various castes. To the south, again, in Bálághat a narrow strip of well-cultivated country on the left bank of the Wainganga fell under survey. It is probably the only favorable portion which was left to the party, and it is inhabited by industrious cultivators of the Powar caste."

118. Considering the nature of the ground, the season's out-turn is fair, and

Opinion on the season's out-turn.

all the work has been well and carefully executed. Every village tri-junction boundary mark of the Settlement Revenue Survey has been carefully inserted in the season's mapping to admit of future connection and incorporation if necessary, thus adding greatly to their value for local use.

119. Lieutenant-Colonel Depree, Deputy Superintendent, 1st grade, in

Good services of the party.

charge, having obtained privilege leave from 10th August to 6th November 1875, in consequence of the state of his health, which had suffered materially from the malarious nature of this very bad part of the Central Provinces, the senior Surveyor, Mr. G. A. McGill, conducted the party into the field and started the season's detail survey, and his good services during this time and throughout the season receive favorable acknowledgment from the officer in charge. All the other Assistants and Sub-Surveyors are reported to have performed their duties cheerfully and zealously in the most trying ground.

120. This party was inspected by myself during the season, and I have again

Inspection of party.

to record my appreciation of the efficient state in which it is maintained under Lieutenant-Colonel Depree's energetic and able management. This inhospitable and intricate country has been most carefully examined by this party: the

field plane-table sections shew ample evidence of the nature and style of the work, which is fully equal to anything that can ever be required of it. The mode in which this officer keeps his office met with my entire approval.

121. Since this party broke ground in season 1870-71 in the southern portion of the Rewah State and the north-eastern portion of the Central Provinces in due succession to the Chota Nagpore survey, it has completed 15,476 square miles of triangulation and 14,929 square miles of topography. It has thus successfully achieved a larger area of bad and difficult ground, covering a period of many years, than almost any other party; most creditable to the officer conducting the operations, and his assistants.

122. There remains to complete, of the allotted area in this division of the Central Provinces, only about 1,200 square miles of topography on the one-inch scale, and the survey of the Pandea Tola forest reserve, which will be completed during the current field season, or by April next. To deal with this small remaining area, all that appertains to the Central Provinces, the party has been reduced by the transfers marginally noted, and on the completion of field-work it will be absorbed into No. 7 party in conformity with the stringent orders of the Government for the reduction of the Imperial estimates, and will bring up its recess work in conjunction with the reduced strength of the Rajputana establishment, thus forming with them a single party of

Mr. A. James, Assistant Surveyor, 1st grade, to No. 8 Mysore Topographical Survey.

Mr. G. L. Fleming, Assistant Surveyor, 4th grade, to No. 8 Mysore Topographical Survey.

Munshi Sher Shah, Sub-Surveyor to No. 7 Rajputana Topographical Survey.

Babu Atma Sing, Sub-Surveyor, to No. 7 Rajputana Topographical Survey.

the ordinary strength which will be able to deal with the extensive area still remaining for survey in that Agency. The miscellaneous contingent charges for one party will thus be saved during the next recess, whilst the remnant of the Native establishment, no longer required, will be altogether discharged in April or May next, on its return from the field. An excellent and well-trained Native establishment, capable, in combination with the European agency, of undertaking any description of survey, has thus been lost to the Department.

NO. 5 TOPOGRAPHICAL PARTY.

BHOPAL AND MALWA SURVEY.

123. The season's triangulation in advance of the detail survey, as explained in paragraph 120 of the printed report for 1874-75, lay in the southern portion of degree sheet IV and in sheet VI (*vide* Index map, No. 5 of party attached); but, owing to the extremely difficult forest-clad nature of the ground in the Vindhya range immediately north of the Nerbudda, great delays occurred in working northward, and consequently degree sheet IV could not be completed. Starting from a fresh base obtained from sides of the Khanpisura series Great Trigonometrical Survey, the triangulation was first carried eastward to establish a junction with the work of previous seasons, about the meridian of 77°, and a net-work of triangles was then extended to the north.

Portion of the Daraiha Nizamut of Bhopal. Portions of the Augar, Ujain and Shajehanpur Subbats in Gwalior territory. Portions of the Subbats of Indore and Khargone in Indore territory. Small detached portions of Dhar, Jhalawar, Jowra, Rajgarh, Dewas, &c.

Strength of Party and season's out-turn.

Captain R. V. Riddell, R.E., Deputy Superintendent, 3rd grade—On furlough, re-joined 19th September 1876.

	Triangulation.
	Sq. miles.
Captain J. R. Wilmer, Assistant Superintendent, 1st grade, in charge	1,914
Lieutenant St. G. C. Gore, R.E., Assistant Superintendent, 2nd grade	1,916
TOTAL	3,830

	Topography.
	Sq. miles.
Mr. C. F. Hamer, Assistant Surveyor, 1st grade	273
" J. A. Barker, " 2nd "	335
" E. A. Wainright, " 2nd "	320
" H. T. Kitchen, " 2nd "	306
" W. H. Lilley, " 2nd "	288
" J. C. Murray, " 4th "	318
" A. Kitchen, " 4th "	335
" T. Downes, " 4th "	227
" G. R. Copping, " 4th "	318
Sub-Surveyor Prem Raj, ...	273
" Gobardhan Dass, ...	212
" Shib Charan, ...	61
TOTAL	3,266

The topography has been tested throughout by 2345 linear miles of check routes run by the officer in charge.

124. The total area triangulated covers 3,830 square miles; of this, 1,914 square miles was executed by Captain Wilmer and 1,916 square miles by Lieutenant Gore, R.E., Assistant Superintendent; it embraces all the country from the Nerbudda river north to the parallel of $23^{\circ} 15'$ between the meridians of 76° and 77° , including Ujain, Mehidpúr, &c., immediately to the north of Indore. Observations were taken at 70 stations, from which 456 points were fixed and 423 elevations determined, giving on an average 1 point trigonometrically fixed for every $8\frac{1}{2}$ square miles of ground and 1 elevation to every 9 square miles.

125. The topographical delineation of the ground in standard sheets 19 and 21 of degree sheet IV, sheets 37 and 39 of degree sheet VII, and sheets 45 and 47 of degree sheet VIII (*vide* Index map), containing principally Gwalior and Indore territory, was completed, covering an area of 3,266 square miles, all of which was duly tested by 234.5 linear miles of check routes besides *in situ* examination of each plane-table.

126. The sheets 45 and 47, which are at some distance from the mass of the season's detail survey, were taken up and completed, as they contain the City of Indore, Cantonment of Mhow and the surrounding country, for which repeated applications had been received from the Military and Civil authorities at Mhow and Indore; it was therefore a leading object to get these sections finished at as early a date as possible.

127. A few brief remarks on the country visited during the season, extracted from the narrative report rendered by Captain J. R. Wilmer, in charge of the party, are given in the Appendix of this Report.

128. The results of the season's work, *viz.*, 3,830 square miles of triangulation in advance of details, and 3,266 square miles of finished topography, is exceedingly good, and I have every reason to be well satisfied with the quality of the work rendered.

129. The party was inspected by myself on its return from the field, and I was very well pleased to find that Captain Wilmer maintained its efficiency in all respects. The records were in good order, and recess duties progressing most satisfactorily; the drawing of the fair standard maps, to suit the special requirements of re-production by photozincography, is fully maintained. These important records are prepared in a most effective and satisfactory state and are highly creditable to all concerned, both in the survey as well as in the drawing. Captain Wilmer's good services are deserving of the highest commendation.

130. Lieutenant St. G. C. Gore, Assistant Superintendent, 2nd grade, whose transfer from the Great Trigonometrical Survey to this party was noted in paragraph 122 of the last report (for season 1874-75) rendered very efficient aid during both the field and recess seasons, and his good services have been prominently brought to notice by Captain Wilmer, and are cordially acknowledged by myself. All the assistants attached to the party continue to give every satisfaction: they have all worked very well, and had arduous duties to perform in the field.

131. During the season 1876-77 the small area remaining to be triangulated in degree sheet IV will be completed, and as much of the ground west of the meridian of $75^{\circ} 30'$ in degree sheets VII and VIII as can be accomplished. As it is essential that materials should be furnished without delay for the completion of the Indian Atlas Sheet, quarter 53 S. W., the publication of which, filled up to margin, has long been delayed, the final topography for all the country north of the Nerbudda river between longitudes 76° and 77° and up to latitude 23° , included in degree sheet VI, will be completed. The remainder of the area assigned to this division consists of Banswara, Jabua, Pratabgarh, Doongarpúr, &c., up to the limits of the Rajputana Agency on the borders of Mahi-Kanta and Rewa-Kanta of the Bombay Presidency between the parallels of $22\frac{1}{2}^{\circ}$ and 24° north latitude.

132. Captain R. V. Riddell, R. E., Deputy Superintendent, 3rd grade, rejoined the party from furlough on the 19th September 1876; but having been appointed by the orders as per margin* as an Assistant Surveyor General at head-quarters,

Changes in strength of party.
* Revenue, Agriculture and Commerce Department No. 827, dated the 21st October 1876.

with the view of taking over the charge of the Mathematical Instrument Workshop in addition to other duties connected with the Surveyor General's offices, arrived in Calcutta on the 6th October last, and is now advantageously employed in the administrative branch.

133. Mr. D. Atkinson, Surveyor, 2nd grade, was transferred to this party from No. 2, from the 1st October 1876, as it was essential to equalise the parties consequent on the formation of the Mysore party, and to relieve No. 2 party of some of the senior and highly-paid Surveyors in it. Mr. Barker, Assistant

† Died at Bhisawal on the 28th October 1876, vide report on No. 2 party.

Surveyor, 2nd grade, was transferred to No. 8 Mysore topographical party, and Mr. Downes, † Assistant Surveyor, 4th grade, to No. 2 party, Khandesh and Bombay Native States survey, from 1st October 1876.

134. This party, on the completion of the survey of the Rewah and Bundelkund Native States, commenced operations in Bhopal and Malwa in season 1870-71, from which period up to date its total out-turn amounts to 19,387 square miles of triangulation and 13,742 square miles of final topography on the one-inch scale, giving a mean annual average progress of 2,748 square miles, which affords good proof of the continued successful prosecution of these operations.

No. 6 TOPOGRAPHICAL PARTY.

KHÁSIA, GÁRO AND NÁGA HILLS TOPOGRAPHICAL SURVEY.

135. The programme for the season under review was clearly described in paragraph 142 of the last report, and in accordance with it, Captain Badgley, Officiating Deputy Superintendent in charge, with Messrs. Chennell and Robert, Assistant Surveyors, undertook the boundary surveys between the Gáro and

Portions of the Khási Kamráp, Khási-Gáro and Gáro-Mymensingh boundaries, and exploration of the Eastern Nágá Hills.

Khási hill districts and plains of Assam on the scale of two inches to the mile, proposed by the Chief Commissioner of Assam, whilst the detachment under Lieutenant Woodthorpe, R. E., Assistant Superintendent, with Mr. Ogle, Surveyor, proceeded to continue the exploration and re-

<i>Strength of Party and out-turn of work.</i>		Triangulation.
	Topography. Sq. miles.	Sq. miles.
Captain W. F. Badgley, Officiating Deputy Superintendent, 3rd grade, in charge.	184 { on 2 inches and 1 inch = 1 mile. }	179
Mr. A. W. Chennell, Assistant Surveyor, 1st grade.		
Mr. W. Robert, Assistant Surveyor, 3rd grade.		
Lieutenant E. G. Woodthorpe, R. E., Assistant Superintendent, 2nd grade.	1,169 on $\frac{1}{2}$ inch.	3,787
Mr. M. J. Ogle, Surveyor, 4th grade.	£2* on $\frac{1}{4}$ inch.	
TOTAL ...	1,532	3,966

* Exclusive of 60 square miles of margin.

connoissance of the Eastern Nágá hills south of Sibságar.

136. In consequence of the very difficult and forest-clad nature of the ground skirting the plains, the progress of the boundary surveys on the scale specified has been extremely tedious and slow. Captain Badgley completed portions of the Gáro-Mymensingh and Gáro-Khási boundaries, and towards the close of the season commenced, on the former scale of one-inch to the mile, a portion of the ground in the vicinity of the station of Shillong in sheets Nos. 14 and 15, which has become of far greater importance and been greatly changed by new villages springing up and the new main or cart-road recently designed and executed, which induced the local authorities to call for revised editions of these old sheets, the reproduction of which by photozincography so

many years ago was not then well understood. Messrs. Chennell and Robert effected a portion of the Khási-Kamrup boundary which is still in hand.

137. The detachment under Lieutenant Woodthorpe, R. E., for the exploration of the Eastern Nágá Hills, joined the Political Officer (the late Captain J. Butler) at Golághát towards the end of November, and under his guidance proceeded into the Nágá Hills early in December and commenced work; but, as has already been reported to Government (*vide* letter marginally noted and para-

*To the Secretary to Government, Department of Revenue Agriculture and Commerce No. 23, dated 5th January 1876.

graph 143 of the printed report for 1874-75), the party was treacherously attacked on the 25th December 1875 by Nágás of the villages of Pangti, Rechim and Change, Captain Butler was mortally wounded and died, to the great grief of all who knew him, on the morning of the 7th January 1876, and the survey party had to fall back on Golághát pending orders for the continuance of the exploration under proper military escort.

138. On the 12th January 1876 the Government of India directed that the exploration should continue under the guidance of Lieutenant Woodthorpe, R. E., who was then placed in civil charge of the party, and subsequently Mr. H. M. Hinde was deputed by the Local Government to accompany Lieutenant Woodthorpe as Assistant Civil Officer. On the 15th January the party re-entered the hills, and after adopting suitable measures against the villages which, with Pangti, were concerned in the attack of the 25th December, it was divided into two detachments with the object of facilitating the work and also to avoid the difficulties which it was anticipated would arise in conveying supplies in the interior for the whole party.

139. On the 25th January the detachment under Lieutenant Woodthorpe, with a military and police escort under the command of Colonel Tulloch of the 4th Assam Light Infantry, advanced into the interior of the Nágá Hills, while the second detachment under Mr. Hinde, accompanied by Mr. Ogle with a smaller military and police escort, proceeded along one of the outer ranges, the two detachments being separated by about 12 miles, and both working in a north-easterly direction advanced towards Tablung, south-east of Sibsagar civil station, fixing stations and completing the triangulation which occupied them up to the 6th February. They then commenced the topographical delineation of the ground and worked backwards and forwards through the whole length of the Eastern Nágá Hills, emerging into the plains near Jaipur after having established a good junction with the work of the previous season.

140. The work completed in the Nágá Hills is described as follows by Lieutenant Woodthorpe :—

"Notwithstanding the delay, at the best time of year, that the sad event of the 25th December entailed, we succeeded, between the 26th January and 17th April, in securing 1,170 square miles of topography on the scale of two miles to the inch, and about 2,500 square miles of triangulation; this latter most necessary work we should never have accomplished in the time if I had not been able to detach Messrs. Hinde and Ogle as often as I did. We passed through between eighty and ninety villages never before visited by Europeans, and have fixed the positions of fifty-eight more, which lay beyond our line of march. The weather was somewhat against us. I find from my diary that rain fell some time during the day for at least half of each month."

141. In the Appendix is given the narrative report in full by Lieutenant Woodthorpe, R. E., as well as reports by Mr. H. M. Hinde, Assistant Civil Officer, and Mr. M. J. Ogle, Surveyor, in which full details of the season's work will be found, together with descriptions of the country traversed and the people who inhabit it.

142. The party met with much opposition at various times, and great credit is due to Lieutenant Woodthorpe for the forbearance and judgment with which he acted at all times under very trying circumstances. The united good exertions of the Military and Civil Officers, Colonel Tulloch and Mr. Hinde, to whom Lieutenant Woodthorpe expresses himself as under great obligations, brought to a successful termination the operations for the season, which commenced with such a sad disaster. Lieutenant Woodthorpe reports most favorably on the good exertions of Mr. Ogle, who has served with great credit and distinction in exploratory surveys of this description for many years past.

143. The total out-turn of work or the season, *viz.*, 1,532 square miles of topography on the scales of 2 inches, 1

Opinion on the season's total out-turn of work.

3,966 square miles of triangulation, is fair, considering the difficult, detached and tedious nature of the boundary survey and the delays and difficulties experienced in the Nágá Hills. The main detachment under Captain Badgley was confined chiefly to working along lines of very intricate boundary, and could not, therefore, cover any extensive area, while the detachment in the Nágá Hills had first to triangulate unexplored country inhabited by unknown and hostile Nágá tribes, and then to delineate the ground at the same time.

144. The portion of the Eastern Nágá Hills surveyed during the season runs diagonally across portions of the standard sheets 77, 78, 80, 81, 82, 108

Work accomplished in the Nágá Hills.

and 109 in degree sheets XVI and XXII (*vide* Index map of No. 6 party attached), and is well connected with the work of the previous season along the hills south of the frontier of district Sibsagar. It adds considerably to our knowledge of this important and interesting frontier, touching, as it does, on the great water-shed between Assam and Burma.

145. Lieutenant Woodthorpe reports (*vide* paragraphs 40 to 42 of his report) that he was not able quite to complete the exploration and survey of the valley of the Yangmun river, one of the tributaries of the Dikhu, which extends much further south of the furthest point which he was able to reach, but it is hoped that the exploration of this portion of country which is needed to complete our knowledge of the political frontier on Burma will not be allowed to remain a blank on our maps, and that during some other season it will be permitted us to finish the mapping up to the water parting between Assam and Burma, with the hills still further east on the south and east of the Lakhimpur district, touching the frontiers of both Burma and China, and without which our knowledge of the eastern head of the Assam valley will be incomplete.

146. During the past recess Captain Badgley was able to start a new large-scale survey of Shillong and environs particularly required by the Chief Commissioner and specially sanctioned by the Government. A portion of the triangulation, together with some traversing and levelling, has been effected.

Large scale survey of the station of Shillong.

This work will be continued during the next recess, and will be prosecuted at convenient seasons so as not to interfere with the district work. This had my special attention on inspecting the party at Shillong in May last, and ample arrangements have been made for devising a really useful survey and plan on the 24-inch scale, which the nature of the place and surrounding features demands.

147. The future requirements of the local authorities were carefully considered in personal communication with the Chief Commissioner, and the various remaining desultory surveys, as specified in his proposed programme, submitted to the Government of India in the Foreign Department, will be duly provided for, to the extent of the available reduced survey agency left to deal with the further wants of Assam. The expenses entailed by these operations in Assam, with cooly labor so extravagantly high, is very considerable and difficult to meet in our reduced estimates.

148. During the next season (1876-77) the boundary between the Khási Hills and Kamrúp district, and between the Khási and Gáro Hills, will be taken in

Programme for the next season.

hand together with the examination of sheets XIV and XV around Shillong and between Shillong and the plains of the Brahmaputra, with a view to a revised and improved edition being published.

149. Lieutenant Woodthorpe with Mr. Ogle has proceeded into the country east and south of Sadiya to explore and map as much of the country towards the head of the Assam valley as they can reach, supplementing the Revenue Survey of the northern portion of the Lakhimpur district so as to embody the features of this part of Upper Assam between "the inner" and "the outer lines" of frontier jurisdiction. The operations of the Great Trigonometrical Survey, in extending the north-eastern or Assam valley series of triangles, are proceeding *pari passu* in this neighbourhood under Lieutenant Harman, R. E., who has obtained special sanction for entering the *Abor* Hills for

the purpose of fixing some trigonometrical points, and Lieutenant Woodthorpe is taking advantage of the same opportunity to push his topographical delineation of the surrounding features, and it is hoped that something practical may result. There is a considerable tract of unexplored and unknown ground to the north of the Brahmaputra and also to the east and south, right round the head of the valley, to the Nágá Hills and portion already laid down, which requires careful exploration before the whole of the Assam Province can be said to be sufficiently geographically described or shewn on the map.

150. By the return from furlough of Major Godwin-Austen, Deputy Superintendent, 2nd grade, on the 20th of November,* Captain Badgley, Officiating be relieved of the charge of this party. Major Godwin-Austen, with the sanction of Government,† has been directed to proceed to Gauháti without delay. Captain Badgley will continue attached to the party for the present.

151. The good services of Lieutenant Woodthorpe, R. E., Assistant Superintendent in charge of the Nágá Hills Expedition, and of all the officers attached to it have, I have much satisfaction in recording, been most favorably acknowledged by the Chief Commissioner of Assam and by the Government of India, in the correspondence marginally noted, which is given in the Appendix.

152. In order to avoid complications and delays in conducting special explorations of this nature so distantly removed, Lieutenant Woodthorpe will act independently of the officer in charge of the Survey in the Khási Hills, carrying on his proceedings with the full knowledge and approval of the Political authorities in the frontier, reporting direct to this Office.

No. 7 TOPOGRAPHICAL PARTY.

RAJPUTANA AND SIMLA SURVEY.

153. In Rajputana the season's detail work or topography lay entirely in the Jodhpur or Marwar State within the districts of Jodhpur, Mirta, Nagour Kuchawan, immediately to the north and north-east of the City of Jodhpur, in the standard sheets

<i>Strength of Party and season's out-turn of work.</i>		58, 59, 60, 62, 63,
Lieutenant E. P. Leach, R. E., Assistant Superintendent, 2nd grade, in charge,	... { 2,506 square miles of triangulation and forest reserve boundaries.	64, 66, 67 and 73,
	Topography, square miles.	degree sheets IX and X (<i>vide</i> Index map attached) and the triangulation in advance of the detail survey was immediately north, partly in Jodhpur and along the southern boundary of Bikanir, in degree sheets XI and XII in Nagour, Saduo, Drowana and Awad &c., and up to meridian of 73° and
Mr. E. S. P. Atkinson, Surveyor, 4th grade,	... 340 also 1,332 sq. mls. of tri-	
„ R. Todd, Assistant Surveyor, 1st „	... 530 ... angulation	
„ C. Tinsell „ 1st „	... 344 ...	
„ F. Warde „ 3rd „	... 628 ...	
„ W. Kelly „ 4th „	... 626 ...	
„ P. White „ 4th „	... 472 also forest reserve boundary.	
„ J. Noah, Sub-Surveyor	... 354 do.	
Harlal Singh „ ...	... 267 do.	
Kalkapershad „ ...	... 413 do.	
Mr. J. Nathaniel „ ...	... 89	
Total topography	... 4,063	
Total Triangulation	... 3838	
Simla environs survey, viz., Mashobra, Mahasu, and Fagu,	... { 16,375 acres on the scale of 6 inches=1 mile with contours 300 feet apart.	
Forest Reserve boundaries in Ajmere and Mhairwara,	... { 140 linear miles.	
south of parallel of 28°.		

154. The country under survey was open and easy to delineate, with but few topographical features, and the progress made during a short field season of barely four months was consequently large, covering an area of 4,063 square miles.

155. The triangulation in advance of the detail survey covered 3,838 square miles, nearly all of which was sandy desert, with sand ridges, rising occasionally as much as 200 feet above the level of the country, and about a mile apart, running generally in a north-easterly and south-westerly direction. Observations were taken at 48 stations, by which 290 points and 212 elevations were trigonometrically determined, giving, on an average, one fixed point to about 13 square miles, and one elevation to 18 square miles of ground, which, for such open country, is sufficient for all practical purposes.

156. In addition to the above, 140 linear miles of eight forest reserve boundaries in Ajmere and Mhairwara and 16,375 acres on the 6-inch scale of the Simla environs were completed.

157. The total out-turn of work, viz., 4,063 square miles of final topography on the 1-inch scale, 16,375 acres on the 6-inch scale, 140 linear miles of boundary survey, and 3,838 square miles of triangulation is very good and highly creditable to all who have taken part in the season's operations.

158. Owing to the open and easy nature of the country now under survey, Lieutenant Leach, R. E., reports that he satisfied himself as to the accuracy of the survey by *in situ* examinations only. Though villages are numerous, with the exception of a few low hills and sand ridges, there are very few or no topographical features in the country, and the *in situ* examination of each plane-table's work is therefore sufficient for the verification of such very open and unimportant detail survey. Whenever the more rigorous test by chained distances is necessary or desirable, it will again be resorted to.

159. An extract from the executive officer's narrative report, describing the country he triangulated in advance of the detail operations, is given in the Appendix.

160. Lieutenant Leach, R. E., Assistant Superintendent in charge, at great personal labor, undertook the correction and completion of the pergunnah boundaries or revised assessment circles on the maps of districts Ajmere and Mhairwara, specially prepared at the urgent request of the Commissioner, in order to give better effect to the results of the new survey, and to afford tangible district maps on the 1-inch scale in supersession of the maps of the old Revenue Survey of 1849, which were much sought for. This has entailed a good deal of extra trouble in the Printing and Drawing Departments, but the advantage gained for both these important British districts in the heart of the Native States of Rajputana is very great.

161. In addition, therefore, to the usual standard sections or sheets of this survey, we have complete maps of each of these districts, forming a compact whole joined together, which completely meet the views and wishes of the local authorities. Lieutenant Leach specially records his acknowledgments to the Commissioner and Deputy Commissioner of Ajmere, Mr. Leslie Saunders and Major Repton, for the assistance rendered to him in completing this survey. A tabulated statement has been prepared by the Executive Officer of the various land tenures in these districts, also

* Land held in estates or baronies by feudal Chiefs, originally under an obligation of military service.

a statement of the cultivated area of the "Istanrar estates,*" which will be very useful to local officials.

162. The extension survey of the environs of Simla on the east, viz., the hills of Mashobra, Mahasu and Fagu on a scale of 6-inches to the mile, with con-

tours 300 feet apart, which was urgently required by and ordered by the Government for the Simla water-supply Committee, detained the party at Simla up to the end of November 1875 (*vide* paragraphs 165 and 166 of the printed report for 1874-75). This work was satisfactorily completed, and a preliminary skeleton map on the scale of 4 miles=1 inch was prepared and printed for the use of the Committee. Silver-print photographs were also made of the original field sections for immediate use and the wants of the Civil Engineer in charge of the water-works project were thus fully met. Subsequently, on the return of the party to recess after the field season, in May last, some small additions were made to the survey, with the object of establishing a good junction with that of the larger scale survey of Simla, and completing the levelled contours continuously. The 6-inch final plan of the extension will now prove of the greatest advantage to the Engineer in charge of the water-works.

163. A very beautiful lithographed general plan of Simla and Jutog, showing the hill features on the scale of 8-inches to the mile, has been published in this office during the year, and extensively issued. It has been very highly approved of by competent judges, and was an acknowledged desideratum for many years past. A new edition of the 24-inch plan sheets, with the estate boundaries shown, is now going through the press. Much time and attention have been given to the settlement of these boundaries in communication with the civil local authorities, who are reaping very considerable increased municipal revenue in consequence of the new survey.

164. The continuation of the road survey to the military cantonments of Solon, Dugshai, Kasauli and Sabathu may, it is hoped, be partially prosecuted during the ensuing hot or recess season, with the view of laying down those cantonments in due course as originally intended, and as so much needed by the Military Department. The orders of the Government of India, removing the restrictions on these important large scale plans of military cantonments, referred to in paragraph 169 of last report, are cited in the margin.

No. 563, dated the 27th June 1876.

165. The junction of the remnant of No. 4 party, on the completion of the Central Provinces' division, as alluded to in paragraph 122, with the Rajputana party reduced strength, will enable No. 7 to undertake whatever work may be required of it at Simla or in the vicinity during the dry months.

166. The ability and zeal with which Lieutenant E. P. Leach, R. E., continues to discharge the duties connected with the charge of No. 7 Topographical party merit my warmest approval. He is indefatigable both in the field and recess, scrupulously exact in all his professional duties, and careful to maintain the efficiency of the party in every respect, which I had many opportunities of personally inspecting and satisfying myself upon.

167. Messrs. Todd, Tapsell, Kelly and White, Assistant Surveyors, are favorably mentioned by the Officer in charge, and are recommended by approved length of qualifying service for promotion to higher grades, which I regret, under the present state of the Department, cannot be granted them with reference to the prohibition of the Government consequent on the reductions in the estimates. Sub-Surveyors J. Noah, Harlal Singh and Kalka Pershad have done good service both in the field and recess, and merit commendation.

168. Messrs. Warde and White, Assistant Surveyors, were transferred from the 1st October 1876, the former to No. 2 Khandesh and Bombay Native States survey, and the latter to No. 8 Mysore Topographical survey, and two Sub-Surveyors, (Sherc Shah and Atma Singh) whose services were no longer required in No. 4 party, were attached to this party from the same date. The strength of this party has been reduced to the special requirements of the work in hand for the current season and for the reduced scale of the survey. It has contributed largely to the Mysore survey. Mr. E. S. P. Atkinson, who had been for some time suffering much from ill health, was allowed furlough for one year from the 12th August 1876.

169. Under the orders of Government, marginally noted* a special survey of the Observatory Hill Estate at Simla, recently purchased by the Government, was commenced after the close of the past

Programme for the next field season.

* No. 797, dated 10th October 1876.

recess season at the beginning of November 1876, on a scale of 100 feet to the inch, with contours at intervals of 10 feet, as called for by the Public Works Department; for this work, the Officer in charge, with two Sub-Surveyors, remained at Simla, where they will continue employed up to the end of December. The rest of the party, under the senior Assistant Surveyor, proceeded at the usual time into the field, to start the regular operations in Rajputana, which, it is hoped, will thus suffer no detention by the additional demands made on account of the sanitation of Simla which is growing in importance daily, and constantly now requiring the services of this survey party. The value and importance of the 24-inch survey recently concluded cannot, therefore, be well over-rated.

170. The triangulation in advance of topography will be extended north into degree sheet XIII (latitude 28° to 29° , longitude 74° to 75°), and a first class series of triangles will be carried along the parallel of 28° from Bikanir eastward to connect with the great triangulation of the Gurhagurh meridional series of the Great Trigonometrical Survey.

171. With the sanction of the Government of India† my recommendation for the scale of this survey to be reduced one-half, or to 2 miles=1-inch, is now being carried into effect, as the country remain-

† *Vide* Revenue, Agriculture and Commerce Department No. 830, dated 23rd October 1876.

ing for survey in Western Rajputana is nearly all sandy desert and water, and provisions being difficult to obtain and expensive to carry, it is therefore very necessary that the survey of this tract should be rapidly completed. The reduced scale is more than sufficient for the representation of all such desert country. The topography will be taken up of degree sheets XI and XII between the lines of latitude 27° and 28° , longitude 73° and 75° , or as much of this area as can be accomplished. If possible, the large scale survey of the city and environs of Jodhpur will be taken up, but it cannot be commenced until after the return of the Native Chiefs from the Imperial Assemblage at Delhi.

172. Since this party was first separated from the Gwalior and Central India survey in 1864, it has completed the topography on the one-inch scale of 34,854 square miles, or an average of 2,681 square miles annually, and has triangulated 40,908 square miles. It has, therefore, accomplished 13 continuous seasons of successful area without a break or drawback of any kind. A large area extending to the confines of Bhawalpore and Sindh remains to be accomplished in this Agency, approximately estimated at 62,000 square miles, but it is for the most part easy, open ground and sandy desert, which can be rapidly surveyed.

173. To Major Walter, Political Agent in Marwar, this department is greatly indebted for the valuable assistance rendered, which is highly appreciated by the Executive Officer.

No. 8 TOPOGRAPHICAL PARTY.

NUNDYDROOG DIVISION, MYSORE SURVEY.

174. The organization and commencement of the topographical survey of the Mysore State, under the orders of the Government of India, by the Imperial Survey establishment, was briefly noticed in paragraphs 180 to 183 of the last printed report.

Districts of Haasan, Tunkur, and Nundydroog of the Nundydroog Division, and Chitaldroog and Kadur of the Nagar Division.

175. During this the first season it was necessary that the skeleton triangulation, as a ground-work for the topographical details, should be carried well in advance and, as has already been reported, two parties of only half the ordinary strength, but sufficient for this purpose, were employed on this duty.

Strength of Party and season's out-turn.

Captain George Strahan, R. E., Deputy Superintendent, 2nd grade, in charge,	} Triangulation	1,740 square miles.	
Mr. F. Kitchen, Assistant Surveyor, 1st grade, ..		1,160	"
" W. Stotesbury " " 1st " ..		1,160	"
" W. W. McNair, Assistant Surveyor; 2nd grade		1,522	"
	Total Triangulation	<u>5,582</u>	square miles.
Sub-Surveyor Krishna Rao,	} Under instruction.		
" Tiruvenkata Sami,			
" Ragavaayangar,			

Triangulation, as a ground-work for the topographical details, should be carried well in advance and, as has already been reported, two parties of only half the ordinary strength, but sufficient for this purpose, were employed on this duty.

176. To No. 8 party has been assigned the eastern and southern half of the Province or the Nundydroog and part of the Ashtagram divisions round Bangalore; and the operations of this party during the past season will be first noticed.

177. The great triangulation of India, *viz.*, the Great Arc series from Cape Comorin to Dehra Dun, and the Madras longitudinal series traversing across the Peninsula from Madras to Mangalore on the parallel of 13° , passed through the eastern and central portions of Mysore, and no difficulty was therefore experienced in obtaining suitable initial bases for the extension of a net-work of secondary and minor triangles over the area which it was desired should first be prepared for topographical delineation, as the revenue and assessment measurement of this portion of the country has been well advanced.

178. The triangulation now completed covers the whole of the central degree sheet VII and the south-west portion of degree sheet VIII, or in all nine and a half standard sheets of 15 minutes of latitude by 30 minutes of longitude, or an area of 5,582 square miles north-west of Bangalore, (*vide* Index map attached.) in which 1,118 points have been fixed and 454 elevations trigonometrically determined by observations at 105 stations, giving on an average 1 point to about 5 square miles of ground and 1 elevation to every $12\frac{1}{4}$ square miles, which for open undulating country is sufficient for all practical purposes.

179. The triangulation was ordered to be made closer in case a larger scale was to be employed; but the scale for the topographical delineation of the country determined on by the Government of India* is one inch to the mile, and this is now being carried out.

180. Captain George Strahan reports as follows in regard to the attempt he is making to fix the village trijunction points; with the object of identifying and defining on his maps hereafter the village boundaries surveyed and mapped by the Mysore Revenue Assessment Survey—

"I had four revenue measures placed at my disposal by the Superintendent of the Mysore Revenue Survey to assist me in identifying village trijunction pillars. For this purpose I instructed them to mark all village trijunctions in a conspicuous manner, so as to be easily recognizable by the plane-tables; and wherever these pillars were found to stand on high ground or in any conspicuous position to distinguish them by a carefully centered pole and brush with a view to their being fixed by theodolite from the neighbouring stations, the others were to be fixed by the plane-table only. This system has not yet had a sufficiently extended trial to admit of my forming a decided opinion upon it, but it seems to me to allow of the village boundaries being inserted with admirable precision from the Revenue Survey records if the position of the trijunction pillars agree, as I confidently expect they will from an examination of the methods employed by that department; if not, a re-survey of the village boundary will be, of course, unavoidable."

181. The Topographical Survey will, of course, incorporate these village boundaries from the Revenue Survey and assessment plans, for which there will be no difficulty, as experience has shewn in the Deccan Surveys; but to adjust or re-survey any discrepant boundaries, wherever any such are discovered, they must be brought to the notice of the Revenue Assessment Authorities, who will deal with them in such manner as they deem proper.

182. The area triangulated during the season is large, and the results obtained excellent, and I have every reason to be well satisfied with all that has been accomplished during this first year in ground, and with the people and language entirely new to the party, under the able management of Captain George Strahan, who expressed himself as follows on the nature of the ground he has to deal with:—

“A minute description of the country and inhabitants of such a well-known Province as Mysore would, perhaps, be out of place in a report of this kind; suffice it to say that, so far the appearance of the ground leads me to suppose, that both triangulation and plane-tableing can be accomplished without any more difficulties than are usually met with in a Topographical survey. There is but little forest to be cleared away for the rays, and there are plenty of low rocky hills suitable for stations. There may be a little difficulty here and there in fixing a plane-table where coconut plantations abound, and considerable care will have to be exercised in the delineation of the undulations of the ground.”

183. Captain George Strahan cordially acknowledges the good help he received from Captain J. McCullagh, R.E., Assistant Superintendent of Survey, in charge of No. 9 or Nagar Division Party, who, from being previously at Bangalore, was able to aid materially in all the preliminary arrangements for the formation of the Native establishments, carriage for the field, &c. for his party.

184. Messrs. F. Kitchen, W. Stotesbury, and W. W. McNair, Assistant Surveyors, who were all transferred from No. 7 Rajputana party, rendered excellent service under many trying circumstances at first starting. Mr. W. W. McNair receives special mention, as usual, for both the quality and quantity of his work, and for his general usefulness and energetic co-operation. The promotion of this able and deserving Assistant is an object I greatly desire to see effected.

185. It was confidently expected that, during the now current season of 1876-77, a considerable portion of the ground triangulated would have been surveyed in detail; and to secure this, the party was raised to the full strength originally intended by the several transfers of Assistants as per margin, thus completing a most effective establishment capable of performing admirable service, the approved estimate for which, including fixed as well as contingent charges, is Rs. 80,000 per annum. In consequence, however, of the famine and drought which unfortunately prevails in Mysore, and more especially in the northern and central districts, it is much feared that very little of the ground, specially prepared for topographical delineation, can be visited at present, and it will be most difficult to carry on any connected operations, whether of skeleton triangulation or of topography, over any part of the Province. The Executive Officer is in close communication with the Local Civil Authorities, as to the best and most practical mode of employing the assistants in taking up detached tracts where the drought may not be so severe, or where anything can be effected.

Lieutenant J. R. Hobday, Assistant Superintendent, 3rd grade, from No. 1 party.	
Mr. R. W. Chew, Surveyor, 2nd grade, from No. 2 party.	
„ R. D. Farrell „ 4th „ „ „ 1 „	
„ A. James, Assistant Surveyor, 1st grade, from No. 4 party.	
„ J. A. Barker, „ 2nd „ „ „ 5 „	
„ P. White, „ 4th „ „ „ 7 „	
„ G. L. Fleming, „ 4th „ „ „ 4 „	

186. As has been already reported to Government in the correspondence as per margin, when it was too late to alter the arrangements which had been completed for the field season, the Chief Commissioner desired that, in consequence of the famine, the transfer of Assistants to the Mysore Survey should be deferred, but most of them were *en route* to Bangalore at the time, and, in consequence of budget estimate arrangements, it was impossible to delay the formation of the full party at Bangalore. Lieutenant J. R. Hobday, Assistant Superintendent on duty with No. 1 Gwalior and Central India Topographical Survey, has, however, been detained temporarily until the close of the present field season, which will relieve the Mysore expenses to some small extent.

Surveyor-General's letter No. ^{F.}₃₄ dated 18th September 1876, to Revenue, Agriculture and Commerce Department.

187. The accounts received up to date of the state of the country are exceedingly gloomy : water and carriage are procured, and provisions transported, with the utmost difficulty and delay. There is but little prospect, under these circumstances, of the usual out-turn of work being obtained. This cannot now be expected, but Captain Strahan is using his utmost endeavours to utilise his establishment to the best advantage, wherever it may be possible to locate them, and to feed them by judicious commissariat arrangements, which demand special care and forethought.

188. The delay in the general survey of the Province thus caused, by circumstances totally beyond the powers of prevention of this Department, is greatly to be regretted; but it is hoped that the prospects may soon brighten, and that the ensuing season may enable us to make up for what we are likely to lose during the current year. The short out-turn expected will, of course, affect the average rate per square mile of the whole survey, and increase the aggregate cost. These are contingencies which cannot be foreseen or guarded against.

No. 9 TOPOGRAPHICAL PARTY.

NAGAR DIVISION, MYSORE SURVEY.

189. This half-party or nucleus of the entire establishment, sufficient for the preliminary triangulation, contemplated to be drafted from the Great Trigonometrical Branch of the Department, as described in paragraphs 180 and 181 of the printed report for 1874-75, was formed as per margin. The distribution of the two parties for the Mysore Province, one from the Great Trigonometrical Branch and the other from the Topographical Branch of the Department, was directed, with

Portions of the Districts of Chitaldroog and Shimoga in the Nagar Division of Mysore.

Strength of Party and season's out-turn.

Captain J. R. McCullagh, R.E., Assistant Superintendent, Officiating 1st grade, officiating in charge,	} Total area triangulated 4,230 square miles.
Mr. L. J. Pocock, Surveyor, 4th grade,	
„ J. W. McDougall, Assistant Surveyor, 1st grade,	
„ E. J. Connor, „ 1st „	

4 Sub-Surveyors under instructions, viz. :—

R. D. Ponnoswami.
T. Venkatramanaya.
T. Narainswami Moodeliar.
V. L. Govindraju Moodeliar.

a view to the relief of both their budget estimates, ordered to be reduced, as alluded to in paragraph 10 of last Annual Report. This contribution, therefore, of No. 9 party has been made under the special orders of Colonel Walker, Superintendent of the Great Trigonometrical Survey of India. Advantage was taken of the presence of Captain J. R. McCullagh, R. E., Assistant Superintendent, Officiating 1st grade, previously serving at Bangalore, to place him in temporary charge of the party, pending the arrival of the Executive Officer nominated by the Superintendent of the Great Trigonometrical Survey for the permanent charge, with early instructions to engage and train the necessary Native establishments, secure carriage, and make all preliminary arrangements for both Nos. 8 and 9 parties, pending the arrival of the Executive Officer of the former, Captain George Strahan, R.E.

190. All this was accomplished in the most satisfactory manner by the end of October, and, after consultation with the Chief Commissioner, it was decided that the party should break ground in the northern portion of the Province, in the Chitaldroog and Shimoga districts, on the borders of Dharwar and Bellary districts, so as to cover with triangulation all the ground appertaining to the Mysore districts above named in the degree sheets II, III and IV, or as much of the country as could be dealt with immediately north of, and in connection with, the triangulation of No. 8 party in degree sheets VII and VIII (*vide* Index map attached).

191. This skeleton triangulation, on which the topography of the ground

is hereafter to be based, it was necessary should be well advanced to keep it ahead in future seasons of the detail operations. The initial sides and elements for it were derived, as in the case of No. 8 party, from the Great Arc and Madras longitudinal series, Great Trigonometrical Survey, and Captain McCullagh reports as follows:—"By mutual arrangement I commenced work with Captain George Strahan in the south-east corner of degree sheet III and reconnoitred and selected a chain of stations along the line, dividing degree sheet III from degree sheet VII, thereby securing continuous triangulation, without overlap or dislocation in the net-work for both degrees," in addition to which a complete network of triangles based on the sides of the Great Arc series, Panghar H. S. to Kaman Konda H. S., & Honúr H. S. to Bandur H. S., and Honúr H. S. to Yeragunta Z. D. S., was extended through the several standard sheets embraced in degree sheets III and IV and the eastern part of degree sheet II, by Captain McCullagh assisted by Messrs. Pocock, McDougall, and Connor.

192. The total area triangulated covers 4,230 square miles, filling up the whole of degree sheets III and IV with part of II down to the limits of the line of junction

(parallel of 14°) of Captain George Strahan's work, thus forming a compact and extensive area of skeleton net-work executed by the two parties, admirably suited for conducting the Topographical detail survey in regular succession, whenever that desirable object may be feasible. Observations were taken at 81 stations, from which 662 points and 366 heights were trigonometrically determined, giving an average of one fixed point in $6\frac{1}{2}$ square miles, and one elevation in $11\frac{1}{2}$ square miles. The greater portion of the ground is more closely covered with fixed points than is absolutely necessary for the reduced scale on which it has since been decided to survey the country, *viz.*, 1-inch to the mile. This, however, is a very good fault; and, owing to the late period at which the final orders were received on this subject, it was unavoidable.

193. The professional tests applied to this triangulation prove that the work has been well and carefully executed, and it is highly creditable to Captain McCullagh

that during this first season, with an untrained establishment, he has effected so good an out-turn. I am much indebted to him for the zeal and excellent judgment with which he has conducted all his duties and given effect to the instructions issued for his guidance.

194. Mr. L. J. Pocock, Surveyor, 4th grade, received from the Great Trigonometrical Survey, is favorably mentioned by Captain McCullagh, all of whose work is declared to be very satisfactory.

195. Four Revenue Measurers were also deputed to this party from the Revenue Assessment Survey, of whose work the Officer in charge reports as follows:—

"The four Revenue Survey Measurers were employed in marking village trijunctions, and a large number have been so marked; but it was such a difficult matter to get them to work in advance of the reconnoissance, and to erect sufficiently conspicuous points, that comparatively few of their points have been incorporated in the triangulation. I hope, however, that their work will come in useful for the detail Surveyors. All these trijunction points of villages must, of course, be definitely fixed, either by the preparatory triangulation or subsequent traversing, the incorporation of the village boundaries being essential from the Revenue Assessment Survey."

196. The Native Sub-Surveyors attached to the party, four in number, were under careful instruction throughout both the field and recess seasons, and have made fair progress in a preliminary knowledge of their duties. In a new country and entirely different language of the people, this has been the more difficult. "The past season," Captain McCullagh observes, "was an unfavorable and unpleasant one; owing to the failure of *two monsoons*, there was a certain amount of scarcity of supplies, forage and water, and the heat was much greater than usual. Sickness in the shape of cholera, small-pox and fever prevailed more or less during the whole season, and grew worse towards the end, causing me continual anxiety for the safety and welfare of the party generally, but I am glad to be able to report no casualties."

197. In consequence of the serious famine and drought in Mysore, no defined programme for the now current season of 1876-77 can at present be well given, but the services of the party will be utilised, in due consultation with the local authorities, in the best manner possible, whenever in detached portions of the country it may be possible for assistants to work. In the portions triangulated in advance this unfortunately will not be the case, so that desultory and unconnected bits of Topography or Forest Reserve Boundary Surveys will have to be taken up, and only a poor out-turn, not practicable to be put together or finally mapped, can be expected.

198. Captain McCullagh states that the prospects for the coming season are gloomy in the extreme; the failure of another monsoon, the third in succession, has caused widespread distress amongst the inhabitants of Mysore and neighbouring districts, and it is extremely doubtful, as already reported, whether it will be possible to undertake the topography of even a small portion of the country which has been prepared.

199. The party has been necessarily raised to full strength by the transfers marginally noted from the Great Trigonometrical Survey, and the Assistants have all joined at the commencement of the field season. The

Major H. R. Thuillier, R. E., Officiating Deputy Superintendent, 1st grade.	
Mr. H. E. Keelan, Surveyor, 3rd grade.	
" H. Todd, Assistant Surveyor, 1st grade.	
" T. Kinney, " " 1st "	
" W. Oldham, " " 3rd "	
" E. W. Lasseron, " " 3rd "	
" J. M. Kennedy, " " 4th "	

The services of Mr. E. J. Connor, Assistant Surveyor, 1st grade, have been transferred to the Great Trigonometrical Survey from the 1st November 1876.

services of Captain (now Major) H. R. Thuillier, R. E., Deputy Superintendent, Officiating 1st grade, appointed to the charge of No. 9 party, have been temporarily retained by the Superintendent, Great Trigonometrical Survey, at Dehra, in deference to the wishes expressed by the Chief Commissioner; but, in consequence of budget provisions to meet the required reductions in the Imperial Survey estimates, he will be compelled to join by the commencement of the ensuing financial year.

200. The estimate for this party is likewise Rs. 80,000 per annum, the same as for the other. With two such effective large parties recruited from the flower of the whole Department, the highest anticipations were formed as to the successful progress and cost of the new survey; but such a calamity as famine could not be foreseen, and we can only endeavour hereafter to make up for what we must obviously lose during the present season. The best energies and most praiseworthy endeavours of the Officers and Assistants employed are devoted to the object in view, and it may be deemed certain that no opportunities will be lost to do the best under the very difficult circumstances in which the Department is placed in the Mysore Province.

H. L. THUILLIER, *Colonel,*
Surveyor-General of India.

SURVEYOR-GENERAL'S OFFICE,
CALCUTTA,
4th December 1876.

APPENDIX.

STATEMENT A.

Shewing progress and present cost of each survey during 1875-76, and general average mileage rates.

SURVEYS.	Final Topography completed, square miles.	Triangulation completed, square miles.	Stations observed at.	Number of points fixed.	Square miles to each point.	Height trigonometrically determined.	Square miles to each height.	Amount of fair copying on the 2", 1", and ½" scales.	Total cost of survey.	REMARKS.
No. 1.—Gwalior and Central India ...	2,892	2,100	33	323	6.5	218	9.6	2,800	60,392	
" 2.—Khandesh and Bombay Native States ...	1,856(a)	3,296	140	507	6.5	340	9.7	1,500(a)	56,893	(a).—Scale 2"=1 mile and 1"=1 mile.
" 3.—Central Provinces and Vizagapatnam Agency ...	3,319(b)	2,400	14	150	16.0	124	1.93	10,190(c)	53,454	(b).—Scale 2 miles. =1 inch. (c).—Includes re-drawing of old maps
" 4.—North-East Division, Central Provinces ...	2,260(d)	...	7	13	...	8	...	2,260(d)	53,721	(d).—Includes Forest Reserve Surveys on 4" scale.
" 5.—Bhopal and Malwa	3,266	3,830	70	456	8.4	423	9.0	3,370	62,005	
" 6.—Khási, Gáro, and Nágá Hills ...	1,532(e)	3,966	24	99	40.1	150	26.4	720	55,015	(e).—Scale 2" ½' and 1" ½' to the mile.
" 7.—Rajputana ...	4,063	3,838	48	290	13.2	212	18.1	4,520	44,852	
" 8.—Nunddroog Division, Mysore ...	...	5,582	105	1,118	5.0	454	12.3	...	42,913	Mysore Triangulation, total cost Rs. 81,356.
" 9.—Nagar Division, Mysore ...	...	4,230	81	662	6.4	366	11.6	...	38,443	
	19,188	29,242	522	3,618	...	2,295	...	25,360	4,67,688	

N.B.—The total cost, exclusive of cost of triangulation in Mysore, is Rs. 3,86,332, from which an average rate of Rs. 20-2-3 per square mile is obtained for the season's final topography.

STATEMENT B.

Professional results and value of the seasons' triangulation and average number of plane-table station fixings of detail survey, season 1875-76.

SURVEYS.	NUMBER OF TRIANGLES.			TRIANGULAR ERRORS IN SECONDS			MEAN DIFFERENCE IN COMMON SIDES IN INCHES PER MILE.			Average plane-table fixings in each square mile of detail survey.	Number of linear miles of check lines run.	REMARKS.
	1st class.	2nd class.	Tertiary & intersected points.	1st class.	2nd class.	Tertiary.	1st class.	2nd class.	Tertiary.			
No. 1.—Gwalior and Central India ...	...	99	497	...	5.4	...	1.7	4.6	10.5	115.3	
" 2.—Khandesh and Bombay Native States ...	23	227	634	5.0	6.3	1.4	4.2	8.6	{ 7.0(a) 19.0(b) }	51.0(a)	(a) On 1" scale. (b) On 3" "	
" 3.—Central Provinces and Vizagapatnam Agency ...	...	56	299	...	11.2	...	1.4	{ 10.8(c) 31.2(d) }	2.1	...	(c) Tree signals.
" 4.—North-Eastern Division, Central Provinces ...	...	...	20	...	...	...	...	...	{ 9.3(e) 38.0(f) }	165.4(e) 6.3(f)	(d) Uncleared peaks. (e) On 1" scale. (f) On 4" "
" 5.—Bhopal and Malwa	16	80	456	3.6	3.7	0.8	1.4	4.2	6.7	234.5		
" 6.—Khási, Gáro, and Nágá Hills ...	...	18	720	...	16.5	...	13.3	37.7	{ 10.6(g) 0.2(h) }	...	(g) On 2" " (h) On 4" "
" 7.—Rajputana ...	...	94	559	...	5.1	...	1.0	6.0	4.7	...	
" 8.—Nunddroog Division, Mysore ...	...	171	1,756	...	5.2	...	4.1	8.8	...	...
" 9.—Nagar Division, Mysore ...	...	107	1,211	...	5.4	...	2.1	10.2	...	...
	39	852	6,161	...	...	...	...	...	{ 38.0 on 4" 14.8 on 2" 7.6 on 1" 1.2 on ½" }	572.5	

STATEMENT C.

Comparative results and cost of Seasons 1874-75 and 1875-76, and general average mileage rates.

	Final Topography, square miles.	Triangulation, square miles.	Number of stations observed at.	Number of points faced Trigonometrically.	Heights determined Trigonometrically.	Cost.	Rate per square mile.	REMARKS.
Season 1874-75 ...	21,731	22,644	459	2,466	1,494	Rs. 4,14,344	Rs. As. P. 19 1 0	7 Parties. Ditto.
„ 1875-76 ...	19,188	19,430	336	1,838	1,475	3,86,332	20 2 2	
Differences ...	-2,543	-3,214	-123	-62	-19	-28,012	+1 1 2	
Mysore Triangulation 1875-76 ...	...	9,812	186	1,780	820	81,356		No Topography during this the first season.

STATEMENT D.

Abstract cash accounts of monies received from 1st January to 31st December 1876.

Dr.

Cr.

ITEMS.	Amount.	Total Amount.	ITEMS.	Amount.	Total Amount.
	Rs. A. P.	Rs. A. P.		Rs. A. P.	Rs. A. P.
<i>To Map-sale Account.</i>			<i>By Transfer Account.</i>		
Amount received from sundries ...	1,731 1 0		Amount paid to General Treasury, vide No. 248, dated 2nd February 1876 ...	397 5 6	
Sales by Mr. W. Bull, successor to the Punjab Printing Company, Lahore, for 1875-76 up to 30th November ...	354 0 6		Amount paid to General Treasury, vide No. 470, dated 1st March 1876 ...	796 8 5	
Sales by Curator of Government Books, N. W. P., Allahabad, for 1875-76 ...	148 9 9		Amount paid to General Treasury, vide No. 694, dated 1st April 1876 ...	277 4 0	
Sales by Messrs. Higginbotham & Co., Madras, for 1875-76, up to 30th November ...	78 7 0		Amount paid to General Treasury, vide No. 804, dated 17th April 1876 ...	3,041 14 6	
Sales by Messrs. Thacker, Vining & Co., Bombay, for 1873-74 and 1875 ...	503 14 0		Amount paid to General Treasury, vide No. 1110, dated 6th June 1876 ...	232 0 4	
Sales by Curator of Government Books, Central Provinces, Nagpur, for 1874-75 ...	391 14 5		Amount paid to General Treasury, vide No. 1255, dated 6th July 1876 ...	38 0 0	
Sales by Messrs. Thacker, Spink & Co., Calcutta for 1875 ...	3,041 14 6		Amount paid to General Treasury, vide No. 1418, dated 11th August 1876 ...	233 0 6	
Sales by Messrs. Cotton and Morris, Simla ...	50 14 0		Amount paid to General Treasury, vide No. 1476, dated 24th August 1876 ...	53 0 4	
		6,300 11 2	Amount paid to General Treasury, vide No. 1518, dated 4th September 1876 ...	8 8 0	
			Amount paid to General Treasury, vide No. 1621, dated 9th October 1876 ...	554 2 0	
			Amount paid to General Treasury, vide No. 1745, dated 7th November 1876 ...	161 8 6	
			Amount paid to General Treasury, vide No. 1973, dated 8th December 1876 ...	198 8 0	
			Balance in hand to be paid to the General Treasury next year ...	309 7 9	
					6,300 11 2
TOTAL ...	...	300 11 2	TOTAL ...	...	6,300 11 2

H. L. THULLIER, Colonel,
Surveyor General of India.

Memorandum showing the total amount recoverable from the Map-sale Agents for sales up to 30th November 1876.

	Rs. A. P.
Messrs. Thacker, Spink & Co., Calcutta ...	2,251 11 0
„ Thacker, Vining & Co., Bombay ...	171 3 0
The Curator of Government Book Depot, Central Provinces, Nagpur ...	48 14 8
TOTAL ...	2,471 12 8

APPENDIX.

Extract from the Narrative Report of CAPTAIN C. STRAHAN, R.E., Deputy Superintendent, in charge No. 1 Topographical Party (Gwalior and Central India Survey).

The country surveyed in detail lay in the States of Gwalior, Pratabgarh, Tonk, Udéypur, and very small portions of Holkar and Jaura.

Remarks on the country plane-tabled.

The cantonment of Neemuch was approximately in the centre, and here I formed a depôt, where I left all heavy and unnecessary baggage when I wished to travel lightly amongst the almost roadless forests to the south, or in the rugged hills to the north. Immediately around the station the country, which mostly belongs to Gwalior, is very open and highly cultivated, opium being the most prevalent and the most remunerative crop. The cantonment itself is situated on rising ground of a red gravelly nature, and is almost 1,600 feet above the sea, having two very small streams flowing past it, one to the north and one to the south, and which join close to the old city of Neemuch, outside the cantonments. A fair-weather road passes through, connecting it with Nusseerabad to the north and with Indore to the south. It is neither metalled nor properly bridged; and as in numerous places it passes over black cotton soil, it becomes impassable during the rains for any wheeled vehicles, and very bad travelling for any animal at all. The consequence is, there is no bullock train nor any public means of communication of any sort between Neemuch and the rest of India, except the post (carried by runners) and the telegraph. As Nusseerabad and Indore are each about 150 miles from the station, it makes it one of the most inaccessible military stations in India. This will be remedied by the State Railway, which is said to be in progress, but there are no immediate signs of it as yet, beyond the proposed line surveyed by the engineers. Ten or eleven miles to the north of the cantonment, the country is a mass of hills, all running north and south, forming narrow confined valleys parallel to each other. The two highest points amongst these hills are just over 2,000 feet above the sea, the average height being about 1,850. The three scarps, described in my report of last year, running almost due east and west, gradually become broken up and merge in these ranges of hills, forming a rather complicated hilly mass. The drainage here is necessarily all north or south, that to the north flowing direct into the Berach, and that to the south joining the small stream known as the Gameri, which, flowing to the west, skirts round the outside of these hills and, turning their western flank, joins the Berach close to Chittor: the course of the Berach is to the north-east, and it eventually flows into the Banas, a tributary of the Chambal.

The only towns within these hills worth mentioning are Bijepur and Jat. The first-named belongs to one of the smaller Chiefs of Udéypur; it is situated in one of the largest valleys, and the ground round about is cultivated as much as the confined space will allow of. There is a large sheet of water to the north of the town formed by a massive stone dam. The town of Jat is situated below and at the end of the central scarp extending from Kuakhera westwards, where it bends to the north and becomes merged in the parallel ranges alluded to. It is famous for the amount of iron-ore smelted there, the ore being found in the adjoining hills; it belongs to Gwalior. Bassi, a small town, is situated at the foot of the northern slopes of these hills, and belongs to a Thakur of Udéypur: this place falls within the Rajputana work. Jawad, the largest of all the towns in this neighbourhood, is to the south of the hills, about nine miles due north of Neemuch, and consequently about two miles from the foot of the hills. It is a large walled city, and has a post-office and dispensary; but it is not remarkable in any way. It, together with Neemuch, gives the name to the Subhat of Gwalior, in which it is situated. The Subha resides in Neemuch, but the district is generally known as the Neemuch Jawad Subhat. Along the Gameri river are several small towns or large villages, in most of which great quantities of cloth are dyed. Atano, one of these, is the residence of a Thakur, whose high white palace forms a conspicuous object in the plains.

About four miles to the west of these hills, on an outlying steeply scarped hill, is situated the celebrated fort of Chitor. It stands 500 feet above the plain, and is upwards of three miles long, and nearly a third of a mile in average width. The town of Chitor lies immediately at the foot of the western slope of the hill; it is walled and entirely commanded by the fort above. The main entrance to the fort is from about the centre of the town. The Gameri river flows past the hill on its west, at a distance of one-third of a mile from the city wall; the junction of the Gameri and the Berach is about a mile due north of the fort. As a large-scale plan of this place is to be made hereafter, I need not enter into minute details into it now. To the west of Chitor the country is open, but by no means highly cultivated, villages being far apart, and the inhabitants, comparatively speaking, few in number; in marching across it large tracts of waste land are met with. Isolated hills and small ridges of rock crop up all over this part of the country, making it a very easy country indeed for surveying. South-west of Chitor the hills are higher and covered with jungle, forming a little distinct range, or rather series of ranges, for here too they are all more or less parallel and run north and south.

The scenery in these hills is in many places very picturesque, principally due to a very white rock, which crops up, forming bold, prominent peaks standing above the jungle. Badesar, the residence of an important Thakur of Udéypur, is situated in the western part of these ranges.

To the south of the Badesar Hills the country is again more open, but the same straight ridges intersect the country, although, as a rule, they are of no height. Near the town of Nekum the white rock alluded to forms two fine bold hills, which are very picturesque: on one of them is situated the hill station of Nekum. In consequence of the saw-like nature of the summit of the ridge, and the extreme steepness of both sides, it was not without some difficulty that I could get the instrument up to the top. All around here the State boundaries caused some trouble, as Gwalior, Udéypur and Tonk are very much intermingled. The drainage of all the country hitherto spoken of has been northerly into the Banas, and consequently eventually reaching the sea through the Ganges; but to the south-west of Neemuch we find the drainage to be southerly and flowing into the Gulf of Cambay. At a distance of about fifteen miles from the station a very wild country is entered, the jungle being higher and thicker than any I have met with in Rajputana or Central India. The ground lies low, the average height being not more than 1,250 feet above the sea; the plateau on which Neemuch is situated being 1,600 feet. This low-lying land is bounded on the east and north-east by ranges of hills, all more or less densely covered with forest. Those to the east stand well above it, and on these hills are situated Partabgarh and Damotar: the latter city is absolutely on the water-shed of India, and Partabgarh is only $1\frac{1}{2}$ miles from it. Through the range to the north-east flows the River Jakum, which collects all the drainage of this part of the country. It has a steep, rocky bed, and as numbers of small streams join it, it soon becomes a very fair-sized river with a strong current.

From Bara Sadri, the residence of a Thakur of Udéypur, which is situated on the plateau to the north, a bold, high and complicated range of hills runs south-east, ending abruptly over the Jakum: these form the western boundary of this low, broad valley, which to the north rises gradually up to the level of the plateau without any abrupt slope anywhere. These hills are no doubt part of the Vindhya Range, but as they begin to merge into the Arvali Range, the distinct line of ghâts which they form across the country to the east is somewhat lost. As we go on still more to the west, they became lost altogether, and the long parallel ranges of the Arvalis alone remain; but still the some great descent from the plateau of Rajputana, down to the level of the country through which the Rivers Nerbudda and Mahi flow, can be traced by the trigonometrical heights in the valleys. The Jakum River, alluded to above, after being joined from the north by the Karmai River, joins the Mahi to the south of our work. Its general direction is south-west, and throughout almost its whole course it flows through nothing but rock and jungle. The scenery in places along it is very striking.

The inhabitants are very few and far between, and are almost entirely Bhils. They scarcely attempt cultivation, living principally by robbery and cattle-lifting. They were on the whole very well disposed towards us; but none of our native followers could ever go anywhere in this country without a Bhil guide—not only as a guide through the intricate parts of the forest, but also as a safeguard against robbery from the other Bhils. Game is not quite so plentiful as I should have imagined, but still there is a fair sprinkling of tigers. Bears are also to be met with, but sambar and all sorts of deer are by no means very numerous, principally, I fancy, owing to the sporting propensities of the Bhils.

Towns, forts, &c.

The principal towns met with this year are as follows:

In Gwalior, Neemuch, Jawad, Jat, Jiran and Nekum; *in Udéypur*, Bara Sadri, Badesar, Chota Sadri, Chitor, Bijapur, Sewan; *in Tonk*, Nimbahera, Kanoj; *in Pratabgarh*, Pratabgarh, Deolia and Damotar.

Of *Neemuch* and *Jawad* I have already made some mention. The city of Neemuch is outside the cantonment boundary. To the south-east a small mud fort is built on a low hill in the centre of the city: it is the residence of the Subbah of the district.

Jawad is a large town and surrounded by a good masonry wall, but there is no inner keep.

Jat is famous for the amount of iron-ore smelted there. It is defended by a stone wall cemented with mud, and a small fort similarly built.

Jiran is also a walled town, and on the small hill above it is the remains of a small masonry fort, which was destroyed by our troops during the mutiny. To the west of the town is a large lake.

Nekum is a good-sized town, protected by a masonry wall, but without any fort. It is picturesquely situated at the foot of a bold hill rising precipitously above it, and surmounted by a very conspicuous temple.

Bara Sadri and *Badesar* are each the residences of two of the powerful Thakurs or Raojis of Udéypur. They are both surrounded by stone walls, much out of repair. Each has a conspicuous palace, and each is defended by a small fort on the hill above the city; that at Bara Sadri being almost a complete ruin. They are neither of them remarkable in any way.

Chota Sadri is a walled town. Great quantities of wood and bamboo are brought from the jungles to the south and are sold here.

Chitor, of historical renown, is immediately at the foot and to the west of the hill on which Chitorgarh is situated. It is a large town but greatly in ruins now, although still possessing a good bazaar.

Bijepur is a small town, the residence of a Thakur of Udéypur, and has been already noticed.

Sawan, a jaghir belonging to the Raoji of Salumbar, is a good-sized town, with the remains of a stone wall round it; but it is now quite ruined on one side.

Nimbahera is a large walled town belonging to Tonk. It is situated on the high road from Neemuch to Nusseerabad, and possesses a post-office and a dák bungalow.

Kanoj, also in Tonk, is a small fortified town on the north of the range of hills near Badesar. The fort and walls are all more or less in ruins.

Pratabgarh, the capital of the State of that name, is situated on a promontory formed by the junction of two precipitous ravines, one protecting the western face of the city and the other the southern. The extreme angle is occupied by a fort, which is quite separate from the city; it is now nothing more than a ruin. The city is itself defended by a stone wall, but this is not kept in repair, and is becoming dilapidated. Inside, the streets are very narrow and very dirty—dirtier even than is usually the case in native cities. The Raja wisely resides outside the city to the east-south-east, where he has built himself a bungalow. The old capital of the State is *Deolia*, finely situated on the edge of the ghâts, overlooking the low jungle tract of country through which the Jakum river flows. The Raja having left Deolia, the town is rapidly going to ruin, which seems a great pity, as it is full of picturesque old buildings surrounding the old palace, part of which has already fallen to the ground. The view from the top of the palace is very grand. It is about eight miles due west of Pratabgarh.

Damotar is a town only remarkable as being the residence of a Thakur of Pratabgarh. There is a fair-sized tank here.

A general description of the hills met with has already been given: of passes through the hills to the north of Neemuch there are several

Hills and passes.

going north, but the country may be looked upon as almost inaccessible, except to men on foot, from east to west. The best road through this mass is that from Neemuch, through Jawad, to Bijepur, and out at the north by Bassi. The road is very stony amongst the hills, but otherwise is good, offering no great difficulties anywhere. Almost all the other valleys have roads along them, but this is the only one which can be called a regular through route. The ghâts over Bawal can be ascended by laden camels with a little difficulty from Mendhi, and again two or three miles up the valley, and beyond this again at Sukdeoiji.

This last-named place is a celebrated temple, built immediately under the precipice at the end of a small narrow valley. Near the temple is a

Shrine of Sukdeoiji.

curious horizontal cleft, in the rock, from which water constantly trickles. Inside this cleft, which can be entered, but in which you cannot stand upright, is a small shallow pool of water, slightly warm. Certainly in the cold weather both the atmosphere and water in this place are manifestly warmer than that outside. The vegetation below the temple and precipice in this narrow valley is very pretty and refreshing to the eyes, more especially as all around it the country is very arid. An annual fair is held here, and in former years occasionally some religious fanatic was induced to throw himself off the precipice above on to the plateau of rock on which the temple is built, a height of 60 or 70 feet, under the impression that if he were killed, he would go straight to heaven, and if not, that he would be blessed with all things necessary to happiness in this world. My guide could remember (when he was a boy) having seen a man sacrifice himself in this way. Of late years this practice has been stopped by our Government.

The best passes through the hilly forest country south of Neemuch are from Pratabgarh to the

Passes south of Neemuch.

south-south-west to Dariawad, another from Damotar, which joins this last-named route, and the high road from Pratabgarh to Sohagpur to Banswara to the south. The pass down this last falls out of our work, and I have never seen it, but it is a good deal used, I believe; it is the continuation of the route from Neemuch to Pratabgarh. The other two roads are of no great importance as regards means of communication between well-known places, but are worth mentioning as the best known roads down the ghâts. They are both pretty easily accessible for laden camels, but carts are unknown in the country below. Through the jungle the roads become very narrow, and guides are almost indispensable. There is also another way by which the hills are to a great extent avoided from Chitakhara, through Gopalpura and Chenpura, and thence down a small rocky valley into the wooded country below. The descent here is slight, but it is a mere footpath over rocks, the small stream at the bottom of the valley being constantly crossed and re-crossed. From the village of Barol there is another and a better road, which might with comparatively little labour be made into a good means of communication; it enters the low-lying country near the ruined village of Seora. From Chota Sadri to the north of Barol the hills are much smaller and form a ridge of about 200 feet in height, dividing the cultivated country around that city from the jungle. Over this ridge are two very fair roads, one due east leading to Bara Sadri, and the other to the south-west, principally used by wood-cutters. These are about the best roads by which to pass the hills dividing the plateau of Neemuch from the jungly valley of the Jakum, but in many cases they are lost down below; consequently only being roads by which grass and wood are brought up for sale.

From Bara Sadri to Pratabgarh is a good road (for that country), passing through Dhaulapani and Bara Warda, and up the ghâts to the north-west of Damotar. In parts it is a mere path, but still it is a well-defined tract, and the ascent up the ghâts is good. From Damotar to Pratabgarh is all flat open country.

Report of LIEUTENANT J. R. HOBDAY, B.S.C., *Assistant Superintendent, No. 1, Topographical Party, on the ground triangulated, Season 1875-76.*

The country triangulated this season lies entirely in the State of Meywar, and was confined

General description of country. to the hilly tracts of the Arvali Range, extending from the high plateau of Gogunda (about 2,750 feet above sea-level) to the valley of the Som river in the south, which divides the Salambar and Dongarpur States, and whose bed gives an elevation of about 650 feet. The general shape of the Arvalis is that of a segment of a circle; the hills to the north running in a general north-easterly direction, gradually curving round to the south, until they take a direction approximately south-east, where the ridges become more broken and detached. So close and continuous are these parallel ranges, that the work was frequently delayed by the necessity of making tedious detours before a practicable pass for the camp could be found. The grandeur of the forest-clad Arvalis, attaining an elevation exceeding 4,000 feet, the stupendous size and beauty of its artificial lakes, the picturesque appearance of its chief cities and shrines, unite to render Meywar one of the finest and most attractive spots in the continent of India.

In this country there exists a sort of feudal system, the Maharana at Udéypur being supreme, and the barons or Chiefs holding estates and lands of various rents, as distinguished from the "khalsa" or fiscal land, which strictly appertains to the reigning sovereign. These Chiefs were formerly divided into two grades of 16, and 32 respectively, but these numbers have considerably increased, I believe, of late years. The estates of the following nobles or Raojis came within the work, *viz.*—Bedla, Salambar, Dilwara, Gogunda, Kotaria, Bansi, Bhendar, Kanor, Koraba, Dariawad and Bamora. On all matters of importance these Chiefs assemble in durbar and form the council of the sovereign, giving their support. For a fixed number of months they annually, and in routine, remain in personal attendance on the Maharana at the capital. In cases of transgression their lands are confiscated, becoming "khalsa,"—a punishment apparently much dreaded, as a considerable sum of money becomes requisite for their re-attainment.

The roads from Neemuch to Udéypur and from Udéypur to Khairwara are metalled and bridged, allowing of any traffic. A branch road of about 4 miles has also been made from the old Residency (some 10 miles from Udéypur on the Neemuch road) to Naharmagra (or Tiger Hill), a shooting-box of the Maharana's, where periodical battues create great havoc amongst the wild pigs which abound in the vicinity. To the north carts can approach from the plains of Meywar as far as Nathdwara. Elsewhere the roads are mere footpaths, and in the hilly tracts these tracts are invariably carried along the rocky beds of tortuous rivers and water-courses. In fact, one may march along one of these the whole day seeing nothing but the sky overhead, the view being entirely shut out on either side.

The principal rivers are the Banas, the Berich, and the Som, the sources of all three originating in the Arvalis. The two first empty themselves into the Chambal, whilst the last-named joins the Mahi, which eventually flows into the Gulf of Cambay. The Banas rises about 3 miles south-west of the old fortress of Kamalgarh, flowing in a southerly direction until it meets the Gogunda plateau, when it suddenly turns eastwards, cutting through the outer ridge of the Arvalis, and in graceful bends reaches Nathdwara, where it skirts the base of the low hills to the north of that place, and finally out of the limits of this survey to the north. The bed of the river is everywhere stony, and fords are plentiful in consequence. Before this river emerges from the Arvalis, I believe it is generally known by the name of Bhetki. The Berach is formed by the leakage from the Peshola and Udeysagar Lakes, the drainage into the latter being termed the Ar. It flows in a general north-easterly direction towards Chitorgarh, and finally joins the Banas. The source of the Som will be included in next year's work, in the very heart of the Arvalis. A very small portion of this river came under my notice in the Salambar State, where it flows in an easterly direction, suddenly turning south near the village of Babrana, and eventually emptying itself into the Mahi near the large village of Sabra.

Udéypur, the capital of Meywar, was formed by Rana Udéy Sing in the beginning of the 16th century, who, after being forced by Akbar to abandon Chitor, retreated into the Girwa (circle) valley and raised a dyke, thereby forming the Peshola Lake; and on the adjacent hills he built a palace called "Nauchoki," around which edifices soon sprang up and formed a city, to which he gave the name of Udéypur. The elevation of this valley is about 2,000 feet above sea-level. This city is certainly now one of the most striking in the world, and on the occasion of the late Governor-General's visit, when I happened to be present, the palace, city and lakes were all illuminated, rendering a most pleasing spectacle as we emerged from the Debari Pass. The Maharana's palace stands on a low ridge, on either side of which dykes are raised, thus forming the Peshola Lake. It is built of granite and marble of rectangular shape, rising at least 100 feet from the ground, crested by graceful towers and minarets. A new palace has of late years been built to the south, of a modern style of architecture, which, in my opinion, has greatly enhanced the general beauty of the city. The water palaces of Jagniwās and Jagmandir, built on islands in the Peshola Lake, assist considerably in the magnificent landscape afforded. They were built about the year 1700 by Rana Jagat Sing, and are entirely constructed of marble, sometimes inlaid with mosaics. The walls are here and there covered with historical paintings and medallions, and the windows formed of various colored glass. Flower gardens, baths, fountains, orange and lemon groves, shaded by tamarind, palmyra and plantain trees, exist

on these water residences, where in former years the reigning monarch and his Chiefs used to pass their hours of recreation amidst the cool breezes which pass over the lake. In March, at the approaching vernal equinox, I here witnessed the festival of Gaugor in honor of Gouri, the goddess of abundance: certainly one of the most imposing spectacles I have ever seen. A week or so prior is passed in preparations, and every family, more or less, during this time is busily engaged in constructing its image of the goddess, which is eventually carried and placed on the edge of the lake. At length the day arrives, and the streets everywhere become crowded to a degree with spectators—men, women and children—all dressed in robes of every conceivable hue. The Chiefs, with their respective retinues, mounted on richly-caparisoned elephants and horses, proceed to the Gaugor Ghât and take their seats in the royal barge there moored. These nobles are attired in their national costumes, consisting of turbans and jackets made of the most gorgeous silks of variegated colors, and the lower part of their dress resembles petticoats. Then dancing girls arrive, and eventually a salute is fired from the summit of the hill south of the city announcing the Maharana's departure from his palace. The procession then, after passing through the streets, arrives at the ghât, and the Maharana is conducted to a lofty seat situated in the stern of the barge, whilst the dancing girls gyrate round the image of the goddess placed on the water's edge. As darkness sets in the lake becomes suddenly illuminated, and after the usual ceremonies are completed the goddess is taken up and conveyed to the palace, when the royal barge is unmoored and rowed round the margin of the lake, the Maharana and the Chiefs visiting, in turn, the image of the goddess placed there. The whole ceremony terminates in a grand display of fireworks.

The city of Udéypur is surrounded by a masonry wall, some portions of which are in a very bad state of repair. There is a wet ditch running round outside the northern and eastern portions of the wall. At a distance of a few hundred yards from the walls there exists a chain of fortresses defending the different roads leading to the city, built on commanding knolls. There are several gates known by such names as Surj Pal, Omli Pal, &c., constructed in the walls on the northern, eastern and southern faces. Amongst other places worthy of notice in the Girwa valley, the ancient and ruined city of Ar deserves attention as containing the burial-ground of all the Ranas of Meywar ever since Udéypur existed. This cemetery is situated about 3 or 4 miles east of Udéypur, on the banks of the Ar river, which flows into the Udeysagar. The entrance is by a gateway on the eastern face of a low masonry wall surrounding it. So thickly is it crowded with tombs and vaults, that little space is left for the observer to pass between them. The size and elegance of these structures is very striking, some of them being at least 30 or 40 feet in height and built entirely of marble from the quarries of Kaukrouli. The situation of Udéypur renders it important in a strategical point of view, so entirely is the Girwa valley shut in by the almost impassable barriers of the Arvalis. From the plains of Meywar to the east the only practical passes are *riâ* Dilwara and Chirwa on the north, and through the Debari gate on the Neemuch road. Again, to the south-east, access from the plains of Salambar and Dongarpur can only be attained by the Keara Pass, and from the south by the metalled road from Khairwara. Advantage has been taken of the natural strength of the position on several occasions,—perhaps the most notable being the skilful defence made by Rana Raj Sing in the early portion of the seventeenth century against Akbar's forces, when success was mainly gained by the former's foresight in making every use of the natural obstacles at hand.

The city of Salambar is of small importance, beyond being the residence of one of the most powerful Chiefs of Meywar. It is surrounded by a masonry wall, and a tolerable sized artificial lake is formed on the west. To the north and east it is surrounded by lofty and picturesque hills, from which a capital view of the Debar Lake can be obtained. From the Girwa valley to Salambar one long unbroken ridge of the Arvalis, over 30 miles in length, forms a barrier which precludes access from north to south. About 8 miles to the south-east of Salambar is a very prominent rock known by the name of Dholagarh or Dholamagra (white fort or hill), owing to its white appearance caused by the quartz rock of which it is composed.

The town of Dilwara lies about 12 or 15 miles to the north-east of Udéypur, and is also the residence of another of the feudal Chiefs of Meywar, and the brother of the Râjî of Bara Sadri. It is picturesquely situated in a narrow defile of the Arvalis, guarding the pass from the plains eastward. The palace is constructed on a small hill overlooking the city, with battlements around it. Owing to the heavy rains and floods during the late season, the city was almost entirely under water, causing great damage and loss as well as misery to the inhabitants. The bastions around the palace also have been much destroyed. On a high pinnacle of the Arvalis, a mile or two south of Dilwara, stands a temple, which is visible from great distances, chiefly owing to the composition of the precipitous rock upon which it is built, the quartz being very conspicuous under the rays of the morning sun. From the summit of the precipice, bullocks are frequently thrown down as sacrifices, and, according to tradition, human beings and elephants were formerly treated in a similar manner.

The Debar Lake lies about 18 to 20 miles to the south-east of Udéypur, and is formed by

Lakes.

a dam raised across a narrow gorge of the Arvalis, thus blocking up the channel of an ever-flowing stream. This dam was constructed about the year 1850 by Rana Jai Sing, when exiled and forced to leave his capital, and the lake is still sometimes known as Jai Sagar or Jai Samundar. The length of this lake is about 8 to 10 miles east and west, and averages about a mile in breadth, and cannot be under 25 or 30 miles in circumference. The elevation of the lake is about 960 feet above the sea. To the south rise the Arvali, 1,000 feet above the level of the water; whereas the northern margin is studded with pretty little hamlets, mostly

peopled by fishermen. Small forest-covered islands crop up in the midst of this vast sheet of water, adding greatly to the beauty of, perhaps, the largest artificial lake in the world. The dyke is entirely made of massive stones, forming steps to the water's edge. "Bara daris" are built at either extremity, and a large temple in the centre, with small "chattris" at intervals between; these are only half finished and in a state of decay. Abutments run out from the dam at intervals between the steps, upon which stand beautifully carved elephants facing the water with their trunks uplifted over their heads. The length of the dam is 625 feet, and breadth 40 feet. At a distance of 175 feet in rear a backing wall is constructed. This interval between apparently was only partly filled in with earth and rubble; yet the dam seems to be as strong as ever, and not a drop of water escapes. For fear of the damage and loss of life which would ensue were this dam ever to break, the present Political Agent has determined upon the filling in of this space between the dam and backing wall, as well as the repair and finishing of "bara daris" and temples; and when I visited the place, several thousands of men and women were busily employed on this task. The repair of this stupendous and magnificent undertaking will obviously prove of great benefit to the populace, who utilise its waters for purposes of irrigation. I must here mention that there is an outlet in the south-east corner of the lake, from which a rapid stream flows into the Som. A palace is built on the crest of the hill on the eastern side of the dam, and another is erected also by Rana Jai Sing on another hill to the north, and from which an entire view of the lake can be obtained. This second palace was the abode of the Rana's favorite queen. The Udéysagar was formed by Rana Udey Sing a few years before that monarch fixed upon Udéypur as his capital. The dam is thrown across a narrow gorge in the most eastern ridge of the Arvalis, about 2 or 3 miles south of the Debari Pass. It is constructed of massive blocks of stone, and of great thickness and strength. The circumference of the lake must be from 10 to 12 miles. The main drainage into the lake is known as the River Ar, and the outlet or leakage is then termed the Berich. The hills around, of every variety in shape, and the villages and rich cultivation in the valley, produce a very picturesque effect.

The Peshola Lake has already been noticed, and needs no further remarks. Amongst others worthy of mention, a very large lake exists near the village of Bitala, about 3 miles or so east of Dilwara; as also one near the village of Bamnia, about 6 or 8 miles south of Salambar.

Nathdwara is situated about 22 miles north-north-east of Udéypur, on the right bank of the Banas river. It is shut out from view from the north, east and south by a low, irregular

Shrines.

cluster of hills, the Banas flowing round the base of these to the north. This shrine is famous owing to the supposition of its containing the same image of Krishna as was worshipped at Muttra, and on this account thousands and thousands of pilgrims, mostly from Rajputana and Guzerat, annually flock there to render their offerings; and the wealth there amassed must be in consequence very considerable.

The shrine of Eklungji is situated in a narrow defile, about 2 miles due south of Dilwara. A very picturesque lake, surrounded by numerous ancient temples in ruins, is formed at an exceedingly high elevation by a very broad and solid stone dam, at the western extremity of which there is a massive portal guarding the entrance to the shrine, which is approached by a road on either side of which there are lemon groves and sweet-scented flowers, &c. The town and shrine is situated in the valley some 300 or 400 yards from the lake and several hundred feet below the level of its waters. Within the walls of the town is an immense temple, built of white marble and containing a brazen bull of life size, where the worship of Mahadeo is practised. When passing through the town, the high priest, a venerable-looking old man, with a very fair complexion, clothed in his sacerdotal robes and wearing a high mitre on his head, appeared on the balcony of his temple and gave me his benedictions. The reigning Maharana of Meywar is styled the Dewan of Eklempji, and periodically pays a visit to the shrine for purposes of devotion.

As the triangulation lay in the wild hilly tracts of Meywar, I was chiefly brought in

Inhabitants.

contact with the aborigines or rude tribes which inhabit those parts. These consist of the Bhils and Menas, whose appearance, manners and customs appear so similar, inasmuch as I failed to distinguish any dissimilarity between them, beyond the fact of there existing an irregular boundary between the parts of the country they frequent. If a line were drawn from the Udéysagar down the drainage of the Keora Pass until it meets the Som, the tribes found eastward of the line style themselves Menas, and those westward, Bhils. This line, however, is only approximate. Their villages, termed 'pals,' are found either in secluded valleys shut in by the towering heights of the Arvalis, or else in dense forest tracts. Their habitations consist of rude grass and wood huts; each individual one built apart, and at a considerable distance from its neighbour, so that a village or "pal" frequently extends for several miles in length. These wild tribes are dark in complexion and of small, though compact stature. They shave the forepart of the head, leaving the remainder of the hair behind to grow to a considerable length. A cloth round the waist generally constitutes the whole of their apparel. Their principal occupations consist in cattle-lifting and wholesale plundering, and the intricate nature of the country they inhabit greatly favors their predatory habits; and I frequently came across small bodies of them armed with bows and arrows, &c., lying in ambush near a road or footpath to plunder some caravan or band of travellers whose advent is eagerly awaited. Cultivation to a limited extent, chiefly rice and sugarcane, is carried on by them; and they are addicted greatly to a drink extracted from the "mowa" which they make and imbibe in considerable quantities.

Although these "pals" lie in lands nominally pertaining to the feudal Chiefs of Meywar, yet these aboriginal tribes appear very independent of their lords, paying little or no rents. I have reason to believe that in the remoter and sequestered tracts they are much encouraged in their thieving propensities by the Rajput Thakurs, who derive a considerable income by appropriating a portion of their spoil. In cases of gross lawlessness, where bloodshed to any degree has been committed during their raids, forces are despatched from the Durbar to inflict punishment on the offending "pals," and serious conflicts ensue, as the Bhils especially are of a very desperate and warlike nature, and fight to the last, notwithstanding the rude character of their weapons. On several occasions on entering these "pals," I and my camp have been mistaken for avenging foes, and should they be indulging in a little conviviality after a successful raid, their fear is much increased, when a peculiar whirring sound, which these individuals make with their mouths, is set up, and soon carried along the entire length of the "pal," to which call hundreds of men crown the heights on either side of the valley with their bows strung, concealing themselves as much as possible behind trees and bushes; and often it has been a matter of no small difficulty for me to assure them that no harm is meant.

Extreme caution must always be observed by the detail Surveyors on first entering these "pals," but when once these tribes understand your object, and you become more intimately acquainted with their manners and customs, I feel certain that, with due prudence, no hindrance will be offered to our work.

In the heart of the Arvalis, due west of Udéypur, there is a very fertile valley of considerable extent, in which is situated the large village of Ognah. This part of the country is known by the name of Rhoomat and is peopled by the Girassias, a race of mixed blood—Rajput and Bhil. The Bhils north of the Banas appear considerably more subjugated and tractable than those met with elsewhere.

With regard to the geological formation of the Arvalis, the strata are of a very primary character, granite being their chief composition, intermixed occasionally with veins of quartz and gneiss. Schistose slates of great variety of hue are to be found in the valleys. The general dip of the strata is to the east. I heard that copper and tin mines exist; and I was also told that gold is to be found near Bara Pal, about 20 miles south of Udéypur, on the Khairwara road, but the working of it had been discontinued, owing to its turning out an unprofitable undertaking.

The soil in the Salambar valley is rich loam, in which every species of cultivation is carried on, but chiefly rice and wheat, which is grown to great perfection. The cultivation in the hilly tracts is obtained by damming up the water-courses, thereby forming short steppes of land, on which rice, sugarcane and cotton are chiefly grown. The Bansi and Dariawad forest contain very valuable teak, which is sold in large quantities at the annual fairs held in those demesnes. "Mowa" and mango trees grow in great abundance in the valleys, and north of the Banas may be found the custard apple and wild fig in its indigenous state.

Very little game is met with in these parts. Wild pigs abound everywhere, and every Thakur possesses his hunting seat, generally near some tank where these pigs are regularly fed and on occasions driven by beaters, whilst the worthy Rajput sits in wait for them in his "odi" (generally a sort of masonry tower, with loop-holes, built on commanding hills). Ravine deer are very common in Salambar State, and sambar are occasionally met with in the Arvalis; but they are very scarce. Tigers roam about in the Dariawad and adjoining States, but owing to the dense forests and general flat nature of the country, it is almost impossible to track them down. In conclusion, I would beg to acknowledge the very valuable assistance afforded me by Colonel Herbert, the Political Agent of Meywar, on all occasions during this year's operations.

Extract from notes by H. J. BOLST, Esq., Surveyor, 1st Grade, No. 1 Topographical Party, Gwalior and Central India Survey.

The country plane-tabled by me during the field season of 1875-76 is comprised within the limits of 24°0' and 24°15' north latitude and 74°30' and 74°30'30" east longitude, and embraces portions of the Udéypur and Pratabgarh States.

I found after working for a couple of days that anything like decent progress was hopeless, and there was no way of remedying the evil. Every inch of the ground had to be chained. The undergrowth of grass and brushwood was so thick and tangled as to prevent my seeing more than 200 or 300 feet ahead of me. The country was intersected with numerous little water-courses, over the rocky beds of which the chain snapped frequently whilst being dragged along. As my staff of klassies was inadequate to my requirements, coolies had to be employed in chaining, &c. Their laziness and stupidity, to say nothing of their unwillingness to work for us, all added to impede progress.

And now another obstacle presented itself. Fever, which is so common in these inhospitable regions, seized my establishment, and thus farther crippled the means at my disposal for pushing on my work. Every effort on my part to stay this scourge proved unsuccessful, and I do not wonder at it. The poisonous water we all drank in common, the equally poisonous air we breathed, the chilly damps at night, the excessive heat during the day, more than account for the continued presence of fever in my camp. From December to April my men suffered more or less.

The country north of the Jakum River and in the neighbourhood of Gangia-ki-Pal presented such physical difficulties to be overcome as I have never met with in the whole course of my long experience as a Topographical Surveyor.

The hills, though not high (the highest elevation being about 1,900 feet above mean sea-level), are massed together and difficult of access. The bamboo jungle is so thick as to become impenetrable in most places, and when after much toil and labour a summit had been attained, it could not be utilised for sketching in detail. Nothing but an unbroken stretch of jungle met the view on every side, while the crowded detail at the foot of the hills lay concealed.

In addition to this, the great heat of the sun now made itself painfully felt. I, in common with my men, had to walk over this ground daily from early morning to late in the evening, and our exertions in scrambling through brushwood, cutting our way through jungle, climbing the steep and rocky sides of hills, over boulders and rocks perilously piled one on top of another, each step being not unfrequently attended with risk to life and limb, were rendered doubly arduous and trying in consequence of the absence of water. Often have I and my men been obliged to go a distance of a mile or two to quench the cravings of thirst and then return the same distance to prosecute my work; and when it is remembered that several of us had already been the victims of fever, some idea of the difficulties and obstacles to be encountered and overcome may be entertained. As the country is sparsely inhabited, there being only one small village besides Gangia ki Pal within an area of 40 or 50 square miles, I had to encamp miles away from my work. Thus it will now be seen that though my best efforts were put forward, yet greater progress than what I made was physically impossible.

The village of Gangia-ki-Pal is situated in a valley shut in on all sides by forest-clad hills, and is composed of three settlements named respectively Babakhera, Pal and Renchri. It extends over a distance of 2 miles, and is inhabited by Bhils, whose wild and predatory habits have made them the terror of the surrounding country for miles. They acknowledge no authority, though nominally under the Partabgarh Raj, lead an indolent and dissipated life, and are much addicted to drunkenness. At all times and in all places they are never without their weapons—matchlocks, spears, daggers, but bows and arrows in particular. They carry on a petty trade in timber and bamboos at the markets of Bara and Chota Sadri, the proceeds of which, as a rule, are spent in the purchase of spirits distilled from the "mowa" blossom.

During the 20 days I was encamped at this place I had no reason to complain of the treatment I received from these people. They were daily out at work with me, were tractable and willing to render any assistance that was necessary. I was never robbed nor were my men molested; and I have no hesitation in saying that closer and more frequent contact with Europeans would tend in a great measure to remove the vague fears which reports of us, our habits and customs, have impressed on the minds of these savages. But such hope is vain, for these and similar tracts in the forest lands of Rajputana offer small inducement for European enterprise.

With regard to the boundary between Udéypur and Pratabgarh, I have simply to remark that no reliable information could be obtained. All that could be elicited from the Bhils on this subject was of the vaguest nature. They knew that a certain village belonged to Pratabgarh and another to Udeypur—that was all. They had heard of a boundary being laid down at some distant period of time, but there were few who could point it out, and beyond the immediate neighbourhood of villages, it was a matter of indifference where the boundary lay, for men from both States cut wood and grass without let or hindrance.

In such country as I have described above it may be expected that any thing like decent roads or fair tracts of communication are unknown. There are no cart roads from the simple fact of there being no carts, and only one path to the Pal from Deolia practicable for camels. The high road to Chota Sadri is used for the timber trade principally, which is exported on bullocks, and includes a number of steep, stony ascents and descents.

On the 13th of March 1876 I left the Pratabgarh State and re-entered Udéypur country, congratulating myself on having got out of such an unenviable locality scathless; but such congratulations were premature, for the very next day my syce was attacked by robbers close to the boundary line between the two States, ten minutes after I had got off the saddle. His cries for help reached me in the jungle where I was at work, and on coming to his assistance, I found him nearly stripped, the only piece of clothing left on him being cut in pieces. He had been pelted at by four men, and on turning round to question them, was reduced to a state of passive submission by being made a mark for their arrows. He was then robbed of all he had on his person, while my horse was taken a short distance and then left to wander at will. Of course, as the thieves were never apprehended, it is not possible to say to which State they belonged; but it is not unlikely that the Bhils of Pratabgarh perpetrated the deed as a reward for enforced virtue during my stay among them, knowing that the blame would attach to Udéypur from the fact of my being encamped in that State.

Extract from the Narrative Report of H. Horst, Esq., In charge No. 2, Khandesh and Bombay Native States Topographical Survey.

Plane-tabling was carried on in two sections, separated from each other by about 150 miles.

Remarks on the country triangulated and plane-tabled. That executed on the scale of 1 mile=1 inch lies in Degree Survey VII, embracing portions of the several Native States of Gwalior, Indore, Dhar, Ali-Rajpur, Jabun and Protected Thakurs. The Nerbudda River flows almost parallel to,

and within the southern edge of, Standard Sheet 27, and the country bordering on it is wild and intricate. Further north, it consists of wild and undulating country, interspersed with large patches of broken and hilly ground, covered with jungle more or less heavy. Every available spot is, however, under cultivation, but the crops are poor and barely suffice to support the wretched Bhil population. The villages are numerous, consisting of huts over the fields and running into each other, so that it is impossible to show the exact limit of each village without surveying its boundary.

Supplies are only obtainable from the large villages, few and far between, which are either the capitals of petty States, or the chief villages of parganas; and very often cannot be procured without three or four days' notice, when the quality is inferior and the quantity very limited.

On the 2-inch scale operations were carried on in the talukas of Sauda and Bhusawal in Khandesh. The River Tapti, along the banks of which there is a good deal of raviny ground, intersects the tract surveyed, and is joined by the Purna River at Changdeo. In the Bhusawal taluka a range of hills of a considerable elevation, 2,000 feet above sea-level, was met, at the base of which is a reserved forest extending from east to west about 16 miles, with an average width of 4 miles. This forest has been demarcated by Mr. Horsley, First Assistant Collector of Khandesh, prior to transfer to the Forest Department, and the boundary appears in this season's maps. The limits of such forests will be regularly taken up wherever demarcated as the survey progresses; and all engineering works, of which there are few besides the Great Indian Peninsula Railway, will also appear. In the plain, open country the village boundaries have been reduced from the village settlement maps of the Bombay Revenue Survey, but those in hilly ground were actually surveyed.

No cities or forts of any importance came within the season's operations; consequently no large scale surveys were executed. Barwani, Ali-Rajpur and Kuxi are the principal towns, but without fortifications, and in appearance are nothing more than large villages.

Only one great road runs through the work, *viz.*, from Indore *via* Kuxi and Ali-Rajpur to Surat. It is only a cart track, but the traffic on it is great, and would be still more were it not that duty is levied on almost every article in passing through each State, and traders are consequently deterred from speculating to any great extent.

The Nerbudda, Tapti and Purna rivers intersect the area plane-tabled. The first-named, passing through east to west of the 1-inch work, is not navigable, there being many rapids and rocks; and the two latter in the 2-inch work are not navigable either, for similar reasons.

In the Native States where the detail work extended the population consists almost entirely of Bhils, some of whom are of a marauding and turbulent class, and who are only kept in subjection by the scattered posts of military police. Not many years ago gangs of these Bhils, under outlawed leaders, used to go out on plundering expeditions, and even levied black-mail on the petty Chiefs, who, in order to put on some semblance of authority, employed body-guards of Biluchis—a practice they still keep up, though not to the same extent, their own retainers being few and degenerate. In Khandesh the people are Mahrattas, of whom no description is necessary.

The area surveyed on the 1-inch scale is poor, and produces barely sufficient for the inhabitants. The cereals are wheat to a small extent and *jowar* and *bajra*. The ryots being Bhils are easily satisfied, and care for little while they can procure liquor, to which they are greatly addicted. The liquor is manufactured from the *mowa*, flower, which is gathered in great quantities during April, and bartered for grain; it is strong, and of a peculiarly offensive smell. The soil, except in the valleys, is poor and rocky, and, from the cattle being small, is little more than scratched by the plough. In the tract plane-tabled on the 2-inch scale the crops are generally flourishing, but depend almost solely on the rain-fall, which this year has been unusually scanty, and it is feared there will be considerable scarcity throughout the province.

In the valley of the Nerbudda the climate is very unhealthy from the ceasing of the rains till the end of January, before which it is not safe to enter this tract. Last season was an unusually healthy one, owing to the rains ceasing earlier; still there was a good deal of fever in the villages.

Notes on the country triangulated, by Mr. D. ATKINSON, Surveyor, 2nd Grade.

The programme of triangulation was, to continue the Vindhya Series, or last season's operations, on to the sides of the Singhi Meridional Series, Great Trigonometrical Survey, and to complete the triangulation of the Satpura Hills to the meridian of 74° east, the meridian common to this Topographical and the Guzerat Trigo-topographical Survey Parties. The triangulation of the portion of country allotted to this party to be mapped on the scale of 1 mile to the inch (१३३३६६) would be thereby completed.

The first part of the programme embraced the country in continuation of last season's ground, lying between the right bank of the Nerbudda and the southern face of the Malwa plateau. The south-west corner of this plateau is terminated by a high, long, flat hill named

Rathanmal, coming within the operations of the Bhopal and Malwa Topographical Survey Party. From this hill a chain of hills runs off westward, and culminates about the meridian of $73^{\circ} 30'$ east, in the hill named Punaghar, rising abruptly from the plains to a height of 2,727 feet above mean sea-level, recommended by Dr. F. S. Arnott in his report dated 26th June 1838 as a convalescent station, possessing advantages well worthy of consideration, and of incalculable advantages to the inhabitants of Baroda from its extreme convenience and proximity to that station. Another chain, from near Rajpur, the present capital of Ali-Rajpur, a State of the Bhopawar Agency, strikes off south of Chota Udeyppur, the present capital of the State of that name of Rewa Kanta Agency, and extends to a little beyond the meridian of 74° east. The valley formed by these two chains is that of the Or. The valley of the Hiran lies between the second-named chain and the one running along the right bank of the Nerbudda. The last-named range contains some inhabited and cultivated highland, and extends to the meridian $73^{\circ} 45'$ east. Mohan, the ancient capital of Chota Udeyppur, is situated about $22^{\circ} 4'$ north latitude and $74^{\circ} 7'$ east longitude. At the foot of this range a large area covered with ruins mark the spot. The palace was a fortified building on a hillock. In the valley of the Or, $22^{\circ} 23' 20''$ north latitude and $74^{\circ} 5' 24''$ east longitude, is a marble quarry worked for the Baroda market. It is about 55 miles from that station, south of the cart road to Rajpur of Ali-Rajpur, along which road there is considerable traffic of grain and timber. This quarry is probably the one to which Major G. Fulljames, Political Agent to Rewa Kanta States, refers in his report submitted to the Government of Bombay on the 10th August 1852. The grey-coloured marble only and of an inferior quality was seen here. It will perhaps be necessary for the topographer to ascertain very carefully if there exists any other quarries, as Major Fulljames states that specimens of yellow and white coloured marble were also brought to him from this locality. The men were chary to point out this spot, denying all knowledge of any other quarry or sort of marble.

The highland of the Satpura hills from its eastern end, or from the meridian of $75^{\circ} 25'$ east, maintains an average width of 22 miles to the two well-known hills, Bawangaz and Babakhor (or the meridian of $74^{\circ} 55'$ east),—the one on the northern and the other on the southern face, on both of which hills the Great Trigonometrical Survey have two stations of the Khanpisura Meridional Series,—now contracts, and within the distance of 25 miles becomes scarcely two miles in width. It again expands, never exceeding 15 miles in width, and terminates about the meridian of $73^{\circ} 30'$ east. As on the eastern end stands the fort of Asirgarh, so on the western end is the stronghold of Rajpipla. The eastern portion of the Satpura hills, which has been nearly all mapped and formed the subject of previous reports, though deserted, wooded and sparsely inhabited, had, and has, carts and cart-tracks, and is accessible to laden carts and cattle by many passes, both from the north and south. The western portion of the Satpura hills, which is British up to the meridian of $73^{\circ} 52'$ east, is the reverse of the eastern portion in nearly every respect. No carts or cart-tracks are to be seen now, and perhaps never existed here; it is not accessible by any sort of carriage, but by laden bullocks, ponies and donkeys, the trade being chiefly carried on by pack-donkeys. It is fairly populated and cultivated. Streams, with steep and high banks rising perpendicularly to beyond 100 feet, cut up the face of the highland; undulations of every gradation of incline and peculiarity of formation adorn and beautify this portion. The artistic topographer may here revel in delight, the only drawback being the inadequacy of the scale for full scope of delineation.

The northern and southern faces present a series of steep, rugged peaks, towering above the height hitherto attained by the Satpura hills. The aspect of the southern face from the plains of Khandesh is forbidding, bristling as it does with steep, high, bare peaks rising nearly abruptly from the plains. One of the peaks, which rises to the height of 4,346 feet above mean sea-level, is held sacred by the natives, and is referred to by Mr. Chew. The northern face slopes down with steep sides on to the left bank of the Nerbudda, offering in a length of 30 miles no spur or stream which could be utilised by the natives as a fair roadway for laden cattle. West of the meridian 74° east the Satpura hills again assume their usual aspect, though not so well inhabited and thickly wooded, and are said to possess cart-tracks. This part of the Satpura hills will come under the operations of the Guzerat Trigo-topographical Survey Party.

The inhabitants of the western portion differ, too, in some of their customs. Though Bhils, yet their women, from the oldest to the youngest, wear a petticoat only, and are not clothed as the neighbouring Bhil women, with *choli* and *chudder* (bodice and sheet) in addition to the petticoat. This custom is due neither to poverty nor to religious injunctions, as is the case with other nearly nude or semi-nude aborigines of India; but with them decency and modesty have given way to the love of jewellery. Their petticoats, tucked high up, expose the heavy brass rings with which they ornament their legs, from the ankles to the knees; their arms are jewelled in a similar manner with brass and other bracelets, from the wrists to the elbows; and their bosoms are thickly covered with strings of beads, particularly of a white colour, which are objects on which the Bhils love to dwell in this their upland home. On the other hand, the Bhils of this portion are so far advanced in their ideas as to seek service as labourers. During the harvesting of wheat in the plains of Khandesh, on the right bank of the Tapi, they desert *en masse* their villages, leading the old and infirm, go down to the plains, and labour in the reaping of wheat; staying there more than a fortnight, return home laden with necessities and luxuries purchased with their earnings from the Taloda market. This desertion of the villages retarded the progress of the triangulation. Once again, later in the season, they desert their villages to gather on their own account the *mowa* flower and the *cheronji* berries.

There are three places of note in this portion: Dhargam is on the highland, the headquarters of the police stations of these hills. There is an inspector of police and men of the Khandesh Bhil Corps quartered here. It was in former days a place of note also, as it possesses a ruined fort. Kathi, the residence of the Chief of the State of that name, one of the six Mewas States of the Khandesh District, is also on the highland on a pretty plateau. The present Chief is reputed to possess a knowledge of the healing art, and to him are brought the sick from all parts of this highland. He was very solicitous in his enquiries as to the symptoms of the fever under which the Surveyor was suffering, and evinced much anxiety to render assistance; but as the secret of his art lay more in incantations than medicine, he was respectfully assured the Surveyor was not under any necessity of seeking medical aid—that time was only required. Akrani, the name by which this portion of the Satpura hills is known in official correspondence, is a deserted fort on the southern face, and built with a temple near a fine spring. This spring is said to be the oozing of water from the tank on Turanmal hill, which lies from it 15 miles to the north-east.

There is one *banjari* road through this portion; it enters somewhere to the north-west beyond the meridian of 74° east, *i. e.*, beyond the limit of the operations of this party, and descends into the plains of Khandesh, about the meridian of $74^{\circ} 24'$ east by Mandevi Pass—the only way by which the western portion can be entered by laden cattle.

The middle constriction or waist of the Satpura Hills is known as Turanmal—a high, flat-topped hill, lying between $74^{\circ} 29'$ east longitude and $\frac{22^{\circ}-6'}{22^{\circ}-4'}$ north latitude, is inhabited and cultivated. It must have been in former days a stronghold of some importance, playing not a small part in the political history of those times, as evinced by the ruins of former greatness and the annual *méla* which is there held and to which, the villagers affirm, more than a 1,000 men resort. It presents, at an elevation of more than 3,500 feet above mean sea-level, a fine area for cultivation, gardening and building. Ruins of buildings, temples and fortifications, all of stone, lie scattered all over it. There are also tanks on it, especially one of more than half a mile in length and a quarter in width, vieing in beauty with that of Ootacamund, but inferior to, though exceeding in size, that of Naini Tal. This tank is said to be frequented by aquatic birds: some cotton teals were seen by the Surveyor about the end of April. There was no thermometer to ascertain the temperature, but, comparatively speaking, it was cool in April. The sides are steep, but there are three roads up this hill, and on all of them fortifications are thrown out for protection. The one from the north-west is from Sindi village, and can be ridden up. The other from the south-west corner is from Nakjeri village, is of steeper ascent, may be ridden up, but part of the road is obstructed by large blocks of stone, the ruins of the fortifications. The third from the east is from Bakrat village of Barwani State, situated on a fine road across the Satpura Hills, from the capital of that State to Shahada, capital of the taluka of that name of Khandesh District. This ascent is easy, over another flat hill by name Jerar, affording a good area for cultivation and building, but of less elevation and dimension, and through what is known as Awasia gate-way. By this road laden cattle may ascend; only a few yards of the road near Awasia gate will require widening. Roads practicable for laden carts can be made both from the Nerbudda valley *viâ* Barwani, Pati and Bakrat (the road as far as Pati is already made), and from the Tapti valley *viâ* Shahada and Bakrat. The height of the station on Turanmal is 3,791 feet above mean sea-level.

The State of Barwani is sometimes designated in official correspondence as Awasia-Ramghar-Barwani. Awasia is the gate to which allusion is above made; Ramghar, an old deserted fort (not visited by the Surveyor) on the southern face of the Satpura hills, about the meridian of $74^{\circ} 44'$ east. Barwani, though the name of the present capital, seems to be a corruption of the name of the highest hill in that State, Borowani, and situated in the same locality as Awasia and Ramghar. Borowani Hill is known to the Bhils as Sinui Buran, two sister tops Sinui and Borowani. The height of Borowani is 3,292 feet above mean sea-level.

The gorge of the Nerbudda was in last season's report said to be more than 30 miles in length; it is nearly 70 miles long. Fourteen miles up this gorge little boats come up with merchandise from the plains bordering the sea-coast, taking back timber. The rest of the gorge is not practicable for boats, and do not afford any places where the river may be forded, excepting one near Hasshi, to which the Raju of Chota Udéypur resorts to bathe, and is fordable in April and May only. There was a very great fall of rain in season 1875—the largest on record in these parts. The villagers state of having never before seen the river so high; the height the river rose in the gorge, above the dry season level, as ascertained by measurements taken, was 77 feet. There has been a greater flood this season, and enormous must have been the quantity of water which rolled down this gorge. In one part of it, the dry season

$74^{\circ} 6'$ east longitude.
 $21^{\circ} 56'$ north latitude.

current is confined between perpendicular ledges of rock for some hundred yards. It is scarcely 20 feet wide, and the current is very rapid. The Surveyor had no means at hand to ascertain the

very great velocity of the stream, and his duties did not permit him to return to it again for such a purpose. About the meridian of 74° east the Nerbudda and Tapti approach each other to within 26 miles.

Description of the country triangulated by Mr. CHEW, Surveyor, 2nd grade, during field season 1874-75.

The country, or rather the valley, of the Tapti, traversed by the Tapti Minor Series, extending from longitude $75^{\circ} 0'$ to $73^{\circ} 48'$ and between the parallels $21^{\circ} 10'$ and $21^{\circ} 47'$, is in

general appearance exactly like that portion of Khandesh over which the operations of No. 2 Party have already gone, being flat, highly cultivated, and well planted with trees. About 74° 30', however, the ground becomes hilly, but still devoid of jungle; the hills consisting of low ranges and small isolated mounds, bounding the river on both sides. A few miles further west and in the vicinity of the town of Taloda, which is a place of some importance, the country again spreads out into a dead flat, with scarcely an undulation, and covered with jungle, which gradually thickens westwards, until it becomes heavy, almost impenetrable forest, with a few scattered Bhil huts at long and dreary intervals.

The taluka of Taloda, which is considered very unhealthy—an opinion confirmed by the experience of the past season—is populated mostly by Bhils. Their villages are small, and the huts built with tiled roofs (an additional difficulty to the triangulator). Nowhere is the flat roof peculiar to Khandesh to be seen, and there does not exist any indication of either sufficiency or comfort, which are so apparent in the neighbouring talukas. Three miles west of the town a nala was seen, in the dry bed of which was a thick incrustation of salt, and along the banks remains of salt pans which have been allowed to go to ruin, because washing them is not sufficiently remunerative. Over this part of the country towers the southern face of the Satpuras, consisting of a succession of sharp, well-defined peaks, with rocky, rugged sides, and many of them inaccessible. The highest, 4,346 feet above sea-level, is called Astamba, and is annually visited by thousands of men from the plains of Khandesh. The ascent is long and tedious and extremely difficult for a short distance from the summit. The deity residing on this hill is supposed to be inimical to females, and objects to even devotional visits from the fair sex; and so great is his antipathy, that men having in their possession female clothing, or even trinkets, have been known to feel his displeasure in the shape of a fall or more serious accident for daring thus to pollute his sacred habitation. Strange to say, none of the Bhils visit this shrine, although there are many of their huts within easy reach of it. Their reason is perhaps the same as that which induces pilgrims from Benares to visit the distant temples of Pooree. They evidently do not value their possession.

Extract from the Narrative Report of CAPTAIN T. H. HOLDICH, R.E., In charge No. 3 Topographical Survey, Central Provinces and Vizagapatam Agency.

The Bastar District, triangulated this season, stretches away eastwards from the Chanda and Ahiri districts in an unbroken plain of dense grass and jungle for about 20 to 30 miles. But from the Pinlakat river, which intersects it nearly north and south, it commences to rise in rugged and broken undulations into an irregular system of hills. These hills on the south become massed into more definite ranges, and cover the country as far as the Indravati, extending eastwards to the high central plateau of Jeypur, and westwards into the south-eastern portions of the Ahiri zemindari. This is the district hitherto indefinitely known on maps as Abajmard or the Mardian Hills—at once the most completely unexplored and the most interesting of the Gond-peopled tracts of the Central Provinces. Northwards these hills break up into long, flat-topped heights of a character similar to the *pāts*; yet further north, with a general trend north and south, intersected by wide, low-lying flats covered with the densest forest and grass, until they merge, more or less definitely, into the hilly districts and high level country of the south of the Raipur District. Further east again that part of Bastar which was triangulated by the late Mr. Harper, and which as yet remained undescribed in this report, is essentially a hill country. It is really the broken edge of the great plateau of Jeypur and Bastar, and its irregular characteristics and general want of definite formation almost defy description. It is neither the plateau nor the plains, and it contains the roughest ground and the most hopeless tangle of forest and grass jungle that are to be found either above or below it. It is a sort of 'terai,' but with nothing of grandeur of mountain scenery on the one side, and no healthy open plains on the other. From this central region forest jungle extends for hundreds of miles to every part of the compass. Such are the characteristics of the ground to be surveyed during the last season of No. 3 Topographical Party—not an altogether unworthy conclusion for a work which has extended over 60,000 miles of the worst districts in India.

The country plane-tabled was pretty fully described under the head of triangulated ground in last year's narrative report. The greater portion of it consisted of rugged hills of no considerable elevation, except along the line of boundary with the old Hyderabad work on the Gadalguta range. The rest is flat forest, of very low elevation in most parts, but partaking much of the character of the forests on the plateau, with long, narrow, grassy glades intersecting it, generally following the line of watercourse and affording some facility for cultivation. Here and there large villages existed, principally the chief villages which give their names to the Bastar taluks of Bhopalpatnam, Kutru, Vijapur and Lingagiri; but the largest of them, which contained nearly all the cultivation included in the season's mapping, were on the direct route between Sironcha and Jugdalpur (or Bastar). The percentage of cultivation to forest in this season's mapping is nearly 2 per cent—a very high average for Bastar: but of this amount certainly $\frac{1}{3}$ ths are maintained by the inhabitants of those villages. Compared to the triangulated districts, this is a fertile and well-peopled country.

In the whole district yet to be mapped, I believe there are but three villages of any note, or whose names are known beyond the limits of the Bastar boundary. These are Pinlakot, Pertabpur and Narainpur. Each of these villages gives its name to a taluk; but the two I visited (Pinlakot and Pertabpur) are but miserable collections of a few small huts, although with certain indications of a much greater importance in previous years.

Villages.

Although the forests and hills of Abajmard and of the plains north of them are intersected by narrow tracks and passes, there is nothing worthy of the name of a road, except perhaps that which passes from Jaroundi in the Chanda district *via* Rengadonda to Chargaon to Dhuntiri and Raipur. This is a cart-track all the way, and there were signs of traffic along it. But the Mardian Hills chiefly owe their security from explorers to the fact of possessing no roads. These hills can be approached from Pinlakot or from Lahir (near Bhamragarb); but it was with the greatest difficulty that the small triangulation camp could be moved about when once amongst them. The hill tracks are nothing but more or less definite footpaths, crossing the rugged and stony ridges by straight cuts up one side and down the other, or following the rocky beds of the small streams that intersect the hills. The road from Sironcha to Jugdalpur *via* Bhopalpatnam, Vijapur, &c., passing through the plane-tabled districts, has already been referred to in previous reports. This is the high road of Bastar, and the only one.

Roads.

The Indravati river, which, roughly speaking, divided the triangulated from the plane-tabled districts, with its forest-clad banks and marvelously picturesque scenery, need not again be described; but flowing into the Indravati, and joining at the village of Bhamraghar in the Ahiri zemindari, is a fine stream called the Pinlakot, which, while it flows towards its southern limits the boundary between Bustar and Ahiri, flows from the northward through the midst of the forests of Pertabpur and Pinlakot. It is a fine, clear stream of water, easily fordable at most points in the cold weather, but evidently rising into an impassable torrent during the monsoon months of the year. The river apparently abounds with fish, but its inaccessibility and the unhealthy nature of the jungle around it, put it for ever beyond the reach of the sportsman. This river, I believe, drains the whole of the triangulated districts.

Rivers.

North of the Indravati, and adjoining the Chanda and Ahiri districts, the inhabitants clearly belong to the large tribe of the Gond family called Gottur, or Gottawar, supposed to be really identical with the Koi or Koitor that peoples the plains of Bastar from the Sileru and Godavari to its most northern limits. Near the hills they become mingled with the Maris, as might be expected, while elsewhere they are largely mixed up with low-caste Hindus. Their manners and appearance, together with their peculiar rites and ceremonials, have already been briefly described in previous reports; but in this part of Bastar they are chiefly to be distinguished from the Maris, which is the other Gond tribe sharing this portion of Bastar, by their lighter color and habit of wearing far more clothing than the Mari. They generally twist a cloth round the head and frequently stick a carved knife into it after the manner of a horn. This is a habit which I have not observed further south. In all other particulars they appear essentially the same, with habits and customs modified by surrounding influences.

Inhabitants Gottur.

The Mari of the Mardian Hills is a Gond in all his original simplicity. The Maris are classed in the ethnological reports of the Central Provinces as distinct from the Maris of the plateau,

Mari.

but connected by intermarriage. I should have thought this connection had extended itself so far that they are practically one tribe, with customs and ceremonies modified by the influences either of more civilised tribes or of climate. They are, of course, subject to the Bastar Raja, and pay a certain amount of revenue, the collection of which is a work of great difficulty. They are an independent and rather pleasant set of people, living in small villages, which are constantly shifted from site to site; their small amount of cultivation being maintained by fire and axe. The appearance of their villages is sometimes rather imposing. There being no lack of forest wood, they build good roomy huts, and show great dexterity in their arrangement. To build a grass hut is the work of only an hour or so to half a dozen Maris. Their most permanent buildings are daubed over with mud and neatly finished off. There were few signs of extreme poverty among these people. They possess a few cattle, while fowls and pigs are plentiful in most villages; and a small amount of rice was generally forthcoming when called for. Their perfect ignorance of the outside world, and total unacquaintance with strangers, was very marked, leading generally to a curious independence of manners amongst them, which was not altogether unpleasant to observe. They all, however, with one consent, declined to give any sort of useful information, and were the most untrustworthy set of guides that it has ever been my lot to be led astray by. They would frequently disappear entirely in the midst of a march, just when the tortuous paths among the hills and density of the jungle had most effectually obscured one's notions of the right direction to follow. They had a most ludicrous dread of a horse; and I fancy that in the more inaccessible parts of the hills a horse had actually never been seen by them. Mounting one's pony was the usual signal for the guides to fly into the jungles, leaving in some instances their hunting knives (surrendered as a guarantee of good behaviour) behind them.

A single cloth round the loins is the general dress of the Maris, both men and women; this extent of clothing being more or less increased according to the proximity of the people to more or less civilised neighbourhoods. I was told on

Dress.

good authority that there are parts of the hills where absolutely no cloth at all is worn either by men or women ; but my own observations did not confirm this statement, although it may still very possibly be true. It was only occasionally that the opportunity of observing the manners and dress of the people when pursuing their ordinary occupations presented itself. As a rule, their villages were either completely deserted at my approach, or only one or two of the chief men were persuaded to remain to give information. I rarely saw any women, and those I did see were dressed as I have described. Their heads are periodically shaved, leaving only a single tuft of hair ; but the shaving is not a frequent operation, and their tangled hair is generally tied up into a single knot. Bead ornaments round the neck are very common, with brass armlets. They are an active, sinewy race of people ; very dexterous as shikaris. They use bows and arrows and long double-bladed knives ; but I saw no traces of the nets, which are so common in the low country, for catching sambhar and spotted deer. Very ingenious traps for catching pea-fowl and small game are often to be observed close to the paths in the hills. This general arrangement is a pliant bamboo fixed upright in the ground, with the thin end bent down by a line attached to it (like the line of a fishing-rod), with a noose at the end and secured by an ingenious arrangement of small crooked sticks, so that the noose surrounds the entrance to an enclosure of stones or split bamboos. A little rice or water is placed in the enclosure. The pea-fowl or hare inserts its head to pick up the grain and releases the noose. The bamboo springs into an upright position, stringing up the unfortunate animal by the neck, and effectually placing it out of reach of hungry jackals and other beasts of prey. With their bows and arrows they are successful in bagging both bison and buffaloes. It is said that the latter, if wounded by an arrow about the foot, will not move many yards from the place where they are shot, owing to the rankling of the arrow in the wound, and fall very easy victims.

Of their rites and ceremonies I am unable to give any account whatever. I imagine that they are but vaguely understood by the people themselves, and but very few of their numbers are perfectly acquainted with them. They burn their dead, and set up stone monuments to their memory, like the Gotturs on the one side, and the plateau tribes on the other ; but these stone monuments are rarely observed, as the stones they use are small and insignificant. As the plane-tables continue their work through these hills, better opportunities for observing any thing in the nature of a monument will be secured ; but I doubt exceedingly whether any accurate accounts of ceremonial rites will ever be obtainable by a Surveyor.

The principal exports are skins and horns, and a small amount of castor oil seed. These are bartered for cloth and beads, and I believe that the exchange is effected through a class of men called *Telis*, who inhabit the frontier villages, and who are the only people of the outside world that ever penetrate into these hills. Even the ubiquitous *Banjara* finds no attraction in this country.

The climate of the country is naturally malarious and unwholesome to a high degree, but I do not suppose that it is worse than that of the Godavari valley generally. On the contrary, the general higher elevation of the district above sea-level is probably beneficial to a certain extent, and the summits of the flat-topped hills, which appear to reproduce the plateau on a small scale, and which are usually free from dense jungle although covered with rank grass, are probably healthy enough.

Note by Mr. J. A. MAY, Surveyor, 3rd Grade, on a part of the Bastar District lying between the parallels of 18° 45' and 19° 0', and meridians of 80° 30' and 81° 0'.

This portion of the country presented a greater diversity in its topography than that described in my notes of last year, varying from the wildest hills and ravines to the rich and well-populated plains.

The configuration of the hills is remarkable, composed of a coarse sandstone ; it assumes a parallelism of formation very curious, and maintains a direction north-west and south-east, which changes slightly across a large river, or when any other form of rock intervenes, but still retains the same peculiarity.

A marked scarp, entering in at the north-west corner of my work, near Budaguta H. S. and continued on to Belapguta H. S., and averaging in height from 1,000 to 2,000 feet above the sea, forms the highest portion of my ground, and sloping gently away northwards, constitutes a plateau of considerable extent, the western half of which is of the wildest and most difficult nature, and all but totally deserted ; while the eastern part is of the best description, containing some of the finest patches of cultivation, studded with numerous villages, that this party has met with for several years.

A peculiarity in this plateau is formed by the beautiful grassy glades in the dense and heavy forest which clothes it, of small width, but extending for several miles. These are naturally seized upon and utilised for purposes of cultivation, but the cultivatable soil, which is very shallow owing to the underlying sandstone, becomes soon exhausted, necessitating a frequent change of locality ; and sites of villages have to be abandoned and re-occupied according to circumstances.

To the south lie the plains or low country, which are a continuation of the ground surveyed the previous season, and the same character is observable, except that in some parts it is more open and cultivated.

The only streams of any importance running through my plane table are the Chinta and

Rivers, streams, routes, &c.

Berndi. The first, taking its rise in the ravines near the village of Chintapili, flows south for about 22 miles, and striking north-west into the Bhopalpatnam valley, passes close to the well-known and thriving village of Madder, and after a course of 54 miles falls into the Indravati near the village of Depali. The latter rises in the hills near the large village of Gangalur, and flowing west and north, meets the Gangivang, when it obtains the name of Durla, and empties itself into the Indravati below the village of Jegur, having a course of 50 miles. Three principal routes afford communication between Jugdalpur and the nearest civil stations: one from Damagudiam to the south, *viâ* Cherla, Vijapur and Byramgarh; another from Sironcha to the west, passing through Bhopalpatnam and Madder, meets the first at Pusgudiam; and a third branches off at Madder, and passing through Thoinad, leads northwards to Kutru. These roads are all practicable to carts; though they happen to pass over ghâts, yet the ground is well chosen, evincing an amount of engineering skill hardly to be expected so far in the interior. Water and encamping-grounds are everywhere available during the cold season, which is the only time of the year favorable to travelling in the Central Provinces.

Portions of three taluks, *viz.*, Bhopalpatnam, Vijapur and Kutru, belonging to Bastar, fell within the area allotted to me. Of these, the two former possess the largest cultivated area, and are decidedly the richest part of Western Bastar, producing a variety of cultivation not found in other localities.

Among the products are sugarcane,—which is extensively cultivated in the Bhopalpatnam taluk,—wheat, Indian-corn, rice, varieties of dhall, horse-gram, linseed, ragi and hemp; the natural products being gallnut and iron.

Products.

The manufactures consist of a coarse sugar, made of the juice of the sugarcane, which is expressed by the means of a machine of rather original construction, consisting of two vertical wooden rollers made to work against each other by endless screws instead of cog wheels, and a long beam fixed to the axis of one of the rollers, to which an ox is yoked, serves to give it motion. Also coarse cloths, hempen ropes, wicker baskets, linseed and "mowha" (*Bassia latifolia*) oil, pottery, country carts, and the common iron implements of husbandry. Several arrack distilleries are scattered over the country and seem to pay well.

Manufactures.

The fauna and flora are the same throughout, except that the teak, found in such abundance south, is beginning to disappear, and is hardly noticed in the way of traffic, owing to the inaccessible positions in which the finest timber trees are to be found; and the *sâl* (*Shoria robusta*) which was lost sight of for several years, is taking its place further north. A characteristic feature in the country is formed by the clumps of magnificent tamarind and mowha trees that everywhere meet the eye. The former is about the only shade tree, the mango being occasionally met with. Palmyra thrives well in the plains, and its juice forms the principal beverage of the poorer classes, taking the place of the salap or sago palm so common among the hills in Ganjam and Orissa.

Fauna and flora.

Several Hindu and Gond tribes inhabit this portion of Bastar, but the want of a

Inhabitants.

good interpreter, and the difficulty of obtaining information during the very short period of our stay in the country, quite put it out of my power to learn anything particular of their customs and usages. I will therefore venture only a few remarks on the Gond family as being considered primitive and most interesting. Three classes of this tribe have as yet been brought to my knowledge, *viz.*, the Raj Gond, Koi (or Koitar), and Gotiwar. The first of these, however, has very few traces of the aborigine. A Vishnuvite in religion, and pretending to a higher state of civilization than his wilder brethren, he is altogether superior in intellect, dress and general appearance.

The Raj Gond.

I have met a few men educated in the Telegu—the language still adopted in the country; many of the talukdars being of this class, which needs no further description from me, as an excellent and interesting account of the Raj Gond will be found in Captain Forsyth's book on the Central Provinces.

The Koi and Gotiwar, though professing to be of the same persuasion as the Raj Gond,

The Koi.

are totally different in their habits and appearance, and are probably the true aborigines. They have rites and ceremonies in common, and differ but slightly in physical qualities, the Koi being darker and shorter than the Gotiwar, and having the cheek-bones less prominent. A close connection evidently exists between these two classes from the following absurd legend. In the beginning, it is said, Vishnu created Adibaba (first father) and Surangidevipoitadi, whom he brought together and united. In the course of time Surangi conceived, and within nine hours of conception was delivered of 130 Kois and 66 Gotiwars. This astonishing number of infants she nursed for five months; but finding that she was unable to afford them nourishment any longer, she called upon Adibaba, her husband, to provide for them, which he did after a most paternal fashion, by taking them into the remotest part of the jungle and leaving them in the lurch, to find a precarious livelihood among the leaves and roots of the forest.

Their festivals are the same, one of which I had an opportunity of witnessing, and which

Festivals.

I find has already been noticed by Captain Holdich in his narrative report of 1874-75, and which is held in honor of deceased relations one year or three years after the event, according to the means of the surviving relations, with a view of facilitating the transit of the soul to a better world: the soul is otherwise supposed to hover about the vicinity; and spirits being usually given to the bad habit of playing malicious pranks on the living, it is of the highest importance that they should be expelled from *terra firma* as soon as convenient without violating the code of decency.

The Gotiwar, however, unlike the Koi, erects wooden memorials to the dead. These are to be seen in rows along the pathways leading into a village, one to each of the departed, and consist of cylindrical pieces of wood about a couple or three feet in height, grooved in several places and pointed at the top, some of them being tastefully carved with different patterns.

With reference to the abduction of the bride, as mentioned in my notes last year, though corroborated this season, and common to both Koi and Gotiwar, I find is only resorted to in case a

Ceremonies.

wife is not procurable by barter, which is considered the orthodox method; and it is among the very poorest only that forcible means are adopted. The marriage ceremony is the same in both tribes, only that the Gotiwar prefers an extra finish, in which a barber is called into requisition, as the toe nails of the happy pair require paring.

Ornaments of beads and brass are worn by the men in great profusion, the women being

Ornaments.

content with very much less ornamentation than the men, and, as is customary with all the wilder tribes in India, the women are the drudges of the household, ungainly, and scantily clothed.

Three small dilapidated stone temples—one at Bhopalpatnam, another at Gudma, and

Buildings.

one at Byramgarh—were met with. These are the only architectural remains that have as yet been noticed in this part of the country, and though no inscriptions of any kind were discovered on them by which their antiquity could be ascertained, they are evidently very ancient and of Hindu origin.

Notes by MR. D. CAMPBELL, Assistant Surveyor, 4th Grade.

The portion of country surveyed by me between the parallels 19° 0'—19° 15' north latitude and 80° 50'—81° 20' east longitude comprised about the wildest part in the Bastar Raja's territory, and this was especially the case on the plateau north of the river Indravati, whose rocky bed and sparkling water were seen from every hill top as it flowed from east to west nearly through the centre of my plane-table section. The river teemed with fish and alligators, and on its banks every species of game common to Central India, the elephant alone excepted, abounded.

The average height of this plateau is 2,500 feet above sea-level, and its temperature is

The plateau.

exceedingly pleasant—a decided contrast to the burning plains of Chanda. The lower hills were of sandstone formation, and the higher ones, whose summits extended in every direction for miles and miles with an average width of nearly a quarter of a mile, were trap. The slopes were abrupt and covered with thick jungle, while the tops were flat and bare. The teak tree, though pretty abundant below the fall, was never noticed on the summits.

Byramgarh, the point from which I started, is the chief village in the little tract of

Byramgarh.

country of the same name subject to Kutru, which is a sub-division of Bastar. Above the village is the hill of Byramgarh H. S., on which are the ruins of an old fortress, the history of which I tried very much to learn, for a most bloody battle appeared to have been fought to the west of the hill; but the old men I took up with me were so conflicting in their narratives, mostly very romantic, that I forbear from giving their versions. The practical view would be the old story of a tyrant and an oppressed people, and even now it is a matter of astonishment how, with the little product of their fields, scarcely enough to sustain themselves, the villagers are capable of paying tribute or tax to their Raja.

Abnjamard.

But Byramgarh was champagne country to that further north, the plateau to which I have already alluded; for there the people had evidently never seen a horse nor a white face before, and it was a most ludicrous sight to watch their pleasure on receiving their "cooly" hire or wages after a hard day's work: they evidently never expected to be paid, and they never knew the value of money. The only things they ever buy (and that with rice) from the *Banjaras* are strings of many-colored beads, which they wear gorgeously around their necks, salt, and a little cloth. Very little of the latter (a square yard) suffices for half a dozen men; and as for the ladies, unlike their sisters of the civilised world, they never bother their heads about clothing at all. This utter disregard for dress of any kind (even for one of fig leaves, which, if poverty were the excuse for their undress attire, would surely be resorted to) must be attributed to that love of cleanliness which so strongly pervades the mind of women. Rather than, like their husbands, wear the dirty rag which is perhaps handed down from generation to generation, they prefer living as they were born.

If suddenly debouching from the jungle I entered a village unexpectedly, there was always a stampede among the fair ones, whose long backs and longer tresses I invariably caught a glimpse of as they fled among the trees.

Their villages comprise two long rows of huts with a street running between them, the usual occupants of which are fowls, pigs, pariah dogs and naked children, whose mothers with their heads only out of the huts would be gesticulating frantically for them to come within doors for fear of the horse and of myself too.

Villages.

Cases of disease and suffering are constantly to be found in these hills. One of the most revolting was that of a young girl, whose whole body was completely ulcerated. I was compelled

Diseases, &c.

at last to turn away a man one morning who was in the habit of coming out to work with me, for he was the most mutilated specimen of a human being imaginable. His nose had been torn up by the roots from beginning to end, together with his lips, and his long white teeth projected far beyond the ordinary run of incisors. This man haunted me from village to village, and often in the dead of night I would start up with his horrible face before me, till I could stand him no longer and accordingly dismissed him. The most helpless case of suffering that I saw was that of a man near the Indravati river, for whom a little hut had been built just outside of a village. With the exception of his hands, leg and arm bones, there was little of him left, and yet he lived on, on the cold hard ground, with a stone for a pillow and ashes for a covering. He was daily fed by a ministering angel in the form of a woman of the village. Small-pox commits sad havoc among these poor people—far from any vaccinating dépôt—to whom the science of inoculation is all unknown.

For the dead, cremation is the *modus operandi*, and always near the place where the bodies are burned, upright slabs of stone from five to ten feet high are placed in memory of the dead,

Ceremonies.

and there were hundreds of them along the high road from Damagudiam to Jugdalpur (at the spot where the battle between Kutru an Bastar was decided), a few miles from Byramgarh village. Sometimes, however, there is an enclosure of light bamboo wicker work, with a few wooden idols within. This is also a mode, though an evanescent one, for preserving the names of their dead from oblivion.

As regards their marriages, I was fortunate enough, though uninvited, to be present at two of them; but as the principal ceremonies are carried on only at night, I was unable to witness the proceedings, which appeared to consist of torch light processions with a good deal of *tom-toming* (drumming) from house to house; while the women, with long bamboos in their hands, form a circle, and, with a wailing song, move slowly round and round. A liquor extracted from the palmyra or sago palm (the latter is found only on the hills) is the only and favorite beverage with all sizes and sexes; and, barring this inordinate love for toddy, I found the men a lively set of fellows, with a warm attachment to their homes and families, though averse to work of any kind.

A great want was the absence of a *vakil* or supply man in such unexplored regions. The man that was given to me served well enough below, but when once I ascended the hills he left me; for neither his authority nor that of his master, the Raja of Bastar, is cared a pin for by the wild Maris of these hills.

Extract from the Narrative Report of CAPTAIN J. R. WILMER, B.S.C., Assistant Superintendent, In charge No. 5 or Bhopal and Malwa Topographical Survey.

The members of the party were again divided into two portions,—the one surveying

Remarks on country triangulated and surveyed in detail.

the country round about Agar, the other the two standard sheets 45 and 47. These two sheets were undertaken by special order, as a survey of the country near Indore and Mhow was much required. A small portion of the Vindhya range was met with in standard sheet 47, south-east corner. The country surveyed in standard sheets 45 and 47 was in general very open and well cultivated, with the usual grain and opium; but the country round about Agar, or standard sheets 19, 21, 37, 39, generally consists of low, flat-topped hills covered with 'karounda' jungle.

The valleys between are cultivated with the usual grains.

Principal roads.

A small portion of the Deccan road was surveyed this season in length 35 miles.

Railways.

The Indore State Railway was met with and surveyed to the extent of 44½ miles.

The principal rivers met with are the

Chambal and Gamhir: the latter probably joins the former further north; also a small portion of the Chural river. The sources of the Chambal and

Rivers.

Gamhir rivers take their rise in the north slope of the Vindhya range; the former close to, and north-west of, the Great Trigonometrical Station of Singarchori, the latter about six miles south of Mhow. The other rivers are the Kali Sind (Bara), which, flowing north, eventually falls into the Chambal. The Lakundar falls into the Kali Sind (Bara) between the villages of Sendli and Takla. The Kutiali, As, Kali Sind (Chota), and Sipra are all tributaries of the Chambal, the latter falling into it near the village of Sipaora. The height of the Chambal river will be obtained at its source and two other places during the coming field season.

The principal mountain pass which has been met with is the road which goes from

Barwai on the banks of the Nerbudda, through Chural, a small village at the foot of the Vindhya

Principal mountain passes.

range, to Simrol, thence to Mhow and Indore. The road is a good metalled one, passable for all kinds of traffic, and is extensively used for the troops stationed at Mhow.

The military cantonment of Mhow and the city of Indore, with the Agency boundary, have been surveyed on the one-inch scale. The former is a well-known military station; the latter is

Cities. very much the same as ordinary large villages, rather remarkable for its dirtiness. It contains a palace, a cloth manufactory (which is said to produce very good cloth of sorts), a mint, and a gun factory, and is the principal seat of the Raja of Indore.

Difficulties were thrown in the way of the plane-table when surveying the city. The principal streets were surveyed on horseback and by pacing, as no instruments were allowed to be carried through the town. The general area of the place, however, has been fairly obtained, and the principal roads going into the city have been properly shown.

The inhabitants were friendly as a rule, the only trouble or annoyance being given by the inhabitants of Indore territory. In small petty ways they attempted sometimes to obstruct work, such as refusing to supply labour for cutting jungle, charging exorbitantly for erecting poles, refusing guides without prepayment, &c.

Opium is very extensively grown, to the detriment of grain, and is much used by the well-to-do. The climate is healthy after November: before that month fever prevails in all the jungly parts of the Vindhya range.

Inhabitants.

Products and climate.

NAGA HILLS EXPLORATION.

From LIEUTENANT R. G. WOODTHORPE, R.E., *Assistant Superintendent, Topographical Survey*, to CAPTAIN W. F. BADGLEY, *In charge No. 6 Topographical Survey*,—dated Shillong, the 15th June 1876.

I have the honor to submit my report on the late survey operations in the Naga Hills.

2. In October last I received instructions from the Surveyor-General to join the late Captain J. Butler in Golághát as early in November as possible. I left Calcutta on the 3rd November, but my steamer breaking down and various other delays occurring, I did not reach Gauháti till the 19th, where I was joined by Mr. Ogle, who had been deputed to accompany me as my Assistant, and who had brought down with him from Shillong our establishment of klassies and coolies. We reached Golághát on the 29th, having, at Tezpur, picked up Lieutenant-Colonel A. Tulloch and his detachment of two companies of the 42nd Assam Light Infantry, which was to form the military escort of the exploration party.

3. We found Captain Butler at Golághát, anxiously awaiting our arrival. His coolies had not then all come up; but being desirous of delaying as little as possible, he determined to start for Wokha at once to establish the guard and dépôt there. Accordingly, on the 1st December, he and Colonel Tulloch, with one subadar and forty-nine sepoy all told, left Golághát for Wokha, and having explained his wishes on the spot to Colonel Tulloch, he returned to Golághát on the 8th. His coolies had even then not all arrived there; but as there was a little preliminary work to be done in putting up signals at Lakhuti and Nankam, and as, should these marks be up when we started work from Wokha, much time would be saved, with Captain Butler's sanction, I deputed Mr. Ogle for this work, and he left us on the 10th December. He was to proceed to Lakhuti *viâ* Bhandari and Sánigaon, and, having put up the mark there, to go on to Nankam *viâ* Pangti and Okotso. There was no reason to suppose that any opposition would be offered to Mr. Ogle's progress, as he had a strong guard with him, and we had been through that country last year, and were well received both at Lakhuti and Nankam; nevertheless, he was unable to get beyond the first of these two villages, for the reasons stated in his report (see Appendix A).

4. In the meantime all our coolies having arrived, and all arrangements being satisfactorily completed, Captain Butler and I started on 17th December for Wokha, where we arrived on the 29th, having been joined by Mr. Ogle at Sánigaon the day before. We found that the surrounding villages had been bringing in rice in large quantities, and the godown was well stocked. On the 21st some men came in from Lakhuti to see Captain Butler and assure him of their friendship. On being questioned as to their refusing to show Mr. Ogle the road, and turning out in war-dress, they replied that they had meant no harm, and had simply intended to escort him. It was necessary, in order to carry on our triangulation, that a point near Kák-enagámi, among the Sémas, should be visited, and also Nummuh, far south among the Eastern Angámis. For this work Mr. Ogle was again deputed; and Captain Butler considered it advisable that Mr. Needham, who had come into Wokha to see him on various matters, should accompany Mr. Ogle. They left us on the 22nd (see Mr. Ogle's report of this tour.)

5. On the 23rd Captain Butler, Colonel Tulloch and I left Wokha, and encamped on the Doiang below Sánigaon. The force with us consisted of the numbers given in the margin, leaving a guard at Wokha whose strength is also shown in the margin. The next day we reached Lakhuti, and I visited the mark which had been put up by Mr. Ogle. In the evening, about 9-20 p. m., we felt a very strong shock of earthquake.

42nd Assam L. I.	{ 2 Native Officers. 4 Havildars. 6 Naiks. 1 Bugler. 58 Sepoys.	} Naga Hills Police.	{ 1 Inspector. 2 Head-Constables. 17 Constables. At Wokha. 1 Native Officer. 2 Havildars. 45 Sepoys.

6. On the 25th, about 7-30 A. M., we left Lakhuti, and as we passed through the village, we noticed that there seemed to be very few of the young men about, and some of the old men and the headman of Sánígaon told us that we might expect opposition at Pangti. I may mention here that our guide, perhaps stricken with a vague feeling of remorse for the treacherous part he was about to play, endeavoured once or twice to induce Captain Butler to turn back to the village, and remain there for the day, or at any rate to take counsel with the elders before going on. It must, however, be remembered that had the Lakhuti men wished Mr. Ogle to fall into the trap, they would have led him on instead of refusing a guide; so there is little doubt that it was only with Captain Butler and the main body that the Nágás wished to try conclusions.

7. About 11 o'clock we crossed the Chebi River, and halted for three-quarters of an hour to allow all our coolies and the rear-guard to come up, as the bank on either side of the stream was exceedingly steep and broken, and the path difficult for men with loads. Our guide had got over any little uneasiness of conscience, and slept most peacefully till we went on again, when all the men had come up. We were soon in sight of Pangti, a large village crowning the hill in front of us about three miles off, the intervening country being broken up into long undulating spurs separated by deep ravines, and everywhere densely clothed with long grass jungle and thick shrubs. The path, a narrow one, went up and down over these spurs and across the ravines for about a mile, when it began to ascend to the village. When we reached the first ravine, our guide suddenly disappeared into the jungle, before he could be stopped by any of the sepoys, and effected his escape. Captain Butler, thinking this was the signal for an attack, sounded the "alarm," and Colonel Tulloch, who was a little way behind, asked if he should fire, as from where he was he could see the course taken by the guide. Captain Butler replied that he need not, as the desertion of a guide is not an unfrequent occurrence, and nothing beyond this had taken place; so we again resumed our march, Captain Butler remarking that he thought we were in for an ambuscade there. I remember saying that during my experience of the Nágás we had never met with anything like an ambush, asking if they had ever laid one for him, to which he replied "No, never;" nor had they ever attacked us at any great distance from their villages, always waiting there for us; and we consequently thought that if we were to be attacked by Pangti, it would probably be at the top of the hill, where we could see some pretty strong stockades, guarding the southern and western approaches. About a quarter of a mile beyond the place where the guide had run away, the path descended steeply into another ravine, crossed a small stream, and again ascended steeply (part of the path here being cut into steps), through the close shrubs, thick trees, and long grass, into which it would have been impossible to send flankers. Indeed, as we afterwards found, the Nágás themselves had been obliged to cut a labyrinth of paths paral-
 led to and about five or six yards from the main road, to enable them to move about in the jungle, a few narrow lanes giving access to the road. This ambush had evidently been arranged some time, and there were signs of the Nágás having encamped there.

8. Our order of march at this time was as follows: Captain Butler's police guard of five constables, a havildar, and four or five men of the 42nd; Captain Butler and myself, with our orderlies and some Nágá dobashas armed with carbines, were in front, a little ahead of Colonel Tulloch, behind whom was the advance-guard of the coolies, a few sepoys keeping up the line between us and him. When we had left the stream about fifty yards, a sepoy behind passed up word that he had seen a Nágá up the stream behind a rock. Captain Butler, asking me to wait for him, went back to Colonel Tulloch to ask him to have the ravine searched, and some sepoys placed on either side of the path, to ensure the coolies crossing the stream in safety. He had seen Colonel Tulloch, and was returning to me, when, according to the account of his orderly and a dobasha, which I believe to be correct (Captain Butler being unable afterwards to remember exactly how it had happened), as he was half-way to me, a spear was thrown which fell behind him and close to his orderly, who exclaimed, "Take care, they are throwing spears." Captain Butler asked, "Where?" half turning to his left, and at the same moment a spear, thrown from a point rather higher than the path, crossing him from the left, struck him, at a great angle, in the right breast, grazing the collar-bone and penetrating to the lungs, passing between the first and second true ribs. He drew out the spear, staggered back a few yards, and fainting, fell heavily to the ground. His being struck was, I imagine, the signal for a war-cry which resounded through the jungle up and down for at least half a mile on the left of the path, a precipitous slope being on the right, and immediately after spears came flying out through the grass. We replied promptly with a volley, and groans within a few yards of us told us that some of the shots had taken effect. I remained where I was for a few minutes, firing at the Nágás, who every now and then came charging down the path towards us, appearing and disappearing, as if by magic, through the narrow outlets, the first of which we had just reached. A spear had fallen a few yards before us on the path, and the head-constable stepped forward and picked it up, when at once a Nágá appeared as if out of the ground flourishing a dao over his head, and he escaped only by running back in a crouching position, while some shots were fired over him at the rascal. I was wondering why Captain Butler had not come back to me, when I heard the "assembly" sounding in rear; so we retired slowly, and on approaching the stream I was horrified to find my poor friend lying in a dead faint in his orderly's arms, Colonel Tulloch being actively engaged in keeping off the Nágás on the opposite bank. I at once opened Captain Butler's waistcoat and shirt, and found the wound, out of which air was rapidly escaping; and the native doctor coming up, I made him sew up the wound: this being done, and some brandy-and-water poured into his

mouth, Captain Butler gradually revived, and going back to the coolies, I got up his bed, which was made into a doolie. Our first thought and care were for him, and it was evident that he could not be moved far. It was too late then to make the necessary arrangements for a detached party to proceed against the village, the punishment of which had to be deferred to the next day; and therefore Colonel Tulloch decided to encamp close by in a good open spot, capable of being easily defended. We moved slowly and sorrowfully back and encamped there, sending off three constables at once to Golághát to bring up Captain Butler's brother and a European surgeon.

9. A very anxious night passed without any further disturbance, and the next morning Colonel Tulloch, with a small force, attacked and burned Pangti, the villagers retreating rapidly before him. I remained in camp to look after its safety, and attend to Captain Butler, who seemed to be much better and stronger in the afternoon, though he lapsed into unconsciousness at night. As it was exceedingly doubtful how long we should have to remain in that camp, and we had only two or three days' supplies with us, I visited Pangti on the 27th, and taking up most of our coolies, brought back to camp a large quantity of *dhan*, with rice-pounders and other implements necessary for husking it: this we did for several days, and soon had sufficient *dhan* stored for three weeks. Our coolies pounded out each day enough rice for the wants of the camp for that day. Notwithstanding the comparatively low elevation of our camp, *i. e.*, 1,350 feet above sea-level, the damp mist at night made it very cold,—the minimum thermometer averaging 45°, while during the day the average maximum was 79°.

10. On the 31st of December, about 8-30 A.M., to our great relief, Dr. Elliott and Mr. Walter Butler arrived in camp. The former pronounced very favorably on Captain Butler's state, saying he was much better than he could have expected;—indeed, so much better that he only required careful nursing, and he thought he himself might return to his garden, where his presence was just then much needed. Our hopes rose considerably, only to be dashed again towards evening by a report from the surgeon that unfavorable symptoms had set in: these increased with alarming rapidity during the night, and next morning Dr. Elliott decided on remaining with us, as Captain Butler was then in a most critical state. During the day a deputation from Nankam and Are came in, bringing in fowls and other presents, in token of their friendship. On the 4th I visited Okotso, and met with a friendly reception.

11. Captain Butler, though very weak, rallied wonderfully several times, but sinking gradually, died on the morning of the 7th January. Preparations for marching were at once made, and starting at 9 A.M., we passed through Lakhuti, and encamped at 7 P.M. below Buragaon (Yembang of the Nágás). From Lakhuti I despatched a letter to Mr. Ogle at Wokha, informing him of what had occurred, and instructed him to join me at Golághát, as I was then ignorant as to whether the survey was to proceed, or not. On the 8th, marching early, we reached Golághát at 7-30 P.M., and on the 9th we buried Captain Butler at that station. Captain Butler, by his great experience and good judgment, inspired every one under him with the fullest confidence; and, apart from the grief we felt at the loss of a personal friend, his sad and untimely fate at the outset of the expedition cast a gloom over the rest of the season's operations.

12. At Golághát we soon heard that the survey was to go on, and that Mr. Hinde was to join our party. On the 12th Colonel Tulloch, fearing that in our absence the Nágás might be tempted to attack the Wokha guard, returned to the hills, whither Mr. Ogle and I followed him on the 15th, having made the necessary arrangements for russia, and left a guard and instructions for Mr. Hinde. We found Colonel Tulloch encamped on the Doiang, below Sáni-gaon, where a fine open flat piece of land afforded excellent camping-ground, overlooking a fine pool. While bathing in this, some Nágás came down on the opposite side and amused us by the original way in which they crossed the river. Taking large stones in their hands, they waded in up to their neck, and throwing up their legs and lowering their hands, the stones carried them to the bottom, along which they crept on all-fours till they reached the shallows on the other side.

13. While we were in camp below Pangti, we had made careful inquiries from the friendly Nágás who visited us as to what villages took part in the attack on us on the 25th; and, from the evidence, there seemed to be but little doubt that Rechim and Change were implicated. For, although the various witnesses differed as to other villages, each introducing the name of some village against which he had a grudge, yet they were all unanimous in accusing those I have mentioned. Rechim had sent in a deputation to us at Pangti, but as none of the headmen had accompanied it, we said we could only hold communication with the Chiefs, who must come in to see us. This, however, they refused to do then: nor did they afterwards avail themselves of Colonel Tulloch's presence for four days on the Doiang (only two hours' journey from their village) to make any further overtures of peace; on the contrary, defiant messages were brought to us, and we were told that Rechim had threatened with dire vengeance any villages friendly to us. Therefore, Colonel Tulloch determined to attack it and Change at an early date. We halted on the 18th to finish some correspondence and give Mr. Hinde a chance of joining us, which, however, he did not do. In the evening Soleji, an Angami dobasha, pointing out a large star in the west with a smaller one close by, remarked that it was a good sign that the small star should be on the right of the larger one, as we were then in the same position with respect to Rechim, over which we should consequently gain a victory.

Had the positions been reversed, we should have had cause for apprehension, as apparently the large star, which would then have represented us, always gets the worst of it.

14. On the 19th January we marched early, advancing cautiously to Yekam, searching the grass jungle on either side, where practicable. About a mile and a half from the Doiang we saw evidences of an intended ambushade. Little spaces had been cleared in the grass to allow of a man crouching in each of them, and each was provided with a small heap of stones. In some the oracle had been consulted in the usual manner, by cutting little chips from a piece of wood and noticing how they fall. Apparently the oracles were not favorable to hostilities, for we reached Yekam, a perfectly friendly village, without molestation. Rechim being distant from Yekam only about two miles, we left all the coolies at the latter village with a small guard, and marched on Rechim, which we entered without opposition, the Nágás retreating in all directions. We burned the village, from which nearly every article of value had been removed to the jungles, thus confirming our suspicions of their guilt, and encamped in a commanding spot close to a good water-supply. The next day we proceeded against the two villages of Changse, which were also burned without opposition.

15. On our return to camp we found that Mr. Hinde had arrived at Rechim, bringing with him a letter of instructions for me from the Chief Commissioner of Assam, in which I was directed to assume civil charge of the expedition, with Mr. Hinde as my Assistant. The Chief Commissioner informed me that he was *en route* for Sibságar; and as Tablung (where a guard and depôt had been established) was close to Sibságar, from which we were very distant at Rechim, and as, moreover, no work could be done at the latter place, I at once determined to move on to Tablung with the least possible delay. Our party, as it then stood, was a large one, and I knew the difficulties of providing a large force with rice from many of the villages along the routes we should have to take, as the Nágás seldom husk out more than a few days' supply at a time, and are unable to meet any sudden demands for large quantities, whereas we required ten maunds a day; therefore it was necessary to divide our party. Further, by dividing it, as I had originally proposed to Captain Butler, who had given his sanction to my proposal, much time would be saved and our work greatly facilitated. The plan was that Messrs. Hinde and Ogle should proceed along the outer range, through country traversed by us last year, and Colonel Tulloch and I along the next inner range, our routes lying parallel to, and about twelve miles distant from, each other. Each party was to clear and put up marks on the hills necessary for carrying out our triangulation, and we were all to meet again at Tablung, where we hoped to be about the 4th February.

16. On the 21st January Colonel Tulloch went into Wokha to inspect his guard there before starting for the interior, and a hundred coolies went with him to bring out from the godown rice sufficient to enable us to leave Rechim with five days' supplies at least. They all returned on the 22nd. In the afternoon a deputation from Chingagi, a large village east of Wokha, came in bringing rice, fowls, &c., and professing friendship. The Rechim men still refused to make any advances of a peaceful nature, and continued to threaten and chase our *dák-walas* and friendly Nágás who came to visit us; therefore, in order to ensure uninterrupted communications between Golághát and Wokha, and to secure the safety of the coolies at work on the new road between those places, it was necessary to come to an understanding with Rechim before we left; and on the 23rd three parties were organised under Messrs. Hinde, Ogle, and myself, respectively, to scour the jungles below Rechim to the east. We took three parallel courses, and came across several encampments, and much grain and other property, which we destroyed. Mr. Hinde had a narrow escape of being speared. A large body of Nágás, whom he had driven out of their camp, made a stand in a ravine, and a Nágá concealed behind a rock attempted to spear Mr. Hinde as he was passing. Most fortunately he saw the spear in time to catch it with his left hand and turn it away, at the cost of a few bad cuts on his hand and one slight one across the breast. The man was shot, and the rest suffered considerable loss. In the afternoon some Changse men came in to make peace. I told them we should pass through their villages on the morrow and would speak to them there.

17. Mr. Hinde's wounds not being of a serious nature, nor disabling him, we moved camp next day to Are, crossing the Doaing below Changse. Before starting, all the sick and a few who had been wounded with panjies were despatched to Wokha, the Yekam men coming in most willingly to carry those who could not walk. They also carried some of our loads to Changse, where we had no difficulty in getting fresh coolies to go on with us to Are. On the road the Rechim headman made peace with us, and told us that twelve of his men and eighteen from Changse had joined with Pangti on that fatal day. He swore that neither he nor his men should ever fight with us again; on the contrary, should we ever be in difficulties with any other village, he would bring a force to our assistance. At Changse we found that huts had been built for us on the site of last year's camp, and a large supply of rice, fowls and eggs was collected outside. Here peace was also concluded with the Changse men.

18. On the 25th we went on from Are to Nankam, where we experienced a very friendly reception indeed; and in the afternoon a signal was put up on a bare point near the village, which we had chosen last year for a trigonometrical station. On the 25th, Mr. Hinde being furnished with full instructions for his guidance, our party divided, Messrs. Ogle and Hinde

with the force named in the margin, starting for Alibar *via* Mungatung; Colonel Tulloch and myself, with the force given in the margin, proceeding to Ungma, which we reached about 3 p. m. I was able to do a good deal of work both on the road and in the neighbourhood of the camp. The road was easy, running along a ridge, with only one or two stiff little ascents, but it was much choked with jungle and overarching grass. Ungma is a very large and flourishing village, containing about 500 houses, and the villagers received us in a very friendly spirit. The next day we passed through the comparatively small villages of Mokokchung and Juju, and halted half-way between the latter and Solachu, below a large wooded hill, on which I wished to set up our next mark. Both villages were cordial, and on arrival in camp I received a deputation from Khenza, bringing in large supplies of rice, fowls, eggs, &c., about one in five only of the latter being good. They seemed astonished at our rejecting the bad ones, especially such a treasure (to them) as an egg in which we could hear the *peep* of the chicken. From this camp in the afternoon I saw Mr. Ogle's first mark. Outside the Juju stockade, by the roadside, we saw a very fine tiger (dead) stretched on a maichan. He had only been lately killed. The villagers said he had tried to carry off a cow one night, so they all turned out at once with huge torches, and, surrounding him, killed him with their spears.

19. On the 28th, leaving Colonel Tulloch to take the camp on to Solachu, I went up the hill to fix on the spot for our station. The hill was so long and broad, however, and so densely wooded, that I found it would be impossible without weeks of labour in cutting to establish a point there, and so went down to camp and endeavoured to find a spot near from which all necessary points could be seen. I was fortunate in finding an excellent spot in the village itself, and succeeded in putting up our bamboo signal before nightfall, amid the merriment of the young women of the village, who seemed to think it an exceedingly comical erection. My only fear was that the villagers might object to its being put up among their houses, and destroy it after our departure. I promised the headman a small present on my return if it was still up, and he said it should be carefully preserved—a promise which I am happy to say he kept most faithfully. The Molotombia and the Solachu men go down to the plains frequently and work in the tea-gardens (a fact proclaimed by the number of old *sola-topis* which appeared to welcome us), and are comparatively civilised. The two villages are large, containing from 250 to 300 houses each, and belong to the so-called Dupdoria tribe.

20. On the 29th we went into Boralangi, called by the *Nágás* Mongsemdi, containing about 200 houses, situated on a long bare ridge, and very strongly stockaded. We arrived early, but fog and rain prevented my doing any more work that day. Indeed the weather was anything but favorable throughout our journey between Nankam and Tablung, and it was fortunate that we were merely putting up marks and not necessarily observing. Of course, the topography suffered a little, as from the foggy and dull weather I was only enabled to get in the country immediately bordering our line of march, necessitating a little extra labour further on in the season. I may here mention that out of the ten days occupied in marching from Nankam to Tablung, no less than seven were dark and misty, of which five were wet. On the 30th we halted at Boralangi, to enable me to do some work which the weather had prevented my doing the day before. In the evening I made a sketch of the headman, who protested that he did not want to be taken, that he should die in consequence, &c.; but who nevertheless all the time was arranging and re-arranging his clothes and ornaments to appear to the best advantage. On the 31st we moved camp to Ungrurr, pronounced, as only a Frenchman (except the *Nágás* themselves) could pronounce it, as if spelt Ungrrr. We found excellent camping-ground in some open *jhúms*, sheltered from the cold wind and well supplied with good water. We arrived at midday, and I sent my coolies up at once to commence clearing the hill above. The cutting was finished, and the mark put up next day, and on the 2nd, passing through Akoya, Santong and Lorian, which were all very friendly, we descended to the Tzela, a fine broad stream with deep pools; and early next morning ascended again steeply for 3,000 feet to Tangsa—the first village of naked *Nágás* we had seen this season. Here we were well received; and I left Colonel Tulloch with the camp near the village, while I went to put up a mark on a point half-way between Tangsa and Kamahu. The hill requiring very little clearing, the mark was up by 4 p. m. I saw in the morning that Mr. Ogle's mark was up at Deka Haimong, and before I left the hill in the afternoon I saw through the telescope that he was then putting up the mark at Kanching, and as he had arrived so far, I knew that his party had met with no opposition. We marched into Tablung on the 4th, and on the 6th were joined there by Messrs. Hinde and Ogle. I append Mr. Hinde's report of their tour.

21. We halted at Tablung till the 9th, in order to put up the mark and observe, and to answer a large budget of letters which we found awaiting our arrival. On the 9th, leaving our sick and incapables behind, we started once more. As all the marks were now up between Wokha and Tablung (with one exception), by retracing our steps we could observe at each point and complete the triangulation in the so-called Western *Nágá* Hills. Messrs. Hinde and Ogle were to return to Wokha nearly as they came, and Colonel Tulloch and I were to

return also nearly by the same route by which we had come, making, however, a detour to the east of Wokha to clear the last necessary hill.

22. We encamped at Nian that afternoon, but the fearful haze which had hung over the hills for the last few days, through which it was impossible to make out anything over five miles distant, prevented our doing much work. This haze was especially unfortunate at this time, as I was unable to see the watershed to the east, and hence did not discover, as I should otherwise have done, how far back the valley of the third feeder of the Dikhu extended. Had I seen this, I should have been able to arrange my programme at Wokha with greater accuracy, and again some additional labour and time would have been saved later on. The next day (10th) was, if possible, worse, but we moved on to Kamahu, passing through Yangia, which village presented us with a goat. Kamahu consists of three villages, built at short intervals along a narrow ridge: here we began to leave the naked Nágás, only a few of whom are seen in Kamahu. I have not mentioned them here, as they have already been described by Captain Badgley. The *morangs* (bachelors' houses) of all the villages in this part of the hills are very much more elaborately carved and ornamented than any others,—figures of elephants, deer, tigers, &c., being carved on all the principal uprights, and in some, life-sized figures of men and women; the weather-boards are carved with figures of birds and fish, and painted in great detail, with red, black, and white stripes, circles and dots. The *morangs* are divided into three partitions—first, the front verandah, enclosed at the sides; second, the body of the house, containing the sleeping apartments and store-rooms on either side of a central passage: each sleeping-room contains four planked beds, arranged in twos like the berths of a ship, on either side of a small fireplace; third, a large room, open to the small back verandah: this contains a fireplace, with a few planks as seats round it; this room is floored with immense hollowed beams. In the back verandah, which has a low circular roof, are hung all the trophies of war and the chase. The big drum is also kept here. A curious custom prevails here, as also in most of the villages lying between the Tzela (most western branch of the Dikhu) and the watershed, of decorating the skulls of enemies taken in battle with a pair of horns, either buffalo or mithna, and failing these, with wooden imitations of them. The houses in Nian, Kamahu, &c., are very closely packed on each side of long streets, the eaves touching and the projecting front gable-ends of opposite houses often overlapping each other: the result is, that even in the middle of the brightest day the streets are wrapped in gloom, so great as to make it difficult to distinguish objects in the front verandahs, the few flecks of sunlight which fall upon the roadway here and there only serving to make the darkness greater. In the front verandahs of some of the houses is a small enclosed room containing a bed and a fireplace. When an old woman is left a widow, and without a home, her son [or (?) her nearest relative] provides her with this little chamber. In front of the houses in nearly all the villages we passed through during the expedition large bunches of leaves were tied to the door-posts. I imagined that these were signs of peace; but I find that their object (like the blood on the door-posts and lintel) is to prevent any evil (sickness or devil's visitation), which may accompany strangers to the villages, from entering a house so decorated. Generally, the withered leaves showed that our visit had been expected for some time.

23. The inhabitants differ only from the Tablungias in wearing a small waist flap, generally made of a woody fibre, woven into a coarse cloth. Here, as very generally, I think, in these hills, a youth having taken a fancy to a girl, either of his own or a neighbouring village, has to serve in her parents' house for a certain time, varying from one to two or more years, according to agreement, before he can marry her, as was Jacob's case. Outside the villages, within a circle of stones surrounding two trees, supporting a small platform, the harvest festivals take place. Large quantities of garlic are grown in these villages in small fenced gardens, panjies studding the ground between the plants.

24. We encamped just below the third village of Kamahu, the road to Tangsa passing above our camp. On the 11th I went up early to the mark, but could do no work on account of the continued hazy weather, and so returned to camp; and in the afternoon visited the three villages, making sketches and chatting with the villagers, who were very friendly. During the night, about one o'clock, the camp was aroused by shots from the two sentries facing the village; on inquiry, they stated that some stones had been thrown at them from the road above. Colonel Tulloch and I at once went up to the village, but we found it quite quiet, and everyone apparently in his own house with his family; so we returned to camp. Early the next morning I sent up a head-constable to the village for the headmen; he returned with several old men, who professed entire ignorance as to the stone-throwing, saying they were all asleep when they heard the shots. I dismissed them with a warning that more stones would entail punishment. I cannot account for this incident. Some Nágás from another village, actuated by ill-feeling towards Kamahu, may have thrown the stones in hopes of stirring up a quarrel, or they may have been thrown "for a lark" by some young scapegraces from the village. The stone-throwing, on the other hand, may have existed only in the minds of sentries, who were recruits, as the night was clear, and anyone approaching them or moving on the road above should have been visible to them.

25. About 10 A. M., as the weather was clearing up, I went up to the mark again, and did all my work there by 4 P. M. Since 2 P. M. I had heard the drums in the village sounding, and on arriving in camp I found everyone on the *qui vive*, and Colonel Tulloch told me that the whole village was under arms, and he feared an attack. This being the case, the only thing to be done was to go up again at once, and try and persuade them to keep the peace. Arrived

inside the gate, we saw some men who had come with us from Tablung, who said these villagers had had a quarrel with the other village, as the latter had given us no supplies. However, I doubted this, as the attitude of the Nágás on all sides was anything but friendly towards us, a large number being collected in the *morang* with spears and shields, their crossbows being bent and levelled at us; others came careering towards us down the narrow streets between the houses. We sent the Tablungias up several times to the *morang*; and after much yelling on both sides for a quarter of an hour, during every minute of which I expected we should be forced into hostilities, the Nágás at length, to our great relief, quieted down. Crowded together as they were in the verandah of the *morang* and the small open space in front, knowing nothing apparently of the power of firearms, we shuddered to think of the loss they would have suffered had they provoked us to fire on them. We returned to camp having impressed upon them that any further hostile demonstration would be dealt with promptly and without parley. We heard a little excited talk during the evening at intervals, but it ceased before 10 o'clock, and after that all was perfectly quiet.

26. This village had given us five or six maunds of rice (for which, of course, they were paid), so I was at a loss to understand this sudden declaration of war. But I afterwards heard that several men from Tablung, not our guides, had followed us to Kamahu, and had demanded free quarters and living on the plea of being our friends. This demand Kamahu naturally refused to comply with, saying they had given us what we wanted, but they would not give to every Nágá who chose to go there. I have a strong suspicion, though I could not get it directly confirmed, that on this refusal the Tablungias, referring to their having a guard at their village, which would ensure its safety, had threatened Kamahu with our vengeance; perhaps had even said that they would bring us up to burn the village. Hence the "assembly" being sounded, and the warriors turning out in battle array.

27. On the 13th, warning our Tablung friends that any of them who came on with us except our guides would be punished, we left for Yajim and Chihu, two villages in close proximity,* which we reached in the afternoon. The houses are crowded, as at Kamahu, but here the skull-trophies are placed in the front verandah, decorated with horns. The eldest brother in a family, in addition to his own trophies, gets the skulls taken by his brothers also to decorate his portals. Many of the verandahs contain a number of Y-shaped posts, carved with human figures and methna heads: these signify that the occupant of the house has been the giver of a big feast. The dead here are sometimes placed in trees, as at Tablung (see Captain Badgley's report of last year), but they are also often placed on maichans inside small houses, the beaks at the end of the coffin projecting through the front of the house. A small window is left in the side—why, I could not find out exactly: I believe it had something to do with the passage of the spirit. These houses, unlike the custom of other tribes, are not outside the stockade, but actually within the village precincts, close to the dwellings; so, in order to obviate any unpleasantness arising from the newly dead, fires are lighted in front of such, the fuel being chaff and dhan-straw, which smoulder slowly, a plentiful supply of smoke being obtained by heaping over the fire a pile of green leaves and boughs. The men here tattoo on the chest after taking their first head. The pattern consists of four lines which spring from the navel, diverging as they ascend, and turn off into two large concentric curves over each breast, the lines broadening out to about one inch in width at the middle of the curves.

28. On the 14th February we left Chihu (or Shushu) early. The villagers had been most liberal in giving us supplies, having pounded out rice during the night with the greatest good-will. We could not persuade them to give us a guide, as there were no Assamese-speaking men among them, and our Tablung guides had deserted during the night, having, I believe, got an inkling that we knew they had been deceiving us the day before. I was delayed with my work, and when I overtook the camp at the River Tzela, about 12 o'clock, I found that the wrong road had been taken, and though the road was very good down to the river on the Shushu side, on the opposite bank not a trace of a path existed. The only thing to be done was to cut our way up the steep hillside to the top of the spur, where we hoped to find a path of some sort. The ascent was nearly perpendicular, and we progressed very slowly, clinging on by roots and creepers, as the loose, shaly soil slipped away from beneath our feet, and we had only ascended 1,200 feet and made about 1½ miles in three hours. At last we found an obscure, disused path, tangled thorns, creepers, and ferns tripping up our feet below, while the overarching grass and bushes caught our faces above, and it was not till 6-30, as darkness was closing round and rain beginning to fall, that we at last emerged on to the open path leading direct to Ungurr, still distant about two miles, with a steep ascent of 1,500 feet. We toiled up this in the dark and rain, reaching the village about 8 o'clock. We waited for the coolies, and all got into our old camping-ground by 9 o'clock.

29. The next morning, shortly after daybreak, I went up to my mark. The day was beautifully clear, and I observed till 2-30 p. m., when I returned to camp for breakfast, and went out plane-tableing till 7 p. m.—the most satisfactory day's work since leaving Nankam. On the 16th we marched into Lungkhung, a village which had lately been destroyed by Letum across the river. They had only just rebuilt it. The inhabitants received us with the utmost friendliness and confidence, bringing in hutting materials for us, and the children coming down in large numbers and fraternising with the sepoy and coolies. Outside Boralangi village, which we passed through during the day, we saw the body of a young man, only a few hours dead, stretched on a small maichan without any covering except his cloth. This circumstance, and the fact that he was lying far from the regular resting-place of the dead, excited our curiosity, and we were informed that he and another man from the next village (Susu) had been

at Boralangi the day before to attend a merry meeting, and had made too merry with the Nágá beer; in consequence of which, the night being dark and the path just outside the stockade a narrow and tortuous one amid a forest of long panjies, he had tripped and fallen, and a panji had passed right through him from side to side below the ribs, and he had died a few hours later. My informant added that men who died violent deaths in this way by accident were simply tied up near the spot where they fell, without covering or ornament, as their death is attributed to their having incurred the special disfavor of their gods. I noticed a similar custom last year among the Nágás about Bormutan and Senua.

30. On the 17th I went out to a conspicuous point known as Yangemdi, about six miles from Lungkhung, along a narrow and jungle-grown path, to put up a mark there. It is the site of a village which was so frequently attacked by its inveterate foe Letum, that the villagers about eight years ago had retired to Lungkhung, where, however, they seem to fare but little better, as in the last raid, besides burning the village and killing the headman and about a dozen others, the Letum men had carried off about twenty women and children: they were consequently very anxious that we should visit and destroy Letum. It was a dark, cloudy morning, but cleared about 9-30 A. M., and I was able to commence observing. Immense *jhun* fires were lighted to the south during the morning, which sent volumes of thick brown smoke rolling down the valley of the Tzela, and threatened to blot out the whole of the ranges to the east. Fortunately, the very high wind which had been hindering my work somewhat here came to my assistance, and keeping the clouds of smoke constantly moving northwards, disclosed, one by one, almost all the peaks I could observe, and by 4 P. M. our work was satisfactorily finished, and I returned to camp. The "gaonbura" told me, on my enquiring why some villages had two names, that a Burmese army had crossed the watershed to the east of Nankam, he could not tell me exactly where, and descending to that village had burned it, Ungma and Semamantin, and had then proceeded, *viâ* Tablung, to the plains of Assam. The villages that were burned were rebuilt, and most of them received new names, though they were still frequently mentioned by the old names. Assamese names were given to all villages from which the Assam Rajas exacted tribute. For convenience in collecting this, the villages were divided into "duars," and names given to them arbitrarily by the Rajas: hence the tribal names, unrecognised by the Nágás themselves, such as Dupduarias, Hatigorias, Assiringias, &c., &c.

31. On the 18th Colonel Tulloch, with the camp, started direct for Soláchu. Taking a few coolies with empty rice-bags, I went round by Semamantin, a large Hatigoria village of about 300 houses. We were hospitably received, and rice, fowls, beer, &c., were brought out in profusion. Leaving our head-constable to collect and pay for the rice, I went out to the other side of the village to work. The burning of yesterday had cleared the spur of the long grass and shrub jungle, and I was able to get in a great deal more detail than would have been the case otherwise. Returning to the village, I was requested to visit a poor little girl about ten years old whose legs had been tattooed a few days before: the operation had resulted in mortification of the limbs. I went into the house where the poor little thing—sad votary of fashion!—was lying on a bed screaming with pain. The sores were dreadful, both legs apparently rotting away below the knee. I could do nothing for her, beyond telling her parents to wash the sores (which apparently had not been touched), and promising some carbolic acid wash if they would send a man to camp with me for it, which, however, they did not do, contenting themselves with asking me if she would die. I was then taken to see the wife of the headman, who was suffering from an unaccountable pain in her stomach. I gave her a little brandy, which she was very loth to take at first, but having once tasted it, suspicion gave way to satisfaction, and she asked me to leave a large supply with her, as she feared the pain would not be removed speedily. On the way to Soláchu, at the top of a stiff ascent, I was overtaken by the headman of Boralangi, who said he was exhausted. As I had halted for breakfast, I gave him the leg of a fowl, and it was amusing to see this "Raja," as some frontier officers would call him, squatting on the ground with one of my Khasias, each holding one end of the leg, from which they took alternate bites. I reached Soláchu about 3 P. M., but a heavy thunder-storm prevented my observing, and obliged us to halt the next day for that purpose.

32. On the 20th, we marched to Ungma, and the next day, turning eastward and leaving the main range, we proceeded along the low watershed by a narrow and difficult track, only

* Described in Report 1873-74.

used as a war-path between the Hatigorias, whom we were leaving, and their Sema* foes, whom we were approaching. Early on the 21st we came in sight of a cluster of five villages, the nearest being Limitsami. We were seen by the Nágás as we passed over the crest of a hill about a mile from the village, and they at once commenced yelling to each other; and as we went on we saw them all turning out in full war-dress, lining the approaches to the village, and occupying every coign of vantage, such as clumps of bamboos, rocks, thick tufts of long grass, &c., &c., till about 300 men had collected. One of our interpreters went forward waving a green bough, and shouted to them till he was hoarse; and at last a few, putting down their shields and spears, came down to where we were halted, and after a short conversation, in which we endeavoured to convince them of our peaceful intentions, they went back, returning with rice, fowls, &c. They said they did not wish us to go through their village, as we should frighten the women, and we expressed our readiness to send the coolies round under the village, if there was a road. But it soon appeared that the only way they wished us to go was back again, no road existing round the village. As it was absolutely necessary for the success of our work that we should visit a point the road to which lay through three of these villages, I told them

that if they could not make up their minds to show us the way, we should have to find it ourselves, and I returned them everything they had brought down. We gave them half an hour to come to a decision, while we got the coolies well up and safely guarded, and then, as they refused to come down and converse any more, only resuming their weapons and retiring to their old standpoint, Colonel Tulloch ordered his men to advance in skirmishing order up the hill. The Nágás fell back before our steady advance, and we gained the village. Here we all halted, to allow the Nágás another opportunity of coming to terms, as they were all collected in the lower part of the village. At last, seeing that we were not apparently inclined to do mischief, a young fellow, unarmed, again came forward with the rice, fowls, &c., for which he was paid, and was highly delighted with the small silver coins, of the value of which he showed his appreciation by saying he should sew them on his large beworried waist-flap. After doing a little work, we went on to the next village, preceded by an immense army of Nágás and followed by a few more. At this village also an attempt was made to turn us back, as before; but as we again went on steadily, they again gave way. Here we lost some of our escort; but at the third village, Chichimi, we found a larger crowd than ever outside the stockade, who were joined by our escort, and for some little time it seemed doubtful if battle was not intended by these gaily-dressed warriors. We occupied a fine open grassy plateau, the approaches to which we could command. At length we persuaded them that it was best to keep the peace, and we passed quietly through this village. Outside I put up my plane-table, the crowd again assembling near. Colonel Tulloch and the guard kept watch while I worked. When all the coolies and rear-guard had come up, we formed camp in a good spot close by. This had been a most trying day: the villages being so close together, we had no sooner passed Scylla safely than we found ourselves face to face with Charybdis. The attitude of all the Nágás was so very unsatisfactory, that we could not relax our watchfulness for a second, and the slightest indiscretion on our part would have provoked an outbreak. However, we hoped that, having got so far, the Nágás would see that we did not mean them any harm, and would not give us any further trouble—a hope not to be realised; for the next morning, when we started to ascend the steep hill to Lukobomi, about four miles south of which was the point I wished to clear, we were again followed by crowds of armed Nágás from all five villages in our rear, and as we were approaching a jungly bit of road, and they pressed on our rear-guard, we were obliged to threaten to fire on them if they did not keep their distance. They pretended to drop back; but as soon as our backs were turned, they came creeping on through the grass till they reached our line again, and I was obliged to fire a few shots over their heads before they would cease from hustling our rear-guard and coolies. We arrived in the village without opposition. All the inhabitants were fully armed, and as it was a small village, it was evident from the large force in it that the village must have been reinforced by their neighbours. We searched for a camping-place, which we at last found about one and a half mile beyond the village. I at once despatched some coolies with a guard to commence clearing the point from which I wished to observe, and shortly after followed myself, the Colonel remaining to look after the safety of the camp, which was being watched by all the Nágás who had followed us, but who had disappeared before my return at nightfall.

33. On the 24th February, very early, I again sent up the coolies with a guard under a Native officer. While at *chota hazri*, Colonel Tulloch remarked that a colony of *hoolooks* had taken up their quarters in the forest which clothed the hillsides everywhere, except on the patch of old cultivation where we had our camp: we had not heard them before. A few minutes later we were told that Nágás were seen at the edge of and in the forest, crouching behind their shields. They saw that they were discovered, and leaving their weapons came forward a few paces, saying they had brought us some supplies; but nothing was forthcoming, and as more and more men appeared in various directions, a diversion seemed to be our best move; so I asked Colonel Tulloch for a guard of twenty men, and telling the Nágás that I was going to Lukobomi, and would receive anything they had to give us there, I took a few coolies and went down to the village, where our presence had evidently not been expected, for although the entrance had been barred, there were only some twenty or thirty Nágás inside. We cut our way through the obstacle without any active opposition, and calling for the headman, I explained that we should have to remain in our camp for a day or two, that we did not mean any harm to any one, and showing him a red cloth, told him that it should be his if he kept his men in order while we were there. He promised to do this, and said he would supply us with some rice; but although he and the other Nágás standing about said they would give us everything we wanted, no one stirred; and it was evident that, having been taken by surprise, they were simply trying to gain time for reinforcements to come up, which began soon to appear in the jungles around, and the men in the village slipped away by twos and threes to join them. As the headman was leaving, I told him that if he wished for peace he must show it by bringing in some presents of rice and fowls, and that as we did not wish to fight them, we would give them plenty of time to think over what I had said. Leaving half the guard with the coolies in the village, which was a most excellent position in which to receive an attack, if one was to be made on us, I went outside to a field about half a mile off, and worked for a couple of hours, during which time we had seen the Nágás creeping up from all sides through the grass and shrubs; and shortly after my return to the village they appeared, surrounding it, and a young warrior, approaching one of the entrances as I passed it, began to dance, and levelling his spear at me, prepared to throw it. I turned for my rifle, and, seeing this, he made for the shelter of a tree. The Nágás then sounded their war-cry and some rushed forth from the jungles, brandishing their spears, while others fired arrows

from their crossbows at us from behind the bushes. The stockade and hedge which surrounded the village prevented their coming on to us with a sudden rush, and a few shots caused them to retire to the jungles again, whence they kept up a desultory fire on us from their crossbows. Hearing the firing, and all the Nágás having left the vicinity of the camp, Colonel Tulloch came down to the village. The Nágás made a few more rushes, but were driven back. Strong reinforcements coming up our path of the previous day from the five lower villages, were also put to flight. We burned the village (forty houses) and returned to camp.

34. I went up again in the afternoon to the clearing, which had been progressing favorably. The working-party had also been visited by a large body of armed Nágás, who, finding the guard on the alert, retired again, saying they were looking for me to give me a fowl. There is no doubt that the villages all round, probably nine or ten, had combined to exterminate us, and that they divided their forces into two parties—one to attack the camp, and the other to massacre the working party on the hill. They had hoped to take us unawares at both places, and the *hoolook* cries we had noticed in the morning were probably signals to each other while assembling, as we heard nothing more of these animals during our stay in the neighbourhood. In the evening the clouds cleared, and the setting sun shone out brightly. I turned my mirror in the direction of Lakhuti, and was pleased to get an answering flash from Mr. Ogle at that place. This was exceedingly fortunate, as the point I had selected was not the one I had pointed out to Mr. Ogle from Nankam, as I found the latter could not be cleared without much loss of time, the whole range being densely wooded along its ridge. Mr. Ogle was looking out for a clearing on the highest point, and but for this fortunate flash might have overlooked the point chosen by me.

35. The next day (25th) I started at dawn for the point, and succeeded in getting all my work done there by 2 P. M., when we moved camp to the site of Lukobomi, where we intended to remain till the country around was a little more settled, and on the 26th I went out along the ridge to the south about nine miles, and was able to do a good deal of work. On the way through the forest we met a few Nágás, who after shouting something which we could not make out, disappeared. A little distance further on we found on a large fallen tree in the path an egg and some rice tied up in plantain leaves—peace offerings. We got back to camp about 9 P. M., and I learned from Colonel Tulloch that seven villages had sent in deputations to sue for peace, bringing in rice, goats, &c. Goats seem to be very abundant in all the villages near the watershed. The next day also we halted, and I remained in camp to see the Nágás, who again flocked in in large numbers during the day, professing the utmost friendliness and bringing in further supplies. On the 28th we again resumed our march, and, passing through Letsámi, went on to Kerumechumi. Here there was some altercation between the guides as to our road, and at length we were conducted down a newly cut path, which apparently ran round under the village, saving us a steep climb. However, after pursuing it for about half a mile, we found ourselves stopped by jungle and tangled fences, out of which there was no possible exit. As it was late then, and we could not go searching about for a camping-ground and as, moreover, this wretched attempt to turn us from our road could not be suffered to pass unnoticed, we took up our quarters at the upper end of the village, intimating to the Nágás that had they shown us a proper road, we should have been four or five miles off by that time, and further that we should remain at the village till they did show us a road. Two tall bamboos, decorated with fringes of bamboo-leaves, stuck up in the highest part of the village, just outside my tent, swaying about in the wind, kept up a noise like the creaking of cordage, which, with the flapping of my tent, for it was a wild night, was highly suggestive of being at sea. Early in the morning several men came up and gave me all the information I wanted as to our best route, and took us along a steep, though good, path to Emilomi, where we were well received, and passing on through Letsámi and Sakomi, halted in a beautiful little spot on the banks of the River Keleki. The men at Sakomi were excessively friendly, bringing out large quantities of their rice-beer (freely watered) for the coolies and others, and cheerfully carrying the Native doctor, who had sprained his foot, down to the camp, a distance of some $2\frac{1}{2}$ miles. They came down again to us at dawn, and conducted us up to Kukiagámi, whence we descended to a big stream, and again ascended steeply to Satakahenogámi, and passing through it, Momi and Hovekhenagámi, all of whom received us well, we halted near the latter, whence at daybreak I proceeded to the peak Lólamávu, already visited by Mr. Ogle (see Mr. Ogle's Report). Colonel Tulloch took the camp to Kakenagámi during the morning, and my work being all satisfactorily accomplished by nightfall, I joined him there.

36. On the 3rd March, passing through Hueshonagámi, we descended to Nunomi. A small party of constables and coolies went into the village for rice, with which they were liberally supplied. The headman came out to meet us; everything seemed peaceful, and we hoped to make the Doiang before nightfall. However, when we had gone about three miles from the village, our rear-guard was suddenly attacked by a large number of Nágás, who had come up through the jungly ravines behind us. I had seen them descending from the village on looking back, but as their arms were concealed in their clothes, I thought they were going to their *shum*. They had probably hoped to cut off the coolies, but the latter, in the speedy prospect of a few days' halt at Woklia, were going very well, and the Nágás having a steep climb through tangled grass, had only come up with the rear-guard. Leaving a Native officer and Police Inspector Memaram to form camp close by at the village Gosutomi, Colonel Tulloch took twenty men with him, and we went back at once to the village, attacked and burned it,

the Nágás offering a very slight resistance as usual when a steady advance is made against them. At various parts of the road, just outside the stockade, we found portions of a puppy, which had been killed, cut up and buried, when they came after us. I learned next day that this ceremony is supposed to secure immunity from adverse spears or bullets.

37. On the 4th March we went to Nungatung *viá* Chelokesámi. The first guide we took from this latter village said that war was raging between the two, and made his escape before going very far. An unsuccessful attempt was made to stop him, when we heard another man calling to us from above, and when he had joined us, he said he would take us into Nungatung, which he did. I asked how it was that he could go there without danger when the other men of his village had refused to guide us; he explained that some time before, when the two villages were at peace, he (a Nungatung man) had married a girl in Chelokesámi and settled there, and in consequence he is looked upon as neutral and can pass backwards and forwards between the belligerent villages without fear. The Nungatung men have a keen eye to business, and assembled outside our camp at 3-30 A. M., with cloths, yams and other articles for sale. On the 5th we marched into Wokha, where we found Messrs. Hinde and Ogle, who had arrived an hour before. I append Mr. Hinde's report of his proceedings.

38. We halted at Wokha for observations and correspondence till the 10th, when we again started, this time with united forces (see margin), and camped once more on the Doiang, the next day proceeding *viá* Nungatung and Pusimi to the Teshi River. On the 12th our road took us to Chichimi again *viá* Lunkomi and Setémi. How different, however, was our reception now to what it had been on our first visit; now instead of crowds of armed men opposing our progress at every step, the Nágás came out with scarcely a weapon among them, receiving us in a most friendly manner; they had

42nd Assam Light Infantry.

3 Native Officers.

6 Havildars.

88 Sepoys.

2 Buglers.

Police.

1 Inspector.

8 Head-Constables.

25 Constables.

shut up the roads leading through the villages by placing small green boughs at intervals along them. This they imagined quite sufficient to mislead us. Captain Butler once told me that he saw a few twigs with leaves stuck here and there along a path leading to an Angámi village. He asked the meaning of it, and was told that the demon of small-pox had visited a village near, and might wish to go there also; but if he came upon the twigs he would say—"Dear me! I thought there was a village-path here, but this is all jungle; I must try for another road." The Nágás do not give us credit for an intelligence superior to that of their devils. We reached Longsa, after a very fatiguing, hot march, in the afternoon. It is a very large Hatigoria village, quite a mile in length, extending along a narrow ridge. The village is not of equal breadth throughout, but must contain, I should think, at least 700 houses. On the lintel of one of them I saw a painting of a *dao* shaped like those we saw at Thetchumi in 1874, on the Lanier, which is thirty miles south-east from Longsa, across the watershed. I was surprised at this and asked where the villagers had got this idea, and they answered that a *dao* of that shape had been taken in a raid on a village far east, the name of which they did not know. Early next morning the villagers brought in nine maunds of rice, and would have given us a good deal more if we could have carried it by any means; but as it was, each man was carrying two seers extra. After it had been served out, we started. A steep descent and a very stiff pull-up brought us to Changyemdi, two small villages situated on peaks about a mile apart. These villages are emigrations from Solachu, and are very poor. On the 14th we crossed the Chene to Lphuemi, the camp descending to the stream beyond again, while Mr. Ogle and I visited the upper village, and passed on to a point on the watershed. A man from Lphuemi told us he had visited Lukopomi *viá* Yehim (on the east of the watershed), after we had departed, to see what damage we had done. In the evening several men came down from Chimomi, bringing a large supply of goats, rice-beer, &c. They did not wish us to go to their village apparently; but I explained to them that although we accepted what they had brought down (paying them, of course) as a mark of friendliness, yet we by no means bound ourselves thereby not to go through their village if necessary: they expressed satisfaction and left. They returned again at 4 P. M. with more goats, and we went up to their village. The camp was pitched at Aimgung village, Mr. Ogle and I again working towards the watershed during the afternoon.

39. On the 16th Colonel Tulloch, with Mr. Hinde and the camp, passing through Nánu, went on to the stream beyond again. Mr. Ogle and I took a more circuitous route, and joined them in the evening. The men of Nánu received us very civilly. I hardly know to what tribe to ascribe the Nágas we were then among: very slight differences in dress or architecture mark the various villages, but they all seem to belong to one race, and have many points in common with the tribes in the so-called Eastern Nágá Hills. We were here quite beyond interpretation, and continued so till we reached Tablung again. The continual warfare which is kept up between all these villages prevented our bringing on men from Longsa and Changyemdi (the last Assamese-speaking villages along that route) further than Chimomi, because as we were not returning that way, we could give them no safe-conduct back again to their villages. On the 17th March, passing through Lungtum, we arrived about 12 before Yáru. We had heard the war-drums sounding for some time as we climbed the hill, and as we neared the village, we saw a large number assembled on an open plateau, who, as soon as they saw us, at once set up their war-cry and began to dance about up and down the path, flashing their *dao* and flourishing their spears. According to our custom, we advanced steadily, and, according to theirs, they

as steadily retreated into the village, closing their gates. Colonel Tulloch took some of the men round under the village to the further end, unperceived by the Nágás. We effected an entrance on our side without opposition, the Nágás falling back, till they found they were cut off by the other party, when they halted, and we were soon all most excellent friends; they laid down their weapons, and some of them resumed their household occupations. The Nágás here and on the Yangmun are finer men than the other non-kilted tribes, and have a much more pleasing and honest expression. Their spears are decorated both after the Hatigoria and also the Niuu pattern, but their *daos* are peculiar, the blades being from twelve to fifteen inches long, about 1½ inches broad at the handle, and widening to four inches at the other end; the handles are also long. These *daos* are also found at Yangnum, Afang, and neighbouring villages. Their shields are either of leather, oblong, decorated with red hair, or of bamboo matting. It will be unnecessary to refer to the arms of the other Nágás, as they are the same for all these tribes, the *daos* being of the ordinary Niuu type described so often. The granaries in these villages are within the stockade, and sometimes mixed up with the houses; they are large substantial buildings, raised about four feet from the ground, the posts being furnished with large wooden discs, on which the beams of the floor rest, similar to the arrangement in many of the Gáro granaries.

40. On the 18th we passed through Yangfai, a large village which received us well, and Longbu, a small Hatigoria village, and encamped on the Sohán River—a pleasant little stream with good open ground on either bank. At Yangfai we noticed a curious custom, the meaning of which I could not find out: large pieces of wood, cut and the white face turned outwards, are joined, so as to resemble a bird with outstretched wings, and placed in the branches of several of the trees near the village, and have the appearance at a little distance of huge white birds beginning to take flight. Early next morning we went on to Ponching, and remained there about two hours, while the fellows collected some rice. At this village and Siphang the men tie up their cloths in a most picturesque manner: they are knotted over one shoulder and cover the body, leaving the arms free; they fall to within about six inches of the knee, and are tied round the waist by the belt, which carries the wooden dao-sheath. The whole has the appearance of a Roman tunic. The tattooing here on the men's chests is the same as that at Chihu. From a point east of Siphang we looked down into the valley of the Yangmun, and I was dismayed to find how much further south than I had expected the valley of this branch of the Dikhu extended. We saw that it would be impossible, with the again unfortunately dull and hazy weather, which obscured all details, compelling us to confine our sketching to the ground immediately about us, to survey the whole of the valley. However, we determined to cross the river to some large villages, and do what we could from there before going into Tablung. We halted that night on a small stream, and on the 20th proceeded on to Chamba. On the way we met a few men going on a trading excursion, who the moment they saw us threw everything down, and went yelling back to the village. We were therefore not surprised a little further on to meet a small body of armed Nágás, some of whom were endeavouring to conceal themselves in the long grass on the right of the path. After a little while they became convinced that we were not animated by any hostile feelings towards them, and preceded us to the village. They gave us some rice, and the headman, again donning his "war-paint," and bringing some long "panjies," proceeded to plant them in a large circle round him; he then took a small hoe in his hand, and, stooping, gave us a representation of some *jhúming* operations, looking to the right and left round his shield the while; suddenly, he dropped his hoe, uttered a war-cry, and drawing his dao, commenced to dance and brandish it, then running up to an imaginary foe, engaged him in combat, was victorious, cut off his head, and returned to his cultivating, till another imaginary enemy appeared, of whom he again disposed in the same satisfactory manner. The bystanders pointed to a village to the south, and we were given by signs to understand that that village was at war with them, and being a strong one, was always harassing them during their labours in the field; and that the headman's performance was not only an illustration of the risk at which they raised each seer of rice, but was also intended as an elaborate apology for not having more to give us. They did not understand money, except as an ornament to be affixed to the waist-belt; so we gave them some salt, a commodity highly prized by them. Leaving them with many reciprocal signs of delight at having made each other's acquaintance, we passed on through Yangtung, and halted on the River Yangmun, which flows through a beautiful open valley with broad reaches of sand and stones, and large spaces of level land on either bank. It is joined by numerous large streams, which come steeply down from the watershed, dividing its huge spurs, whose almost precipitous sides send down most of the water which falls on them to swell the streams below. From the hill near Yangtung we saw beneath us, in a clear field on the left bank of the river, a large gaily-dressed body of warriors, escorting some women with loads; on seeing us, after many demonstrations of defiance, and dances up and down the field by each of the warriors in turn, they prudently retired to the other side. Higher up the stream was another large party of Nágás from Okha, to which village we intended to march next day. These men were encamped on the river engaged in fishing. They also retired on seeing us, and took up a position on a small eminence overlooking the reach on which we pitched our tents, and as our lines were being run up, set up a long rolling war-cry, but made no further hostile demonstrations that night.

41. On the 21st, as we were starting, we saw large bodies of armed Nágás collected on all the points commanding a view of our camp and road; but nothing occurred till we approached the village, after an ascent of 3,000 feet, when our flankers came across some men in

ambush, who at once attacked them, wounding one man in the foot. A few shots speedily dispersed them, and though they attempted a stand at one or two points along the road, they were, of course, unable to stop us, and we entered the village and encamped on the further side near the village wells. Being out of interpretation, we were unwilling to punish the Nágás heavily for their attack, beyond helping ourselves to some of their live-stock, &c., and as I was anxious to visit Tobu, a village eight miles south of Okha, we kept the camp standing next day, orders being issued that no one was to be allowed to go into the village, in order not to frighten any Nágás who might be willing to come in. Messrs. Hinde and Ogle accompanied me to Tobu, a rather trying walk, involving a very steep descent of 2,300 feet to the stream below and an equally precipitous ascent of 3,300 feet to the top of the Tobu spur. About three miles from the village we saw the Nágás collected watching us, and as we went on, we found three goats and the same number of dogs tied up on either side of the path, green boughs being stuck in the ground near; the whole arrangement being, as we had discovered last year, indicative of a wish to open negotiations. We untied the dogs, taking one with us as a sign that we also wished for peace, and went into the village, where we were very civilly received. We did some work on the other side, the whole of the male population looking on. One or two old men pointed out villages to us, giving their names. They were especially pressing that we should go against a village just opposite, with which they were at war, telling us by signs that if we would go first and "pung, pung, pung!" as they expressed the noise of firing, they would come on behind and secure the heads of those we killed or wounded. One of the villagers had suspended on his chest a piece of the rim of an old stoneware soup-plate: I should have been very glad to find out how he had come by it. They wished us to take some more goats and dogs, but we declined them, and left. Working by the way, we got back to camp by the evening. A cruel fate overtook us after the labours of the day; for a very heavy thunderstorm, which had been long threatening, burst over us just after we had commenced our dinner, and breaking through the roof of the hut, swamped it and our dinner, and we had to beat a hasty retreat to bed. Colonel Tulloch told me that men from Chamba and Yangtang had been in with presents; also some of the Okha and Yakchung men.

42. Further exploration of this valley was not to be thought of, for in the absence of interpretation, we should probably have become involved in further hostilities; and moreover, to do the work satisfactorily, we should have been detained at least a fortnight longer in those parts—a delay which, in the face of the Chief Commissioner's instructions, I did not feel justified in incurring, as we had then already been a fortnight away from postal communications. Therefore, on the 23rd March, we left Okha, and passed through Yakchung and Yanghun. Here they were very friendly, and several young fellows accompanied us to our camping-ground and encamped near us during the night. The following morning we mounted a steep hill to Afang, where we were again well received, and thence through Achung, Lungching and Chua, all large villages, to a small stream where we encamped. Chua is most curiously situated, its upper portion overlooking a precipice, the rest being built on such steep sloping masses of sharp, stratified rock as to make walking in boots an exceedingly dangerous operation. The path, on entering the village, runs for some distance along the edge of the precipice, which is broken away in many parts, necessitating a light roadway of bamboo matting; in other places the low eaves of the houses threaten to push the passer-by over the cliff.

43. It may be as well in this place to note a few characteristics of the dwellers in the valley of the Yangmun, as we did not come across them again.

44. The men are very like those of Yaru, &c.—fine, well-built, and in many cases handsome. Their dress and accoutrements are similar to those of their brethren farther east. Their hair is dressed in a similar manner to that of the naked Nágás, *i. e.*, closely cut everywhere, except on the top of the head a thick tuft falling over the forehead, another long tuft hanging behind from the crown; the latter is twisted up into a tail with a band of grass. There is very little, frequently no, tattooing among these men, till they approach the naked Nágás and adjoining tribes, when a little tattooing on the face and limbs is observable, increasing in amount as we go eastwards. The women in the Yangmun valley have a very peculiar mode of cutting their hair; it is kept so closely cut as only to leave a dark shade on the head; a narrow space on each side of the head is shaved perfectly clean from the temples to the crown. They wear very little clothing: a small belt of very fine leather thongs, to which in front are attached the upper corners of a long narrow slip of cloth, about 30 inches long and 6 broad; from this point it falls perfectly free and loosely round the loins and buttocks. The dead are placed on a maichan, raised about 4 feet and covered with a low roof, which gradually tapers out in front for about 20 or 30 feet. The jhúm-houses, of which they build in the fields nearly as many as they have in their villages, have their roofs tapered up for a considerable length, either at one end only, or at both. These curious structures, dotting the bare hillsides, and standing out against the dark red soil, look at a distance exactly like huge crocodiles lying about. Another striking feature in the landscape is a curious erection seen near most villages, which is visible a very long way off. It looks at a distance like a large silver chevron turned upside down. It is made of split pieces of wood with the white face turned outwards, placed close together vertically and fastened to large curves of cane or bamboo, suspended between three trees; the whole length varies from 40 to 50 feet, and the average width is about 6 feet, widening to about 12 feet at the centre point. We could not arrive at the meaning of these erections; but they were always put up facing towards a village with which their builders were at war: there was no idea of fortification about them. At Okha and neighbouring villages very quaint designs were carved in slight relief on the planks forming the front walls and doors, the

designs being further brought out by a judicious use of black, brownish red, yellow, and white pigments. The roads, though in some places steep, are good in all this part of the country, and at Tobu is a very fine stone viaduct in the middle of the village, about 50 feet in length and 20 feet in height, with a most scientific culvert through it. Outside the village, the approaches are rendered secure by planting small twisted boughs and trunks of trees along them at intervals, utterly preventing any sudden rush down them.

45. On the 25th we went on through Chongvi (being again among the naked Nágás), hoping to be able to encamp on the Dikhu; but the road was long and the day hot, and two hours being lost at Chingtang by a wretched guide deliberately leading the whole camp astray, we had to halt for the night in the village, and starting early next morning, crossed the Dikhu, here called Yangnu, and reached Tablung once more in the afternoon.

46. When we left Tablung in February there were about 60 maunds of rice in the godown. I had sent for 40 maunds more, in order to have at least 100 maunds awaiting us for our final excursion in the Eastern Nágá Hills. What was my dismay, therefore, when I found that the police stationed at Tablung to guard the rice had disposed of 60 maunds among themselves, the sick I had left behind, dák-runners, &c., instead of, in accordance with my instructions, getting up their own supplies from Sibságár. There was not four days' supply for our whole force. Our work and correspondence would oblige us to halt at Tablung for at least two days; the villages to the east we knew had little or no rice to spare, and it was, therefore, out of the question to think of starting with only two days' supply. Senua being about eight days' journey away, not allowing for any delays on account of weather, &c., nothing remained for it but to send down to Nazirá for the supplies we wanted; and on the 28th I started off 100 coolies with a small guard to that place. Had we attempted to explore more of the valley of the Yangmun, we should probably not have found a day's supply at Tablung, in which case the whole party would have been obliged to leave the hills then, to the probable stoppage of all further work that season. Mr. Fisher, Superintendent of the Assam Tea Company, as usual, was most kind in affording us assistance in procuring supplies. Mr. Hinde has also noticed (Appendix D, paragraph 2) Mr. Baker's cordial assistance later on in the season, and our thanks are due to these two gentlemen for their help at a time when it was of great importance that no delay should occur. Our coolies returned from Nazirá on the 1st April.

47. While waiting at Tablung, Captain Brydon joined us to relieve Colonel Tulloch in command of the escort. And on the 2nd April we started again, dividing our forces,—Messrs. Hinde

With Captain Brydon.

42nd Assam Light Infantry.	{	2 Native Officers.
		3 Havildars.
	{	43 Sepoys.
	{	1 Bugler.
Nágá Hills Police	{	1 Inspector.
	{	2 Head Constables.
	{	13 Constables.

With Mr. Hinde.

42nd Assam Light Infantry.	{	1 Native Officer.
		3 Havildars.
	{	40 Sepoys.
	{	1 Bugler.
Police	... {	1 Head Constable.
		10 Constables.

and Ogle proceeding to Punglung and Muniting, &c., while Captain Brydon and I struck eastward. The strength of the respective escorts is given in the margin. We halted for the night on the River Shinióng. The next day we passed through the two villages of Totok, each containing between 200 to 300 houses, where we were exceedingly well received, and halted for the night on the Yangnu, the third branch of the Dikhu. On the 4th, passing through Chao early, we arrived at the first village of Chen about noon. The villagers were assembled at the top of the very steep ascent, fowls in baskets being tied up to a row of bamboo stakes on one side of the road, while on the other was a large number of small leafy packages containing rice; a big basket full of eggs occupied the middle of the road. Here we were again rather at a loss for interpreters, but they made us understand that they had heard of Okha, and pointed out a village, Changka, on a lofty hill, which they wanted us to go and polish off for them. I think it will be seen from this and similar instances how false the prevalent notion is that Nágás, though fighting among themselves, will forget their own private quarrels and combine to expel the intruder. A combination of several tribes (not villages) for such a purpose is, I venture to think, an impossibility.

48. Chen is a cluster of large villages, on a high but narrow ridge running down from the watershed, with very steep sides. We halted on the River Tílam, and the next day ascended to the two large villages of Saha, the headmen of which were very anxious that we should halt there for the day, promising all sorts of supplies if we would. Our time was too precious to avail ourselves of their hospitality, so we went on to Tang, where we were again well received, and descended to the Yangnu, on whose banks we once more encamped. On the 5th April, at midday, we arrived at Niassia. Here the Nágás were rather suspicious and sullen, but nothing more. In the afternoon I visited Captain Badgley's station of last year, and restored the signal, leaving a note for Mr. Ogle in a small bamboo chunga half-buried by the mark stone; this note he found there a few days later. The weather had never been clear since we left Tablung. It had been fearfully hot and hazy, and the haze seemed to increase every day, and we went on the 6th to the Taokok, passing through Bor and Huru-Kamlung. All the villages lately passed through are exceedingly pretty; instead of being divided into irregular streets, with houses crowded together, as in the western villages, the houses at Tang, Niassia, &c., are dotted about on gently undulating grassy slopes, on which numerous white goats are grazing, tall clumps of the graceful bamboo springing up everywhere. Brightness is

introduced into the scene by the flowers of the butia-tree, and the large white geranium-like blossoms of another large tree. On one side, stone parapets, as a rule, guard the entrance, outside which are the tombs, the bodies, as usual, placed on "changes" and covered with palm-leaves. Under a shed hard by are the effigies of the departed, painted, tattooed and dressed after life, with hair tied into gorgeous tubes of red, yellow, and black canework.

49. We encamped below Longting, intending to go through that village to Joboka next day. In the evening some men who came down from Longting told us that war was raging between them and Joboka, and that the path between the two villages was impassable, owing to pit-falls, "panjies," and other obstacles, and that our only way was round by Bor-Utu. I was annoyed at this, as our supplies were running short, and willing as the Nagas seem to be to assist us, they actually had no rice to give away. The story as to the impracticability of the Longting route was corroborated the next morning by some Bor-Utu men, who said also that Joboka had done no cultivation last season, having been too much occupied in fighting, and therefore could not help us with supplies. The bad weather seemed likely to necessitate a stay at Joboka of two or three days; so, after weighing the matter carefully, I decided to go at once into Senua, whence, "flying light," and taking sufficient supplies from the godown there to be independent of the Nágás, we could easily visit Joboka. The men of Longting and both Bor and Horu-Utu told us that Joboka had a large supply of firearms, which made it impossible for them to cope with the men of Joboka, and they were very unfortunate that we should put them all on an equal footing, either by giving the Utu men guns, or by depriving the Joboka men of theirs—they did not care which, as in either case a fair fight would be the result.

50. We reached Senua village early on the 9th. The Raja's house and the huts occupied by the expedition last year are all in ruins, tall weeds growing over them, that part of the village having been entirely deserted. Just outside Senua, on a well-chosen spot were most elaborately constructed godowns and barracks, &c., surrounded by a most serviceable stockade; the upper end of the enclosure was adorned by the figure in clay of a couchant tiger, more than life size, painted yellow and striped most artistically. We found that the godowns, tiger, &c., had all been made by the Senua men for us, in accordance with instructions they had received through Mr. Hinde early in the season. The site chosen would have been a most convenient one in every way for our work, but unfortunately Mr. Goad, District Superintendent of Police, had not approved of it, and established his guard near Bor Bansang, about four miles nearer the plains. We reached this latter place about midday. As I had feared, the hazy weather had detained Messrs. Hinde and Ogle, and they had not then arrived.

51. One man, Ponghi, of Senua, who had been concerned in the massacre of Lieutenant Holcombe's party last year, had taken refuge in Ninu, and the Ninu men having repeatedly during the past year refused on our demand and that of Senua to surrender him, I was instructed to again demand him, should the evidence collected on the spot go to prove that Ponghi was still sheltered at Ninu. I halted on the 10th April to collect evidence on this point from the Kunsai of Senua and the Bansang headman, from which it appeared that Ponghi was certainly still at Ninu. I therefore directed these Chiefs to send messengers to Ninu demanding Ponghi's surrender, adding that I should be away at Joboka two or three days, that if I found Ponghi in my camp on my return, well and good; if not, we should proceed to Ninu ourselves.

52. On the 11th, taking a very small camp with us, Captain Brydon and I started for Joboka *via* Banfera. I went up to the mark, about a quarter-mile above the village, and the evening being clear, managed to do a little work. Shortly after I reached the mark I heard a gun fired in the village. Captain Brydon tells me that he had just then reached the village, and I imagine it was a signal-gun to give warning of the approach of strangers, though afterwards when the headman went into camp and Captain Brydon questioned him, the old fellow stoutly denied that there was a single gun in the village, and accounted for the report by saying it must have been a bamboo cracked by heat. On the 12th I went up to the hill at dawn, and set the coolies to work to put up the mark. A heavy shower of rain fell and cleared the atmosphere, and I got the signal up and all my observations done before 10 A. M., and we started the camp off at that hour. The coolies went well, and we got back to Bor Bansang at 6 P. M. We halted on the 13th and 14th, and I did some work at the Senua mark each day. On the 14th Messrs. Hinde and Ogle joined us. (An account of their tour will be found appended.) Two messengers from Ninu came in, in the afternoon, who swore Ponghi was not there. I told them I did not believe them, and that we were going there next day.

53. On the 15th, with the force marginally noted, we started for Ninu, having with us the Kunsai of Senua. The path of last year from the Tisa River to Ninu had become grass-grown and swarmed with leeches, and we were some little time in making our way along it, and arrived on the old site of the village about 3 P. M. No houses had been re-built there; but a small village had been established in the *jhúms* just beyond, whence we could see several groups of Nágás

42nd Assam Light Infantry.

2 Native Officers.

3 Havildars.

55 Sepoys.

1 Bugler.

Police.

1 Inspector.

1 Head Constable.

15 Constables.

retreating rapidly along the path to Kajmoi. Entering this collection of huts, for the village was little more, we found a leper and three old women who could hardly move—the only occupants. The former told us that Ponghi had run away long since, but afterwards admitted that he had been instructed to say this by the villagers if he fell into our hands; but that Ponghi was still with the second Chief, whose house was at another and larger settlement about four

miles off, near Nisa. Leaving the camp to be formed at the smaller village, we at once went on to the other, and found that deserted also; in neither was there any property to speak of, a few fowls and three or four pigs the only live-stock visible, and the houses themselves had a generally uninhabited appearance. We returned to camp in the evening. Next morning at dawn we again proceeded to Ninu, but no one was visible, and a careful search for several miles around confirmed our belief that the Nágás had not taken refuge anywhere near—indeed, after last year's experience, it would have been strange if they had. So, having burned the huts, we retraced our steps to camp and burned the small village also, sparing a couple of houses for the use of the old women and the leper, with whom we left a message for the Ninu men, to the effect that if they would give up Ponghi, peace would be made with them. A party under a Native officer had been scouring the country towards Kaimoi while we were at Ninu, but only one small temporary camp had been seen. When this party rejoined us we marched and encamped at night on the Tisa.

54. The Senua man and others who were with us said that the Ninu men will not rebuild their village on its old site until permanent peace is concluded with us. They are now at peace with all the surrounding villages except Khanu; and I think it not unlikely that, on the guard being established at Bor Bansang, they began to remove their property to those villages which would receive them, a comparatively small number only remaining in the two villages of Ninu to take care of them. There were no signs of rice-pounding visible, but quantities of the bark of the sago-palm tree, which is largely used as an article of food in all villages east of Tablung, at Chen and elsewhere, were lying about everywhere. It seems that the nephew of the Bor Bansang Chief has lately married a Ninu girl, and a few families (thirty to forty) have gone to live at Chasa (Horu Bansang).* We cannot deny our admiration to the headmen of Ninu for the staunch way in which having got Ponghi into trouble, they have stood by him. They have sworn to protect him, if he will trust them; the Chief saying, "If I give you up, on that day with the sun let my glory set; and when the moon sets may my glory set, and my name as Raja be forgotten on the face of the earth."

55. On the 17th April we arrived at Bansang early, and made all arrangements for taking away our whole force and the police guard on the morrow. This we did, and passing through Bor Mutan, halted on the Teru. I took the last observations from the Khulan Mutan mark in the afternoon, and the next day everyone quitted the hills. Mr. Hinde left us at Jaipur, and on the 22nd we marched into Dibrugarh.

56. Notwithstanding the delay at the best time of year that the sad event of the 25th December entailed, we succeeded, between the 26th January and 17th April, in securing 1,170 square miles of topography, on the scale of two miles to the inch, and about 2,500 square miles of triangulation: this latter most necessary work we should never have accomplished in the time if I had not been able to detach Messrs. Hinde and Ogle as often as I did. We passed through between eighty and ninety villages never before visited by Europeans, and have fixed the positions of fifty-eight more which lay beyond our lines of march. The weather was somewhat against us. I find from my diary that rain fell some time during the day for at least half of each month.

57. With respect to the question of the suitability of Wokha for a station, I think it by far the best site, all things considered, that could be chosen, and its position renders it exceedingly eligible for a head-quarters station, whence the Angámis on the one hand, and the Eastern Nágás on the other, can easily be reached. Wokha is close to Golághát, and has a good elevation; the site for the station would average 4,800 feet (*i. e.*, about the same height as the station of Shillong, the hill above rising to 6,600 feet above sea-level. Captains Butler and LaTouche reported fully last year, I believe, as to its capabilities, and it will not therefore be necessary to recapitulate them here. In Mr. Hinde's report (Appendix C, paragraph 10) he mentions the fact of the Deka Haimong men having offered to become British subjects and to pay Rs. 7 per house per annum for the privilege. This is a significant fact. I believe there are a great many other villages who would be very glad to do the same. Many Nágás who have had some experience of us have declared at different times that they would be only too glad if some external power superior to them all would step in to repress their endless raids on each other and their blood-feuds; but, as they say, no one village or even tribe could of itself initiate the reign of peace. I am of opinion that the establishment of the station at Wokha would go far towards attaining this "most devoutly-to-be-wished-for consummation." Samaguting is very low, far away from any powerful Nágá villages, out of the Nágás' sight, and almost out of their country; whereas Wokha and its peak are well in Nágá land, and are visible to all the surrounding tribes. I consider that the station might be formed there now with very little opposition, if any, from surrounding villages. The Nágás seem to get very soon accustomed to our permanent presence in any place; and at Wokha, on my second visit in March, I found the villagers and the sepoys on the most intimate terms,—women and children passing backwards and forwards through the camp all day long without the slightest fear; the boys frequently supping in camp with their friends, and even passing the night there. This I also found to be the case at Tablung. We had seldom any difficulty, if ever, in getting coolies from Bhaudari, Sánaigaon, Wokha, &c., for taking supplies to the guard there.

* By a curious slip, which escaped Captain Butler as well as myself, I see that in my last year's report I said "Su" was an affix signifying large; it has just the opposite meaning, "small"—"Nu" meaning large.

58. With reference to a first boundary between the Nágá Hills and Burma, I am of opinion that it will have to be decided by geographical limits. The distinctions between the different tribes are so slight (except as between the Angámis, Eastern and Western, and all other tribes), and their villages are so mixed up together, that I doubt very much if tribal limits could ever be successfully adopted without going very far east. The Eastern Angámis extend across the watershed for some distance, but, in common with all other Nágás, they are not restricted by any geographical considerations, and are frequently building new villages and deserting old ones, so that a tribal boundary would be a very variable quantity—at one time, to put an extreme case, it might be well within the watershed, at another considerably beyond it. *Apropos* of this question, I may quote a passage from the Appendix to Captain Butler's Report of 1873-74: "These various tribes all dovetail into each other in a most remarkable manner, and it is impossible to assign to them any hard-and-fast limits, or to say that beyond certain limits a tribe does not extend; for not only do we often find men from two, or even three, tribes living in the same village" (see paragraph 17, Appendix C), "but in many cases villages belonging to the same tribe are separated from each other by those of several other tribes." These words are as true of the tribes lately visited as of those I then wrote about. A very careful study of the characteristics of each tribe would further be necessary in assigning tribal limits to the boundary. I regret that I was unable to get further ethnological and philological notes concerning the new tribes we visited this year; but even if I had had the time, the total absence of interpreters would have rendered it impossible to make them.

59. I have now to thank Colonel Tulloch and Captain Brydon for their cordial support and assistance; without which our work could not have been brought to so satisfactory a conclusion.

60. Mr. Hinde performed the duties assigned to him in a most efficient manner. Had I not felt full confidence in his tact and judgment, as well as in Mr. Ogle's, I could not have detached them as often as I did, and only half the work could have been done. Mr. Hinde seems already to have established a considerable amount of influence over the Nágás with whom he has come in contact in his district of Jaipur, and I hope that our late progress through the hills will enable him to extend and strengthen that influence.

61. Mr. Ogle's reputation is well established. He possesses in a high degree the confidence of all officers with whom he has served in these frontier expeditions, and to his exertions in a great measure is due the success of the triangulation.

62. Inspector Mimaram, of the Naga Hills Police, did very excellent work, and was as active and energetic as usual.

From M. J. OGLE, Esq., Surveyor, No. 6, Topographical Survey, to LIEUTENANT R. G. WOODTHORPE, R. E., Assistant Superintendent, Topographical Survey,—dated Shillong, the 15th June 1876.

Agreeably to your request, I have the honor to submit a brief narrative of my proceedings while on detached duty in the Nágá Hills during last field season.

2. After Captain Bulter's return to Golághát from Wokha, whither he proceeded with Colonel Tulloch to establish a guard, finding that the full complement of his coolies had not yet arrived, you decided upon sending me on in advance to erect the survey marks on Lakhuti and Nankam, two stations you had selected the previous year, after which I was to join you at Wokha.

3. Accordingly I left Golághát on the 10th December with a guard of forty men and one Native officer in command, and encamped the first night near the Giladhari stream. On the 11th I marched on to Bhandari, where there was a guard of eight sepoy in charge of the "russud" stored up there. On the 12th I left Bhandari, and passed through Sanigaon and encamped at Khergaon, a village about two miles further on. Here the people were very civil and supplied me with all I wanted without making any difficulties about the matter. On the 13th I started for Lakhuti, taking with me a guard of six sepoy, leaving the rest of them to follow up with the coolies. I arrived at the village about 9 A. M., and found very few people in it—only a few elderly men. I told them to call in the headmen, who were supposed to be out in their fields, and they promised to do so. The coolies and rest of the sepoy came in at about 12 o'clock. I at once passed through the village, pointed out a spot to the Native officer for the camp, and instructed him to have it cleared and got ready while I went up to the hill with a few coolies and a guard of four sepoy and set about putting up the mark and doing some preliminary work. The mark was ready that evening, and I returned to camp at 5-30 P.M. I found that none of the headmen had come in. Between 7 and 8 o'clock two of them made their appearance, and promised me provisions and a guide next morning.

4. They, however, did not keep their word—in fact, did not appear at all, but sent quite a different person, who likewise was profuse in his promises of a guide. I asked him where the guide was; he replied, "waiting in the village." I marched the camp there, and when we got in he attempted to escape, but was seized. I halted the coolies at one end of the village while this man inveigled me from place to place, saying that if I went with him to a certain house I should find the guide there, and when I got to it, he would say he had left this and

gone to some other house, where I followed him. He kept on in this style for about half an hour, till I saw at last that he was deceiving me. I then tried to induce him to show me the way to Pangti himself if he could not get another man, telling him he would be well rewarded if he did; but all to no effect. Then I tried threats, which were equally ineffectual. While this was going on, I noticed there were only women and children and the old and decrepit left in the village, and I had been through a great portion of it. Shortly after I was informed by the sepoys who were left in charge of the coolies below that there were a number of armed men going along the road that was supposed to lead to Pangti, and when I returned to where the coolies were, I found their report to be correct. This man at last flatly refused to give me a guide, nor would he accompany me himself. Seeing now the hostile demeanour of the people, and considering it beyond my province to enter into any complications by proceeding in the face of it without first intimating the same to the Political Agent, I determined upon adopting this course, and returned to Sanigaon to await further orders. I was instructed to remain there till he came up.

5. On the fourth day of my stay at Sanigaon, eight or ten Nágás from Lakhuti came in with presents of fowls, &c., and sent word to say that they wished to speak to me; but my reply was that I should have nothing more to do with them, and whatever they had to say now must be said to Captain Butler. They went away, and did not appear again, I believe, till we got to Wokha. I might mention that the night we were encamped at Lakhuti, men of that village were seen prowling about on the outskirts of the camp by the sentries, who, however, when challenged, went away: this was not reported to me till this day. Captain Butler, accompanied by yourself and Mr. Mathews, arrived on the 19th, and we all marched into Wokha on the following day, where we found Mr. Needham had come in a couple of days before.

6. The programme was now changed, and my orders were to put up marks at Lálumávu and Nummuh, and observe at the latter station and Nidzukru, a mark having already been put up at Nidzukru; after which I was to return to Wokha and observe at the hill above it.

7. After one day's halt I left Wokha, in company with Mr. Needham and a guard of 24 sepoys, 3 havildars, 2 naiks and 1 bugler, in command of a jemadar. Mr. Needham had his own escort of Samaguting police. Our first march was to Tesephema, over a very bad bit of road after leaving the village of Nonsechong, until we arrived below Kotsobagwé, a distance of some six miles. We got into Tesephema long after dark; most of my coolies and guard did not come in till early next morning. This place was a little out of our way, but the orders of the Political Agent were to visit the village, as the people did not behave in a proper manner towards Mr. Needham on the occasion of his passing through it about a week before. They were more obliging this time, probably from seeing a larger number of men; brought in firewood, fowls, eggs, &c., and promised to supply us with any quantity of rice we might require, which they did next morning.

8. On the 23rd we marched into Kité, passing close to Inusema and through Kotsobagwé where the people were friendly. Kité is the centre of a group of three villages, viz., itself Sampé and Roki, neither of which is more than half a mile from it. Representatives from all three villages met us, and behaved in a friendly manner at first, but later in the evening, when our camp was formed, we observed the people of Kité carrying away their household goods, and were apparently in a great state of excitement. On noticing this, we sent for the headman and asked him what it meant; he replied with great candour that the people were going to fight us, but at the same time said the elders did not wish it. Shortly after, Rihu, one of our interpreters, came down from the village and corroborated this man's statement, adding that the old men tried to dissuade the young men from doing anything so foolish, but the latter would not listen to their advice, and they were determined to attack us at night. We said we were quite prepared for them at any time, after which every Naga in camp was turned out. All night they were employed in carrying away their things, and shouting defiantly, but nothing occurred. Probably, they consulted their omens, which told them that it would be safer to let us alone, or they might, after all, have been overruled by their elders, for they were friendly again, and brought in rice next morning. We now found that Rihu, our interpreter, who was permitted to go to Roki on the previous night, did not appear, and on enquiring for him, found he had deserted. Fortunately there were two lads with us, one a native from Themokedsama and the other from Themokedima, who understood the language of the people we were among, and who proved of the greatest possible service to us.

9. Notwithstanding their friendly demeanour this morning, but bearing in mind last night's demonstration, it behoved us to be careful in leaving camp. The road that we were to take led at once down into a small stream, from which our camp was supplied with water. On the opposite side of this stream was the village of Kité, and numbers of armed Nágás were ranged above the road which passed under the village, and which ran level along the side of a spur. We first started the coolies and kept back eight or ten sepoys; so that, in case the villagers had any hostile intentions, we could command them from this point, which was open and well situated, and not much more than 250 yards off. After all the coolies got up the spur on to the level bit of road, and had formed an unbroken line and were clear of the Nágás, we followed up and marched past the village cautiously. We pitched camp that day at Goshitumi, where we arrived early and were well received.

10. On the 25th we marched to Kakenagámi, passing through Nunomi and Gueshalogámi, remaining at each of the villages for an hour or so. The people behaved well, supplying us with fowls, &c., though we did not ask for them. On the 26th we went up to Lálumávu

Peak, leaving the camp in charge of the jemadar. While up here I noticed thick dark clouds of smoke rising from the direction of Pangti, and drew Mr. Needham's attention to it. We had an idea that the people of that place were being punished, but little suspected then the calamity that had befallen the leader of the expedition. The mark was put up, a few angles observed, and we got back to camp just before dark.

11. On the 27th we passed a small village *en route* to Sillimi, where the people met us with presents. They had also tied a large basket of rice to the stockade round the village; we paid a rupee for this rice in four-anna pieces. I noticed one of our Nágá dobashias take out from a bag that he was carrying a worn spike of a spear, about 3 or 4 inches in length; he offered it for the money they had just received. They put a four-anna bit into his hand; he was not satisfied, and told them he must have all. The iron was of greater value to them, and it and the silver changed hands without further bargaining. Sillimi is situated on a broad-topped hill. From the side we approached it, and on the outskirts of the village, was a fine large open piece of ground, which sloped gently down for a considerable distance. Upon the crest of this hill were assembled a number of Nágás, fully armed and separated into two parties. It was a most imposing sight to see them thus collected in their "war-paint;" but when they found that our motives were peaceful, they dispersed at once, their leaders taking us through the village.

12. On the 28th we passed through Nakomi and ImpHEMA. We remained in the latter village for about a couple of hours, waiting for our coolies to come up. The people were very friendly, freely exchanging fowls, vegetables, &c., for two-anna and four-anna bits; but the chief after a time seemed very anxious to get rid of us, gesticulating in a very excited manner for us to quit. The reason of this extraordinary behaviour, I understood, was the fear of raising the cupidity of the young men by our continued presence, who would in all probability disregard the distinctions of *meum* and *tuum*, some of them having appropriated coin for articles that were promised but never produced, but which on the headman being informed were always given up. This was the first Angami Nágá village we passed through. We marched on to Ketsama, and halted there for the night. The Nágás of this place were very obliging; they offered us a large hut in the village if we chose to stay in it, and when we would not, they showed us where we could obtain water and assisted in getting up our camp. It was our intention to have gone through Ungoma and Ronguzumi; but as small-pox was raging in these two villages, we were obliged to make this little detour. On the 29th we passed through Terocheswema, skirted Zogazumi, went through Satazumi, left Yarabama to our right, and crossing over a small stream encamped about half a mile below Teropetsima.

13. Next morning I started very early for Nummuh, with a guard of 10 sepoy and 30 coolies, taking with me one day's provisions and a little bedding, intending to encamp on the hill for the night should I not be able to get the mark up and observe the angles. I was doubtful of accomplishing the work that day, as the hill was a long way from camp and bad weather had set in, all the hill-tops being enveloped in mist. About 40 Nágás from the village accompanied me voluntarily, and with their aid the hill was rapidly cleared, the mark erected, and the weather fortunately clearing up, the necessary observations were secured. On my way back through the village, one of the seniors invited me into his house, and his *cara sposa* helped me to two or three different brews of beer, all of which were excellent and very acceptable after the long and hot descent from the hill. He was a big man, considering the ordinary size of Nágás, and stood beside me comparing his height with mine. On return to camp I found that all my rice-bags were filled up—a very lucky thing, as we were running out of provisions, and none of the villages that we had been to before could supply us with any large quantities. At this place, however, it poured in, in maunds, and there was a great deal more brought down than we could carry away.

14. On the 31st we marched close by Chajubama, through Khesoma, into Kizimatuma. The first part of the road was very trying for laden coolies; it ran through swampy paddy-fields and over the ridges of the terraces, which were very slippery and narrow. A Khasia coolie nearly lost his life; he slipped, and was precipitated headforemost with his load, and landed on the terrace below, about eight feet. Fortunately, there were people near to extricate him from the wet, clammy clay, or he would most certainly have been smothered in it. The rest of the road, with the exception of a small bit down to the Sijjo, after leaving Khesoma, was good—a fortunate thing for us, as the march was long.

15. On the 1st of January we passed Dehoma, leaving it to our left, down into the Zullo; then up a very steep hill, till we got near ReKroma; passed that village also on our left, then went down into the Shanor River, and finally up a long but easy spur into Nerhema. Here there was stationed a guard of the Samaguting police for the protection of the coolies who were employed upon the Samaguting and Wokha road, and which was now carried up to within four miles of Nerhema. This was a long and trying march for our coolies, some of whom did not come in till after nightfall. We halted here a day to give everybody rest—all were in need of it, having marched continuously for eleven days.

16. On the 3rd we again broke camp, Mr. Needham and I parting company, he to return to Samaguting, and I to work my way back to Wokha. I sent my campon to Tophema, while I proceeded direct to Nidzokru. The weather was fine and clear, and I succeeded in securing all the observations, and returned to camp late in the evening.

17. The next day I marched past Themoketsama and through Themokedima, and encamped at Tesephima, and on the 5th arrived at Wokha, having been away fourteen days. It

was at Themokedima that the first intimation of the sad catastrophe that had befallen our leader was received as a sort of rumour, and on arrival at Wokha a letter from you confirmed the report. I was detained three days here owing to bad weather, the Nidzukru signal not being visible. On the 9th I left with the intention of joining you at Lakhuti, but on the road received a letter from you announcing the death of Captain Butler, and ordering my return to Golághát.

18. When I arrived at Yekam that day, I was met by Ipomo, the headman of Sanigaon, and also by the second Chief of that place. The former appeared to be very sorrowful, and was crying most bitterly at the tidings of the death of his "father," as he called Captain Butler. There were some eight or ten other Nágás with him. Ipomo tried very hard to dissuade me from proceeding to the Doiang, declaring that the party would be attacked on our way down to the river by the people of Rechim; he also said that some Pangti men were there. While Ipomo was talking to me, some of the Nagas present began to consult their omens; and after communicating the result (as I thought) to him, he became still more importunate in his desire for me to stay, saying that we were a small body, and would all be cut up. He accompanied me through the village, and remained with me at the other side while I waited the arrival of the coolies. He made another effort to keep me back as I was going off, laying hold of me by the arm and detaining me, when I was obliged to have him forcibly removed. We, however, got down to the Doiang without meeting with any opposition. I met a few Nágás on the way, carrying up cooked rice and liquor—meat and drink no doubt from friends of the fugitives from Pangti who were at the time harboured by Rechim and Change. After a short rest at the Doiang, I proceeded through Sanigaon and pitched camp on the Bárti River.

19. On the 10th I marched through Bhandari and camped on the Nungjam River, and on the following day joined you at Golághát.

From H. M. HINDE, Esq., Assistant Civil Officer, Naga Hills Survey Party, to LIEUTENANT R. G. WOODTHORPE, R.E., In charge Naga Hills Survey Party,—dated Tablung, Naga Hills, the 7th February 1876.

With reference to your letter dated Nankam, Nágá Hills, the 25th January 1876, I have the honor to submit the following report of my proceedings while on detached duty with Mr. Ogle and the force noted in your letter above alluded to.

2. On the 26th January I marched from Nankam to Alibar, passing through the village of Mungatung. We were cordially received by the villagers and furnished with supplies. From Alibar we marched to Mukhigaon, which we reached on 27th January. On the 28th to Mueching, where Mr. Ogle put up the survey mark. On the 29th to Waromang, passing through Dibua. On the 30th to Deka Haimong, passing through Bura Haimong. On the 31st we halted at Deka Haimong, and Mr. Ogle put up the mark. On the 1st February we marched to Naogaon. On the 2nd to Kanching, where we halted for one day (February 3rd) to enable the survey mark to be erected. On the 4th we proceeded through Tamlu to the River Dikhu, where we remained on the 5th. On the 6th February we reached this place.

3. We were kindly received at almost all the villages through which we passed, and furnished with rice, fowls, &c., for which we paid at the rates laid down in your letter. The villages of Mukhigaon and Waromang were the only ones that received us badly; we, however, got supplies from them, and nothing approaching a rupture occurred.

4. At Deka Haimong I found rice stored for us. The quantity was asserted to be 10 maunds, but on measurement turned out to be 8 maunds 27 seers, *i. e.*, 1 maund 13 seers short. No one in particular seemed to be in charge of it. I also found a maund of salt there; but as I had no immediate want of it, I left it for my return.

5. In conclusion, I have much pleasure in testifying to the uniformly good conduct of Jemadar Babu Jan and the men of the 42nd Native Light Infantry under his command.

From H. M. HINDE, Esq., Extra Assistant Commissioner, Jaipur, to LIEUTENANT R. G. WOODTHORPE, R.E., In charge Naga Hills Survey,—No. 15M., dated Jaipur, the 7th May 1876.

In accordance with the request conveyed in your letter No. 47B., dated Dibrugarh, the 23rd April 1876, I have the honor to submit the following report of my proceedings while on detached duty with part of the survey party under your command.

2. I have already in my letter dated Tablung, 7th February 1876, laid before you an account of my progress from Nankam to Tablung, at which place I arrived on the 6th February.

3. On the 9th February the portion of the party under my command left Tablung and marched to Kongan, passing by Jaktung, a village at war with the Tablungias, the inhabitants of which promised to bring me five maunds of rice into Kongan; they failed to do so, but I afterwards found out that this was due to the fact of their having no rice to spare.

4. On the 10th I halted at Kongan, to enable Mr. Ogle to put up the survey mark and observe.

5. On the 11th February I marched from Kongan to the Diku River below Tamlu. We managed to get about a maund and a half of rice out of the Nágás of Namsang, but with some difficulty, as they were decidedly surly; but a little conversation rendered them most willing to oblige us in any way. In this village (Namsang) I observed a Goorkha kukri in the

hands of one of the Nagas, who, on seeing me look at it, ran off into his house and returned without it. This might have been part of the loot of the Geleki guard (cut up some years ago), but I did not take any notice of it, nor make any inquiries, as I had no authority to open up the matter. The village, however, is generally supposed to have been one of the guilty ones.

6. On the 12th February I marched from the Dikhu to Kanching, passing through Tamlu, the inhabitants of which village furnished us with supplies. We encamped on the side of the village nearest the mark for Mr. Ogle's convenience.

7. On the 13th and 14th February I halted at Kanching, Mr. Ogle being delayed in his observations by the thick weather. The villagers were friendly and fairly liberal with supplies. As from my experience on my way to Tablung I had reason to fear that I should not be able to depend for my supplies entirely on the Naga villages, I sent a police constable down to the Deputy Commissioner of Sibságar with a note asking him to have fifteen mauuds of rice ready for me at Deka Haimong.

8. On the 15th I marched from Kanching to the Janji below Deka Haimong, passing through Naogaon, a village that, on both the occasions we passed through it, treated us very well. There is no direct road between Kanching and Deka Haimong, so that we had a long round-about fatiguing march.

9. On the 16th we made a short march into Deka Haimong, where we had to halt for the purpose of observation. I found Babu Godula, the Native missionary, at the village; he showed us every attention, and proved of great assistance. He gave a good account of his Naga converts, of which there are twenty-three, but complained bitterly of the oppression that this small village has to undergo at the hands of the powerful Hatigoria villages in the interior. Our rice arrived from the plains in the evening.

10. On the 17th I halted at Deka Haimong, Mr. Ogle not having succeeded in completing his observations the day before. After dark, I was informed that four of the villagers wished to see me. On being admitted into camp, they said that they had come secretly after nightfall for fear of the villages complained against to ask, on behalf of the whole village and of Bura Haimong, that they might become the Maharani's subjects, as they could in no other way shield themselves from the plundering propensities of Nankam, Ungma and Soláchu, the powerful villages of the interior, who pass through Bura and Deka Haimong on their way to the plains. They offered, in return for protection, a revenue in the form of a house-tax at the rate of Rs. 7 a house per annum—an amount which shows how they value the peace and quiet of their neighbours in the plains. I replied that I had no authority either to entertain or answer their application, but promised to report it to the Government.

11. On the 18th we arrived at Munching, a very long march from Deka Haimong, passing Bura Haimong, Dibua and Woramong. We were by no means so cordially welcomed in these villages as on our previous visit to them; but this I found to be the case all along. We found Woramong had been accidentally burnt to the ground during the night a short time before our arrival.

12. On the 9th we marched to Mukhigaon, Mr. Ogle carrying out his observation *en route*.

13. On the 20th we marched from Mukhigaon, through the large village of Changki, to Mekula. Between Mekula and Changki there is scarcely a vestige of a road. The two villages are at bitter feud, and have been for generations—in fact for so long, that no one knows what they originally quarrelled about; the probable reason is, that they are different tribes, and therefore, in the Naga's estimation, natural foes,—the Mekula men being Lbotas and the Chanki men Hatigorias. The road consequently is merely a jungle track, worn by the warriors of the two villages in their raids on each other, and is studded thickly with pitfalls and panjies, as our advance-guard discovered to their cost. Mekula, being in full view of Pangti, was most painfully polite; they cut up our firewood, supplied us with rice, built our camp, and one gentleman went so far as to insist on taking off my boots.

14. On the 21st February I marched from Mekula to Lakhuti, passing through Akuk, a moderately sized village, the people of which were very attentive. On reaching Lakhuti, however, our reception was very different, the Nágás preserving a most distant and almost hostile demeanour towards us. The bad conduct of the villagers on Mr. Ogle's first visit to the place, and their present behaviour, occasioned evidently by the idea of their own strength and our divided numbers, determined me to adopt a decided line with them. I sent a peremptory message into the village ordering the headmen in to pay their respects and to furnish supplies. As no notice was taken of my message, I waited two hours to see if it would be complied with, and then with a few men went into the village. What the Nagas thought I was going to do I am unable to say, but my visit to the village had a most surprising effect. In the course of the afternoon we were inundated with rice, fowls, eggs, goats, pigs, &c., borne by smiling Nágás, who seemed to think a little coercion the most agreeable pastime in the world. The headman of the village patrolled the jungles until he had collected three loads of firewood, which he brought, one after the other, on his own shoulders into camp.

15. On the 22nd, 23rd and 24th we were detained at Lakhuti by the hazy weather, which rendered observation impossible. On the evening of the 24th, however, Mr. Ogle managed to secure the various points. After the first day we met no annoyance from the villagers. An idea of the confidence they have in their strength may be gathered from the fact that though at feud with many of the neighbouring Hatigoria villages, Lakhuti is entirely destitute of fortifications, in spite of its being built in a naturally weak position.

16. On the 25th February I marched to Pangti, which I found had been rebuilt, although it was deserted by the villagers on our approach. I had been informed by the Mekula men that Pangti intended to oppose my progress. Had such ever been their intention, their hearts must have failed them at the last moment—a very common occurrence, as we afterwards experienced.

17. On the 25th February I marched from Pangti to Nankam, passing through Okotso, a small village half Hatigoria and half Lhota, and in consequence bullied by the surrounding villages of both tribes. The perfect hopelessness with which they yield to the oppression that their weakness subjects them to may be imagined when I say that the money that I paid for the supplies they brought us was delivered on demand to one solitary Nankam man, who happened to be in the village on his way to the plains to trade. He simply put out this hand, and the money was placed in it without demur, almost as a matter of course. I restored it to the rightful recipient; but I suppose things went all right for the Nankam man after I had left. We reached Nankam about 3 P. M., and I found, as I expected, that the Nankam men had got tired of us, and were by no means inclined to accord us the cheerful welcome we had received from them on our first visit. This I found, as I observed before, to be almost invariably the case. They refused even to show us water. One old man said to us: "Why should we show you water? Why are you here again? You said last time you were here you had come to make a map. What are you looking for now? Have you no rice in your own village that you travel about to eat?" They also got up some cock-and-bull story about one of Mr. Ogle's guards having stolen a *dao* from one of their women; of course, I made an immediate inquiry, gave the woman an opportunity of identifying the offender, which she was unable to do, and finally discovered that it could not have been a man of our party, but in all probability a Mungatung Nágá who had passed down the road just after us. It required all my temper to listen calmly to their assertions, to which they adhered with all the usual Nágá obstinacy; our denials were met with demands for restitution, our protestations of innocence with contemptuous incredulity. At last, one particularly repulsive old man betook himself to threats: he said,—“At your word all the troops will turn out, at mine all the Nágás, and then both Assamese and Nágás will die.” It is only due to the bold Nágá who made this speech to say that he was drunk; but, of course, his freedom of speech necessitated his immediate expulsion from camp. He went away in a great huff, and shortly after another old man came up to me and said he wanted Rs. 3 to make matters square between me and my irate friend, to whom he would present the money and my apologies. I declined this friendly intervention, holding out that I was the bigger man of the two, and the one to be appeased; and the result was that the repulsive Nágá came down at 10 o'clock at night with a *chunga* of liquor and begged pardon most abjectly.

18. Next day the attitude of the Nágás was still more unfriendly. Men of Mungatung, to whom I had sent for rice, came in 150 strong, escorting twenty seers of rice, a most unnecessary precaution on their part. I sent them back for more, and got it. The Nankam men were, however, as obstructive as ever—in fact, I fully believe they had half a mind to attack; for on the 29th the war-drums in Nankam and Mungatung were beaten all the morning, but I suppose they thought better of it, for at 4 P. M. they brought us all the supplies we wanted.

19. We were unable to leave Nankam until the morning of the 2nd March, on which day I marched back to Pangti, which I burnt to the ground in accordance with the instructions received from you. After leaving Pangti, we passed on the 4th March through the villages of Change and Rechim, both of which had also been rebuilt, and the reception the Nagas gave us proved fully how completely the punishment inflicted on them for the treacherous attack on Christmas Day had taught them our power and at the same time our forbearance.

20. On Sunday, the 5th March, we marched into Wokha, having completed the work on which we had been detached. The party under my command behaved in every respect well, the sepoy's being well kept in hand by Jemadar Babu Jan, who afforded me every assistance and support.

From H. M. HINDE, Esq., *Civil Officer on Duty, Naga Hills Survey*, to LIEUTENANT R. G. WOODTHORPE, R. E., *in charge Naga Hills Survey*,—No. 14 M., dated Jaipur, the 6th May 1876.

I have the honor to lay before you the following report of my proceedings after leaving you at Jaktung on the 2nd April.

2. I reached Panlung the same day, passing through Chintak, a small poverty-stricken village in the most extreme destitution. I encamped, for Mr. Ogle's convenience, under the mark near the village. We halted at this place on the 3rd, to allow of the erection of the survey mark. On the 4th I marched through Oting to a camp in the Terai below the Munting mark. Judging, from the poverty of the villages I had passed through, that no rice could be obtained in the hills, I on the 5th sent my coolies into Chorai-deo factory with a note asking the manager to let me have 25 maunds of rice. This he very kindly did, sending his own carts into Nazirá to bring the rice out. I beg you will bring this act of courtesy on Mr. Baker's part to the notice of the Government, as it was done at great inconvenience to himself, while the successful issue of our part of the survey depended greatly on our speedily obtaining supplies, which we were enabled to do by Mr. Baker's obliging conduct.

3. After staying four entire days at this camp, we were obliged to leave it without securing the necessary observations from Muniting station, the weather being extremely hazy. We marched on the 9th to the river between Oting and Borgaon. On the following day we marched into our old camp below the Punglung mark, which we reached about 1 p. m., and Mr Ogle, by a great stroke of luck, was able to secure all his observations during the afternoon. We were consequently enabled to march again on the following morning, and passing through Lonkai, near Nianu, and through Mulung we encamped about three miles below Horu Changnoi. The Mulung men treated us most courteously; the Raja, by means of a bedstead, mat, and a red cloth, extemporised a most imposing-looking seat for us, and did the honors of his village most hospitably. His courtsey, however, did not extend so far as to supply us with good liquor, for the stuff he brought us was not fit even for a Nágá to drink. The village is a large, powerful one, and the only one near that can in any respect rival Changnoi. Their houses are large, clean, and well-built, the Chief's house being 450 feet long. But prosperous as this village appeared, when compared with those previously passed through, it was most strange to observe the utter absence of all live-stock. The villages west of Tablung swarmed with fowls, goats, pigs, &c., while here not a living thing was visible. They seem to have a scanty supply also of rice, *i. e.*, they have enough for their own wants, but none to give away; they gave us two seers as a great favor. On the 12th we marched through Horu Changnoi and Changnoi to Niassia. The village of Borchangna is the head village of these parts; it is by far the largest of any that we passed through, and claims to be the parent stock from which all the surrounding tribes sprung, as the name signifies. From Niassia the villages destroyed last year are nearly all plainly visible, and we were in consequence rather suspiciously received by the villagers, who seemed to think we meant mischief; but as they understood Assamese, I managed to calm their fears, and they brought us in supplies. Mr. Ogle completed his observations from the Niassia mark at about 12 o'clock on the 13th; so at 1 p. m. we struck camp and again began our march. After leaving Niassia we found that none of the inhabitants of the villages we passed through understood Assamese, whereas in the villages previously visited one or two at least of the Nágás could understand me and reply. At Lonkao, the first village we reached after Niassia, our approach created a great commotion. The war drum was beaten; the young men flocked in from the fields and got into their war-dress; and as I halted before the village, I heard the crash made by the fall of planks, rice-pounders, and other miscellaneous property, as they were thrown into the street to save them from the anticipated conflagration. I found it extremely difficult to devise gestures expressive of my peaceable intentions, and at the same time intelligible to the Nágás; in fact, I have not the least idea which of the many signs I employed succeeded in conveying the desired impression: I did succeed, and four men came in unarmed and on all-fours, the Nágá attitude of submission. They talked fluently in their language, I in Assamese; we neither of us understood the other, but we were mutually satisfied, and I passed through the village on my way to Maihua. A man of Lonkao accompanied us and explained to the Maihua men that we meant no harm, and we were thus enabled to pass through quietly, and encamped for the night in the ravine between Maihua and Niassia.

4. Next day we marched into Borbanchang, passing through Niassia and Nianou, sister villages, the latter of which was destroyed in last year's expedition. Here I met friends whose acquaintance I had made in Jaipur, and though we could not understand each other, they seemed relieved at seeing some one they knew. The men of these villages came down with presents to Jaipur when the order was sent up last December to the Senua men to erect buildings for the depôt. They asked for peace, and in accordance with the instructions laid down in the Chief Commissioner's letter No. 3510, dated 8th October 1875, I informed them that no further hostilities would be undertaken against them as long as they gave no further cause of offence. It was curious in these two villages to note the method adopted by the villagers of expressing their friendly feelings: the men turned out unarmed, carrying large *chungas* of water, and lined the sides of the road we passed along.

5. The depôt I found had been established at Borbanchang instead of Senua, the site originally chosen by the late Captain Butler, and where I had had a very comfortable and well-situated stockade and godown made by the Senua men. This change of position was, in my humble opinion, a mistake: first, because it was calculated to give the Nagas the erroneous idea that we were afraid to occupy the more advanced position that had been prepared for us; secondly, on account of the inconvenience our party underwent, owing to the increased distance

* I certainly agree with Mr. Hinde.—R. G. W.

from the work we had to do.*

6. The villages along the outer range eastwards from Tablung are all in a state of great destitution, and had Mr. Clark, of Sibszgar, alluded to them in his letter to the Chief Commissioner as being on the verge of famine, I could have agreed with him. I would have gone further, and said that they were actually suffering from famine. The chief article of food among them is the bark of the "sewa" tree, which they dry in the sun, pound into powder, and eat it in the form of *chapatis*. The Nágás assert that this scarcity is due to a plague of rats that destroyed their standing crops; but I think that it is owing to the fact that scarcely any rice cultivation is carried on at all, or has been for years. The reason of this state of things is the terrible hold that the vice of opium-eating has taken of these villages. The sole object of the Nagas is to get money to buy the drug, and in consequence their fields lie fallow, while they follow the more profitable occupations of gathering rubber and cotton and mat-making, and the money they earn is spent exclusively on opium, of which they consume

enormous quantities. Hence the poverty, misery and starvation evident in these villages, compared with which the thriving, prosperous communities in other parts of the hills where opium is unknown present a most pleasing contrast. In this and in my former letters I have not remarked on the habits, dress, religion, &c., of the tribes visited by me, as I believe they have been already described by the officers who have accompanied the surveys of former years.

Extract from the Narrative Report of LIEUTENANT E. P. LEACH, R. E., Assistant Superintendent, In charge No. 7, Topographical Party.

The detail survey was entirely confined to Marwar in the Native States of Jodhpur, Mirta, Nagour and Kuchawan districts.

North of Nagour (an old walled city, one of the favorite resorts of the late Maharaja, but now very much out of repair) the soil is entirely sand, heaped up into high ridges by the prevailing wind, and devoid of regular cultivation. Beyond this point the desert proper may be said to commence, and there is little or no water above the surface. After a dry season little grass can be procured; the camels and sheep, of which there are large numbers, being fed entirely upon the leaves of the "ber" and "khejra" dried and stored for the purpose. The grass, such as there is, is coarse and stunted, covering the surface of the sand with small thorny seeds (called "bhont"), which find their way into every thing and are an immense source of annoyance—worse even than the spear grass of other parts of India. Horses will scarcely touch the grass in consequence, but thrive well on husked "moth" (vetches), which is cheap and plentiful. The ordinary grains are only procurable from the large towns of Nagour, Didwana, Shujangarh and Bikanir, and are imported thence from the Delhi and Hissar districts, but, curiously enough, prices are, if anything, lower than at Ajmere. During the rainy season large quantities of "bajra" and other light cereals are raised, but the depth of the wells precludes any attempt at irrigated cultivation. Notwithstanding the apparent poverty of the country, villages are numerous, and the inhabitants are apparently able to subsist. The richer classes store water during the rainy season in what are termed "tanks" or underground reservoirs; but the fact of their existence is scrupulously concealed, and the tanks on the borders of the desert country are absolutely drained before the villagers will go to the expense of working their wells. This portion of the country was the most unpleasant to work over,—the water from the unused well being, if anything, more unpalatable than the muddy contents of the tank.

Further north the well water, though very brackish, is perfectly clean and pure; and no sickness appeared among the natives of the party. During the cold weather months the climate is certainly healthy; the nights are very cold, and the air sharp and bracing; but early in March sand-storms set in, and the heat becomes very oppressive.

The formation of the sand ridges is remarkably uniform, corresponding to the direction of the prevailing winds, and the level of their surface is continually varying. The difficulty of obtaining long triangulation rays over these continuous ridges was considerable. In reconnoitring I had taken advantage of the sites of an old G. T. S. Minor Series of the "Gurbagarh Meridional," but on returning to observe, I found the ray in one instance completely obscured by an intervening ridge, and in others had considerable trouble in making the signal visible. The general direction of the ridges is N. E. and S. W.; they rise in parallel rows, one behind the other, at intervals of about a mile, and are occasionally as much as 200 feet higher than the valleys below. The roads, which are mere tracts, wind along their bases, and seldom cross a ridge, while the village sites are naturally selected in hollows, to decrease the labour of sinking wells.

The above remarks apply only to the ground over which the triangulation passed this year and the detail survey will extend next.

The plane tables were, without exception, working in open, easy country, dotted here and there with low hills, but almost entirely devoid of topographical features. A look at the season's standard sheets will give a better idea of the ground than can be conveyed in a written description. The water-course lines disappear at a short distance from the hills, and the river-beds, except in the rains, are entirely dry. The villages are numerous, and the country can be traversed in almost every direction by light carts.

APPENDIX E.

GEOGRAPHICAL, COMPILING, AND DRAWING BRANCHES, SURVEYOR GENERAL'S OFFICE.

Statement showing the nature of the work performed, and the progress made, from the 1st January 1876 to 30th September 1876, nine months.

MAPS, &c.	SCALE.	REMARKS AND PROGRESS.
	Miles. Inch.	
INDIA—Standard in 6 sheets, original (in outline).	32 = 1	Additional materials from the several surveys in progress, reduced and in course of insertion. Further information from various sources of the countries beyond the Punjab and Sind Frontiers re-compiled on sheets 1 and 3. In progress.
INDIA—6 sheets (outline) ...	32 = 1	Blue print re-productions of the above standard compilation. Sheet 4 (Bengal) engraving. Sheet 1 (Punjab) completed for engraving. Sheets 3 (Rajputana) and 5 (Madras) in progress.
INDIA—No. 3—4 sheets (outline) ...	64 = 1	Reduced from the above standard compilation. All existing unsurveyed blanks compiled from the most authentic materials available on a dry transfer proof to complete for a preliminary issue, subject to further corrections from surveys.
BENGAL—Standard, 2 sheets (outline).	16 = 1	Engraving. Sundry additions made to original.
ASSAM—Standard, 8 sheets ...	8 = 1	For lithography. Sheet 8 compiled and drawn complete with hills. Hills drawn on sheets 1, 2, 4 and 5 to complete. Sheet 3, Lakimpur and Sibsagar Districts, with surrounding country of the various hill tribes, in progress.
ASSAM—The Province of (complete with hills).	16 = 1	Standard projection made for copper-plate engraving. Sundry additions and corrections made to original compilation.
SIND—The Provinces of (complete with hills).	16 = 1	Engraving. Fresh additions made on the Northern Frontier, in Baluchistan, on a dry print proof.
KELAT—The Khanate of, or Baluchistan.	16 = 1	For lithography. Hills drawn on a dry print proof, additional information inserted, and further revisions made, subject to future correction from time to time on receipt of new material and sketches. This map embodies all information received to date.
ODDH—The Province of (complete with hills).	16 = 1	Engraving. Hills drawn on a dry print proof.
PUNJAB—The Province of the ...	32 = 1	Proof thoroughly revised and completed with a view to the correction of the copper-plate to 1876.
PUNJAB—The North-Western Frontier of the	16 = 1	A special map of the Frontier from Jacobabad to Abbottabad for the Punjab Government. Drawn in outline on a blue print for re-production by photography.
PUNJAB—Frontier Line, 4 sheets ...	4 = 1	The line of British Frontier on the north-west from Jacobabad in Sind to Bannu in the Punjab, compiled and drawn in outline for the use of the Corps of Guides, with a view to the employment of the men on fresh exploratory surveys beyond the border where practicable. For the Punjab Government.
The Northern and Western Frontier of India.	64 = 1	Four copies on tracing cloth for His Excellency the Viceroy, extracted from the new 64-mile map of India, the habitats of the various tribes all along the frontier from Kurrachee to Hazara being shown in color, with all the passes leading thereto.
NAGA HILLS and surrounding country, for Political Agent.	4 = 1	Drawn complete with hills in vertical strokes for re-production by photography.
Countries between Hindustan and the Caspian Sea.	64 = 1	A blue print proof of the old edition, now out of print, under revision and correction for a new edition to 1876. In progress.
BHOPAL—Native States ...	8 = 1	Compiled and drawn complete with hills.
NIZAM'S DOMINIONS, with the Berars.	16 = 1	Mr. Mulheran's new work on the north reduced and added to office compilation to complete. In progress.
SIMLA—20 sheets ...	24 = 1	Insertion of estate boundaries, and examination and revision of originals for a new edition to 1876. Twelve sheets completed, the rest in progress.
SIMLA—Index map ...	4 = 1	Extension survey of Simla reduced from the 1-inch sheets and drawn on Index.
BAKA—Cantonment of ...	8 = 1	Drawn complete for re-production, season 1866-67.
MELGHAT PANGANA ...	...	Reduced and drawn complete from the original plane-table sheets for the Forest Department. Re-produced by photography.
CANTONMENTS.—Boundaries of.—Boundaries of the following cantonments reduced and inserted to complete the recorded set of office atlas sheets which show them. Alipoor, Attock, Ballygunge, Bareilly, Berhampore, Campbellpore, Doranda, Dibrugarh, Fyzabad, Goanah, Gwalior, Hazareebaugh, Jubbulpore, Moradabad, Biorar, Nowshera, Faehmarhi, Phillour, Ranchi, Ranikhet, Saugor, Simla, Seetapoor, Suddiya, Tezpor, Amritsur.		
MYSORE, Survey Index ...	16 = 1	Drawn for re-production by photography.
BAITUL—District of ...	4 = 1	Reduced and drawn in outline.

Maps for new edition of Aitchison's Treatise.

MAPS, &c.	SCALE.	REMARKS AND PROGRESS.
	Miles. Inch.	
PUNJAB WITH KASHMIR ...	32 = 1	Engraved provincial map, adapted.
KASHGARIA, AFGHANISTAN, PERSIA AND ADJOINING COUNTRIES ...	64 = 1	} Drawn on blue prints of office compilations and adapted.
SIND AND BALUCHISTAN, WITH PARTS OF PERSIA AND AFGHANISTAN ...	32 = 1	
ARABIA AND THE EASTERN COAST OF AFRICA ...	320 = 1	
MALAYAN PENINSULA, SUMATRA AND SIAM ...	110 = 1	Extracted from Johnstone's Commercial Map of the World and adapted.
NORTH-WESTERN PROVINCES AND OUDH ...	64 = 1	} Extracted from new 64-mile map of India and adapted.
BENGAL ...	64 = 1	
ASSAM ...	64 = 1	
BRITISH BURMAH ...	64 = 1	
BOMBAY PRESIDENCY ...	64 = 1	
MADRAS PRESIDENCY WITH THE CENTRAL PROVINCES, BEHAR, HYDRABAD, MYSORE, COORG AND CEYLON ...	64 = 1	
RAJPUTANA AND CENTRAL INDIA AGENCIES ...	64 = 1	
<i>Maps for Dr. Hunter's Gazetteer of Bengal.</i>		
PATNA DIVISION ...	16 = 1	} Engraving. Drawn in outline.
RAJSHAHI—KOCH BEHAR DIVISION ...	16 = 1	
BHAGALPUR DIVISION ...	16 = 1	} Engraving. Drawn complete with hills.
CHOTA NAGPUR DIVISION ...	16 = 1	
CHITTAGONG DIVISION ...	16 = 1	
	16 = 1	

Sheets of the Atlas of India. 4 miles = 1 inch.

MAPS, &c.	REMARKS AND PROGRESS.
Sheet 95, four quarters ...	Projection computed of sheet 95 and marked on the coppers for Madras Revenue Survey.
" 52, S. W., 61, 63, 76, 77, 78, 79, 91 N. W., 91 S. W., 92 N. W., 93 S. E., 93 N. W., 130 N. W.	} Points projected on dry prints of the sheets named.
" 17, full plate ...	Part of Bhawalpoor reduced and drawn from the Revenue Survey sheets to complete. In progress.
" 22, S. W.* and S. E.* ...	Part of Kattywar compiled and drawn in outline. In progress.
" 23, N. W. and S. W. ...	Part of Kattywar, 23 N. W. drawn complete with hills, 23 S. W. in outline, hills in progress.
" 33, S. E. ...	Parts of Ajmere and Jeypore drawn in outline to complete. In progress.
" 34, N. W., N. E., S. W. ...	Parts of Ajmere, Udepur and Jodhpoor, compiled and drawn in outline, S. W. Hills in progress.
" 35, N. E.* and S. E.* ...	Part of Thalawar, Neemuch, Udepur, &c., compilation and drawing in outline. In progress.
" 36, S. E. ...	} Parts of Central India, Native States, and Khandesh, compilation and drawing of, in outline. In progress.
" 37, N. E. ...	
" 52, S. W., N. W., S. E. ...	
" 53, S. E., N. E. ...	Parts of Central India, Native States, compilation and drawing in outline, S. E. Hills drawn complete.
" 54, full plate ...	Part of Bhopal and Hoshangabad, additions compiled and drawn complete with hills.
" 66, full plate ...	} Additional materials to date from the Khandesh and Bombay Native States Survey compiled and drawn complete with hills on a dry print proof from England. Waiting further materials.
" 67, full plate ...	
" 71, N. E., S. E. ...	Parts of Kumaon and Garhwal compiled and drawn in outline to extent of materials received from the Great Trigonometrical Survey. In progress.
" 72, N. W. ...	Parts of Mandla added on dry proofs, waiting further materials.
" 73, full plate ...	Parts of Chindwara and Baitul. Hills drawn complete.
" 74, full plate ...	The blank portion of the Aherree Zemindaree compiled and drawn to complete plates. 73 completed with hills. 74 hills in progress.
" 90, S. W.* ...	Parts of Mandla and Raipur of Central Provinces. Compilation and drawing in outline in progress.
" 92, N. W.,* S. W.* ...	Parts of Raipur, Chanda and Bastar. Compilation and drawing in outline in progress.

Those marked thus * are new sheets.

Sheets of the Atlas of India. 4 miles = 1 inch.—(Concluded.)

MAPS, &C.	REMARKS AND PROGRESS.
Sheet 93, N. W.,* S. W., S. E. ...	Parts of Jeypur, Bastar and Godavari Taluks. 93 S. E. and S. W. compiled and drawn complete with hills. N. W. drawn in outline. Hills in progress.
.. 94, full plate ...	Blank portion on the north of the Godavari Taluks and the Vizagapatam Agency, compiled and drawn complete with hills.
.. 105, S. W. ...	Parts of Sirgudj, Jushpur, and Udepur, Gurjat States. Hills drawn complete.
.. 108, full plate ...	Hills drawn complete on a dry proof in outline of the blank portion of Jeypur on the west.
.. 119, full plate ...	Part of the Goalpara District from the sheets of the Revenue Survey, compiled and drawn to complete.
.. 124, N. W., S. W., N. E., S. E. ...	Parts of Goalpara, Kamrup, Darrang and Nowgong. Additions of new materials from recent surveys compiled and drawn. In progress.
.. 130, N. W., S. W. ...	Parts of the Naga Hills, Nowgong, Sibsagar, and Lakhimpur. Further additions from recent surveys to date drawn complete with hills.
.. 131, S. W. ...	Part of the Naga Hills and Manipur. Further additions from recent surveys to date drawn complete with hills.

These marked thus * are new sheets.

Standard sheets of the Topographical Survey re-drawn for Photozincography.

MAPS, &C.	SCALE.	REMARKS AND PROGRESS.
<i>Chota Nagpore Division Survey.</i>	Miles. Inch.	
Sheet No. 54½ ...	1 = 1	Under correction for a second edition.
<i>Ganjam and Orissa Survey.</i>		
Sheets 22, 24, 42 ...	1 = 1	Projected and fair drawn from the original field sheets.
.. 43 ...	1 = 1	Projected and in progress.
.. 30, 31, 32, 46, and 48 ...	2 = 1	Projected and in progress, in various stages.
<i>Garo, Khasi and Naga Hills Survey.</i>		
Sheets 24, 25 ...	2 = 1	New work added to standards from the original field sections for a new edition.
<i>Central Provinces Survey.</i>		
Sheet 7 ...	1 = 1	Projected and re-drawn from the original field sheets.

Hyderabad Survey.—Omitted village names inserted in 19 original plane-table sheets of this Survey, and the edges of 25 original field sheets examined and adjusted.

MISCELLANEOUS MAPS.

Charts of Triangulation No. 6 Party, Khasia and Garo Topographical Survey, 4 miles = 1 inch, seasons 1868 to 1870 ...	Two traces on vellum cloth made for Captain W. F. Badgley, employed in laying down various boundaries.
Chart of Triangulation, Hurilhong and Chendwar series, Great Trigonometrical Survey, 4 miles = 1 inch, seasons 1844 to 1862 ...	Extract made on tracing cloth of the portions passing through the Districts of Patna and Gaya. Eight sheets of Synopsis of Latitudes and Longitudes and Azimuths written out. For the Superintendent, Revenue Survey.
Map of the country round Koraput in the Native State of Jeypur, Vizagapatam Agency, scale 4 inches = 1 mile, season 1869-70 ...	Enlarged from the original 1-inch Sections. For the Special Assistant Agent, Koraput via Vizagapatam.
Chart of Triangulation, Khanpishura series, Great Trigonometrical Survey, 4 miles = 1 inch, season 1847-48 ...	Copied, with 3 sheets of Synopsis of Latitudes, Longitudes and Azimuths, for the Superintendent of Survey under His Highness the Nizam.
Sketch Map of Ganjam and Orissa, showing the Salt routes ...	A trace on vellum cloth made from the copy sent by the Revenue, Agriculture and Commerce Department.
Corrections and additions to original Topographical Survey sheets ...	Sixty sheets examined, corrected and touched up for re-production.
Corrections and additions to engraved, lithographed and photozincographed maps. Various ...	Blanks filled up; railways, boundaries, territorial names, headings, foot-notes, Titles, &c., inserted, examined, and corrected in 2,323 sheets.

Atlas sheets and engraved maps colored—4,497 sheets.

Lithographed and photozincographed maps and plans colored—11,217 sheets.

J. F. BANESS,
Surveyor and Chief Draftsman.

J. O. N. JAMES,
Assistant Surveyor General, in charge.

SURVEYOR GENERAL'S OFFICE,
Calcutta, 1st October 1876.

APPENDIX F.

ENGRAVING BRANCH, SURVEYOR GENERAL'S OFFICE.

Annual Progress Report up to 30th September 1876.

			New Sheets.
Atlas Sheet No.	52 S. E.	...	New sheet completed.
"	53 N. E.	...	Ditto ditto.
"	131 N. W.	...	Ditto ditto.
<i>New sheets to which large additions from new surveys have been made, or are in progress.</i>			
"	34 N. E.	...	New portion of survey, outline done. Writing in progress.
"	34 N. W.	...	Ditto ditto Ditto.
"	53 S. E.	...	New portion of survey, outline and writing done; hills will be put in hand as soon as possible.
"	124 N. E.	...	New survey, outline done; writing in progress.
"	124 S. E.	...	Ditto outline and writing done; hills in progress.
"	124 N. W.	...	Ditto ditto done. Writing in progress.
"	124 S. W.	...	Ditto ditto and writing done. Hills in progress.
"	130 S. W.	...	Old work erased for new survey; outline and writing done. Hills will be put in hand as soon as possible.
"	131 S. W.	...	Old work erased for new survey; outline and writing done as far as drawing; hills in progress.
<i>New atlas Sheets in hand up to the 30th September 1876.</i>			
"	23 N. W.	...	Outline done; writing in progress,— $\frac{7}{8}$ ths done.
"	23 S. W.	...	Ditto writing and coast shading up to margin done.
"	34 S. W.	...	Ditto and writing up to margin completed.
"	37 N. E.	...	Ditto done as far as drawing; writing just commenced.
"	52 N. W.	...	Ditto and writing up to margin done.
"	52 S. W.	...	Ditto as far as drawing ditto.
"	72 N. E.	...	Plate finished as far as drawing; hills require touching up a little.
"	72 N. W.	...	Outline and writing up to margin done; hills will be put in hand as soon as possible.
"	93 S. W.	...	Outline and writing done; hills in progress,— $\frac{3}{4}$ ths completed.
"	93 S. E.	...	Ditto up to margin; hills in progress,— $\frac{3}{4}$ ths completed.
"	93 N. W.	...	Ditto done as far as drawing $\frac{1}{3}$ rd of the plate.
"	125 N. W.	...	Ditto ditto; hills $\frac{3}{4}$ ths done. In progress.
"	130 N. W.	...	Outline done; Writing in progress, well advanced.
"	130 S. E.	...	Ditto and writing done; hills just commenced.
<i>Old plates to which large additions have been made, or are in progress.</i>			
"	17	...	Heavy additions of new survey south of the plate, first portion done; second portion outline done; writing in progress.
"	31	...	New survey, outline done; Writing in progress.
"	67	...	Erasing parts of old work and engraving heavy portion of new survey completed.
"	73	...	Heavy additions of new survey, taking out old work, repairing and engraving new outline and writing, done; hills will be put in hand as soon as possible.
"	74	...	New portion of survey; outline and writing done; hills will be put in hand as soon as possible.
"	88	...	Very heavy sheet of new survey, corrections and additions done.
"	94	...	Heavy additions of new survey; outline and writing done. Hills in progress.
"	107	...	New survey engraved and completed.
"	108	...	Ditto outline and writing done; hills in progress.
"	113	...	Heavy additions of new survey; outline done; writing in progress, well advanced.
"	119	...	Extra additions of new survey, erasing old work and engraving new outline, done. Writing in progress.
"	121	...	Heavy additions of new survey of the Sunderbans; outline done. Writing in progress.

		<i>Sheets repaired to which small additions and corrections have been made.</i>
Atlas Sheet No.	2 N. E. ...	Slight additions of names completed.
"	14 ...	Title and territorial names ditto.
"	15 ...	Ditto ditto
"	29 ...	Title, railway, roads, and territorial names completed.
"	48 ...	Trying to repair hills; plate put down for other work.
"	58 ...	Slight additions.
"	59 ...	Hills being repaired; more than half done; plate put down for other work.
"	65 ...	Title and territorial names completed.
"	66 ..	Ditto ditto ditto
"	75 ...	Repairing hills ditto.
"	72 ...	Alterations and additions of large district names. Writing in progress. When finished this will make quarter sheet 72 S. W.
"	112 ...	Alterations of district names, repairing and re-engraving parts damaged by taking out the old names, completed.
"	103 ...	Heavy alterations, repairing parts damaged by the taking out and re-engraving. Outline and writing in progress.
"	77 ...	Slight additions, title and price, done.
<i>The following plates have been projected and margins completed.</i>		
28 plates.		Atlas sheets 61, 63, 77, 78, 79—all four quarters; 36 S. E., 95 N. E., 95 N. W., and 131 N. E. In all 28 plates.
<i>General and Miscellaneous maps and other work completed and in progress.</i>		
No. 2,—India, scale 128 miles = 1 inch.		Corrections and additions done and the entire hill etching executed.
Map of Oudh, scale 16 miles = 1 inch.		Outline and writing with heavy corrections and additions done; hill etching partially finished.
Simm's plan of Calcutta, 4 sheets		Heavy additions.
Map of Sind, scale 16 miles = 1 inch.		Outline done; writing in progress, well advanced. Heavy sheet.
Map of Assam, scale 16 miles = 1 inch.		Ditto writing in progress, just commenced. Ditto.
Six sheet map of India, scale 32 miles = 1 inch.		Borders and projections done. The Bengal sheet outline just commenced.
Two sheets of Bengal, scale 16 miles = 1 inch.		Borders and projections done; outline well advanced.
Gazetteer maps, Bhagalpur Division		Outline done; writing just commenced.
Gazetteer maps, Chittagong Division		Ditto and writing done; waiting orders for hills.
Ditto, Chota Nagpore Division.		Ditto done; writing just commenced.
Gazetteer maps, Patna Division,		Ditto ditto ditto well advanced.
Gazetteer maps, Rajshahi and Kuch Belur Division.		Ditto ditto, just commenced.
Outline map of India; very small		Engraved in outline only for the Meteorological Office.
Map heading for transfer ...		Khasi, Garo and Naga Hills Topographical Survey.
Ditto ditto ditto. ...		Assam Revenue Survey, with additions to the plate, completed.
Three plates of imprints ...		With new additions and alterations of dates.
One scale for the Indian Atlas Longitudes and Latitudes.		Additions of new scales to the plate completed.
One scale for the Mathematical Instrument Department.		Completed.
<i>Number of plates in hand up to the 30th September.</i>		
	1876	... .. 123
<i>Copper-plate printing.</i>		
Proofs	... ..	1,135
Transfers	... ..	717
Impressions of copies	... ..	6,130
TOTAL IMPRESSIONS	... ..	7,982

C. W. COARD,
Superintendent, Engraving Branch.

J. O. N. JAMES,
Assistant Surveyor General.

APPENDIX G.

From CAPTAIN J. WATERHOUSE, Assistant Surveyor-General, in charge Photographic Branch, to the Surveyor-General of India, No. 434 P., dated Calcutta, 2nd December 1876.

I have the honor to forward the usual tabular statements showing the amount and progress of the work performed in this branch of your office during the first nine months of the current year, or from the 1st January to 30th September.

2. The report only covers the period of nine months, on account of the recent change, by order of Government, in the date of submission of your annual report to Government, necessitating the submission of this report before the 31st December. It has, therefore, been brought up to the 30th September, in order to correspond with the professional year, or the period for which the reports of the other branches of the department are made out.

3. It is to be regretted that the period of report on the present occasion is so short, because I am prevented from making a fair comparison between the out-turn of former years with that of the present year, which has been unusually large.

4. AMOUNT OF WORK.—The amount of work performed between the 1st January and the 30th September, as compared with the same period of the previous year, is shewn in the following table :

	Five months of 1876—January to September.	Nine months of 1876, January to September.	Difference.	Difference in decimal sq. feet of 100 sq. in.	REMARKS.
Originals	1,279	1,573	+ 294		
Negatives	2,282	3,516	+ 1,234	+ 4071.94	
	6676.96 d. s. f.	10748.80 d. s. f.			
Silver prints	2,129	525	- 1,604	- 516.04	
	1638.87 d. s. f.	1123.84 d. s. f.			
Photo-transfer prints ...	2,341	3,521	+ 1,180	+ 9195.13	
	6968.64 d. s. f.	10634.00 d. s. f.			
Transfers to zinc or stone ...	898	1,396	+ 37,968		
Number of pulls	110,698	148,666	+ 45,054		
" of complete copies ...	112,671	157,725	+ 58,081		
" of impressions	126,045	184,126			
Photo-collotypes	392	.....		
Carbon prints of convicts ...	.....	1,840			
			

5. PROGRESS.—As will be seen from the above table, there has been a very large increase in all branches of the work except the silver printing. This increase has been almost entirely caused by the re-production of the sheets of the North-West Provinces Cadastral Surveys, and a great part of this has been done as extra work.

6. EXPENSES OF WORKING.—As the period now under report is not a complete year, and as it may be more convenient for future reference to show the expenditure for the past financial, instead of for the professional year, I have given in a separate table a statement in the usual form of the approximate expense of working the office during the last financial year 1875-76, amounting to Rs. 70,554-4-8, inclusive of Superintendent's salary, contingencies, and the cost of stores, &c., as far as known.

7. The approximate sum to credit of the office is Rs. 94,693-1-1, which shows a nominal profit of Rs. 24,138-12-5 in favour of the department.

8. PERSONNEL.—The staff of the office has been considerably increased, in order to provide the extra establishment for the re-production of the cadastral maps of the North-West Provinces, as sanctioned in Revenue, Agriculture and Commerce Department No. 3, dated 5th January 1876. Corporal Robert George, formerly of Her Majesty's 55th Regiment, who was trained in photography by Colonel Tennant, R.E., and assisted me at the transit of Venus in 1874, and at the eclipse in 1875, joined the office as photographer on the unattached list in February 1876, and has since been employed in learning the special duties of each branch of the work. Mr. L. Lagnier, who had formerly been employed here, and Mr. V. LeRoy, have been entertained as photographers; and in the zinc printing branch Mr. E. LeFranc has been appointed a zincographer. All these young assistants are now under training in their respective duties, and give promise of being useful. The senior assistants, Messrs. J. Mackenzie, B. Mackenzie and J. Watson, Sergeants Harrold and Marshall, have continued to perform their duties with their usual zeal and diligence.

9. PROCESSES.—*Intensifying Negatives.* Complaints having been received from the neighbours of the unpleasant smell caused by the hydrosulphate of ammonia used for intensifying negatives, trials have been made of various methods of intensifying by which the use of this noxious substance might be avoided.

10. The most promising method tried, and partially adopted, was that of Messrs. Eder and Toth of Vienna, who, after the negative has been developed and fixed in the usual manner, apply a solution of

Ferridcyanide of Potassium	...	...	...	6 parts.
Nitrate of Lead	...	...	...	4 "
Water	...	...	...	100 "

The effect of this is to greatly increase the density of the film, and change its colour to a yellowish white, which is then darkened by the use of hydrosulphate of ammonia or the sulphantimonate of soda.

11. As, however, the object was to avoid the use of hydrosulphate of ammonia, further trials were made to find a good substitute, and my head photographer, Mr. J. Mackenzie, was fortunate enough to discover that a treatment of the negative with a solution of iodide of iron after the application of the ferridcyanide, and followed by a weak solution of permanganate of potash, gave all the density required without blocking the lines.

12. Further practice showed that the best proportions of the solution of iodide of iron were :

Iron filings	...	...	...	10 parts.
Iodine	...	...	...	5 "
Water	...	...	...	300 "

and of the permanganate of potash

Permanganate of Potash	...	...	...	1 to 2 parts.
Water	...	...	...	100 "

It must be mentioned that the plate should be thoroughly washed between the application of each of these solutions.

13. The above method is perhaps the most efficient for general use, but it was also found in the course of these experiments that sufficient density could be obtained by treating the ferridcyanide film with a solution of permanganate of potash alone at 5 per cent., which produces a dense, rich, dark-brown film; by a solution of bichromate of potash, which turns the film a deep yellow; by a solution of chloride of uranium, which gives a dark chocolate brown image with perfect clearness of lines, and also by a solution of chloride of cobalt at 10 per cent., followed by the ordinary alkaline developer. The ferridcyanide film could also be intensified in the usual manner with acid pyro. and silver, but there appeared to be a tendency to fill up the lines.

14. The first practical trials during the hot weather with this intensifier were so successful, that I proposed to adopt it entirely for the work of the office, but during the rains it was found to break up the collodion film and produce a crapiness and reticulation to such an extent as to render the negatives quite useless, and I therefore had to abandon it. Since the return of the dry weather it has again been used with successful results, and though it will not quite replace the old method for the finest class of work, it will prove very valuable and, I believe, economical.

15. During the course of these experiments some other methods of intensifying, without the use of hydrosulphate of ammonia were also tried. The following was one of the best and would be of great value, but for the fact that it cannot be used with the old glasses stained with mercury.

16. After development with iron and fixing in the usual manner, the plate is plunged into a bath made up by Davanne's formula as follows :—

Iodine	...	...	...	1 part.
Iodide of Potassium	...	...	...	4 parts.
Water	...	...	...	200 "

The plate remains in this till it is of an even yellow colour, and is then thoroughly washed and treated in broad daylight with the ordinary acid pyro. and silver intensifier, when it readily takes any required degree of intensity.

17. Some good results were also obtained by the use of the alkaline pyrogallic acid developer, after the plate had been treated with bichloride of mercury in the usual manner; but for success with this method it is necessary that the film should have considerable density before the application of the alkaline developer.

18. *Photo-collotype*.—During the early part of the year little was done with this process, and as I found that Sergeant Marshall was not doing much good with it, I transferred him to the negative branch, where he has since been very usefully employed upon the cadastral and other work. I have, however, lately been making some trials of a process which appears to have many advantages in cheapness and simplicity over those formerly tried. Instead of using a thick film of gelatine on a plate of glass, I use a thin film on a plate of copper and thus obviate all difficulties connected with the drying of the gelatine, which have hitherto always given us so much trouble. The copper is also lighter and more easily handled than the glass, besides standing rough usage better. The gelatine films stick well to it, and the chipping off of the dry film cannot tear up the surface of the copper as it does that of the glass.

19. The formula for the sensitive gelatine mixture has also been modified, and now stands as follows :—

Gelatine	...	...	...	15 parts.
Formic Acid	...	...	...	4 "
Bichromate of Potash	...	...	...	4 "
Water	...	...	...	100 "

As different samples of formic acid vary in strength and quality, the above proportion of this ingredient may require to be modified; but I have found that if the films are too soft and

granular, they may be much improved by the addition of a very small quantity of tartaric acid ($\frac{1}{5}$ of a part) to the above.

20. PIGMENT PRINTING.—During the early part of the year the work of printing the photographs of convicts by this process, as noticed in my last report, was continued with fair success, and the whole of the 207 negatives sent on by the Jail Department were printed off by the 24th July 1876. Under the orders of Government, the experiment is to be continued for another year, and we have already commenced the printing from the negatives of the convicts of the present season with greater success than last year, owing to the experience then gained, and with the advantage of a proper supply of tissue and materials received from England for the purpose.

21. CADASTRAL MAPS OF THE NORTH-WEST PROVINCES.—During the period under report the work of re-producing these sheets has been carried on steadily as far as the limited means at our disposal would allow us. The presses, apparatus and stores, indented for last year on special indent for this work, have all been received, with the exception of the cameras, which it is hoped will soon arrive, because, until they are received, it will be impossible to secure a regular and sufficient out-turn of these maps owing to the demands upon the office cameras for the ordinary work.

22. The additional accommodation for presses and cameras has been provided by the Department Public Works, though paid for out of the grant given by the Government of the North-Western Provinces for the re-production of these maps, and a portion of the additional establishment has been entertained and trained, so that we now only await the arrival of the cameras from England to go on with the work at full power. During the nine months under report, 923 sheets have been printed off and turned out, in great measure as extra work. We are now re-producing 6 to 8 sheets a day, and I hope that by the end of the year at least 1,500 sheets, or about half of the full annual out-turn estimated by me, will have been turned out as the year's work. Every effort has been made and will continue to be made, to push on with this important work to the utmost possible extent; and the out-turn this year would have been larger had it not been for the exceptionally wet and dull rainy season which interfered very much with the taking of the negatives.

23. CADASTRAL MAPS OF BENGAL.—At the urgent solicitation of Colonel Vanrenen, a few sheets of these surveys on the scale of 32 inches to the mile have been re-produced without photography by a modification of the anastatic process. This work, however, is so enormous, that if it is to be undertaken by this office, so as in any way to keep pace with the surveys, I cannot too strongly urge the necessity for making an early commencement of new offices for this branch in which sufficient accommodation for this large extension of our work may be provided. With the present accommodation it will be perfectly impossible to meet any further demands involving large increase of work.

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Statement showing approximate cost of working the Photographic Branch of the Surveyor-General's Office from 1st April 1875 to 31st March 1876.

Da.	Number of complete copies.	Selling Value.			Ca.	Cost.		
		Rs.	A.	P.		Rs.	A.	P.
Topographical Survey Maps ...	29,785	25,484	4	10	Superintendent's salary from 1st April 1875 to 31st March 1876 ...	14,198	6	6
Revenue Survey Maps ...	35,510	41,865	9	5	Sanctioned establishments from ditto to ditto ...	21,204	12	0
District Maps ...	1,785	1,605	14	11	House-rent from ditto to ditto ...	4,200	0	0
General Maps ...	1,008	1,907	2	6	Contingencies from ditto to ditto ...	3,828	10	3
City and Cantonment Plans ...	3,045	5,335	5	6	Chemicals received from England as far as known ...	5,178	0	9
Miscellaneous Maps ...	76,701	5,846	9	6	Chemicals received from Government Medical Store Department on emergent indents ...	377	15	5
Anastatised ...	5,480	3,607	8	0	Cost of paper ...	18,097	3	8
Zincographed ...	2,590	90	15	6	Cadastral establishment, N. W. P. ...	649	0	0
Silver Prints ...	2,463	2,699	10	11	Ditto Contingencies ...	79	6	3
Cadastral Survey Maps, N. W. P. ...	12,500	6,250	0	0	Ditto Extra-men ...	2,741	10	7
					Balance in favour of the Department	24,137	15	8
TOTAL ...	170,837	94,693	1	1	TOTAL ...	94,693	1	1

Abstract of work performed in the Surveyor-General's Office, Photographic Branch, for 9 months, viz., 1st January to 30th September 1876.

	NUMBER OF		PRINTS.			Transfers to zinc or stone.	Number of pulls.	Number of complete copies.	REMARKS.
	Sections or at sets.	Negatives plates.	Carbon prints.	Silver prints.	Photo-transfer prints.				
Topographical Maps ...	89	130	...	62	111	52	17,975	19,785	
Revenue Survey Maps ...	159	250	...	...	271	89	31,034	28,864	
District Maps ...	3	8	...	...	15	6	430	400	
General Maps...	11	37	...	1	33	10	3,347	2,667	
City and Cantonment plans	22	47	...	...	46	15	5,870	2,675	
Miscellaneous Maps, &c. ...	207	323	...	...	258	105	43,214	77,218	
Silver prints, miscellaneous	...	...	...	421	...	...	...	...
Photographs of life convicts	...	...	1,840	...	...	...	...	...
Anastatic Transfer	...	...	...	...	...	9	..	...
Proofs ...	...	...	...	...	...	...	2,141	...	
Total ...	491	795	1,840	484	734	286	1,04,011	1,31,609	
Cadastral Survey, North-West Provinces ...	1,083	2,721	...	...	2,787	1,115	46,150	25,360	923 sheets printed off.
GRAND TOTAL ...	1,574	3,516	1,840	484	3,521	1,401	1,50,161	1,56,959	

SURVEYOR-GENERAL'S OFFICE,
PHOTOGRAPHIC BRANCH,
Calcutta, 2nd December 1876.

J. WATERHOUSE, Captain,
Asst. Surveyor-General, in charge Photographic Branch.

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APPENDIX H.

From CAPTAIN R. V. RIDDELL, R.E., *Assistant Surveyor General, in charge Lithographic Branch, to the Surveyor General of India,—No. 1213*₁, dated Calcutta, the 2nd December 1876.

I have the honor to submit returns of the amount of work completed in the Lithographic Office between the 1st January and the 30th September 1876.

2. This period has been selected as that most suitable for this year's report, in order to assimilate the termination of the proceedings of this office with the date of the close of the survey official year, and to admit of the report being submitted in time to meet the unusually early demand for the annual administration report.

3. The principal map in hand during this year was the new map of Simla, on the scale of 8 inches = 1 mile, with hills in chalk from an original drawing by Captain G. Strahan, R.E., of which two sheets remained unfinished last year.

4. A comparison of the out-turn of the year under report with that of the corresponding months of last year shows a favorable result both in the stone and type printing branches. Mr. Niven went on furlough on the 6th April, and during his absence his duties were carried on successfully by Mr. J. Watson, from the Photographic Office. Captain Waterhouse, from whom I lately received charge of this office, reports most favorably of the manner in which Messrs. Jevezy, Niven, Lepage and Watson carried out the duties entrusted to them respectively: the annexed returns speak for themselves.

Abstracts of the Drawings executed in the Surveyor General's Office, Lithographic Branch, from 1st January to 30th September 1876.

Scale, &c.	New Maps, &c., the Lithographic drawings of which were completed during the present year.	Size.	No. of Sheets.	REMARKS.
GENERAL MAPS.				
128 miles = 1 inch	Map of India, No. 2, hills drawn only ...	Imperial ...	1	
128 " = 1 "	Military Map of India ...	{ Additions and corrections done only. } Ditto ...	1	
8 " = 1 "	Map of Dacca Division ...	{ Corrections, boundaries, margins, lines, &c., drawn. } Double Royal ...	1	Taken from Eastern Bengal Sheets.
8 " = 1 "	" of Chittagong Division ...	Imperial ...	1	
DISTRICTS.				
4 miles = 1 inch	District Champarnn ...	{ Corrections, boundaries, margin lines, drawn. } Atlas ...	1	By Plate Transfer from the Engraved Plates of the Atlas of India.
4 " = 1 "	" Balasore ...	Ditto ...	1	
REVENUE SURVEY MAPS.				
1 mile = 1 inch	District Sonthal Pergunnabs, Sheets Nos. 3, 5, 7, 8, 9, 11, 13 and 15.	Double Royal ...	8	
1 " = 1 "	District Beerbhoom, Sheets Nos. 1, 2, 3, 5 and 6 ...	Ditto ...	5	
1 " = 1 "	" Rungpur, Sheet No. 1 ...	Ditto ...	1	
1 " = 1 "	" Dinajpur, " " 1 ...	Ditto ...	1	
			16	
PLANS.				
6 inches = 1 mile	Plan of Calcutta (Southern Section ...	Double Elephant ...	1	
8 " = 1 "	" of Simla and Jugog, Sheets Nos. 1 and 2, chalk hills drawn only.	Atlas ...	2	
12 " = 1 "	Plan of Fogluckabad Fort, District Delhi ...	Imperial ...	1	
			4	
GEOLOGICAL MAPS.				
1 mile = 1 inch	Geological Map of Wardha Valley coal-field, Chanda and Sasti area.	Imperial ...	1	
1 " = 1 "	Geological Map of Wardha Valley coal-field, Warorab, Wan areas.	Double Imperial ...	1	

Scale, &c.	New Maps, &c., the Lithographic drawings of which were completed during the present year.	Size.	No. of Sheet.	REMARKS.
MISCELLANEOUS.				
Various scales ...	Bengal Government Maps and Plans ...	Various sizes ...	2	
" " ...	Foreign Department " ...	Ditto ...	17	
" " ...	Archaeological Survey Plans and Drawings ...	Ditto ...	3	
" " ...	Department of Revenue, Agriculture and Commerce Maps, Plans, &c. ...	Ditto ...	4	
" " ...	Miscellaneous Maps, Plans, &c. ...	Ditto ...	61	
			89	
	TOTAL ...		114	
COLORING.				
128 miles = 1 inch	Map of India, No. 2, ...	Imperial ...	4	
4 " = 1 "	" Indian Atlas Quarter Sheet No. 2, N. E.; 52, S. E.; 52, N. E.; 53, N. E.; 93, N. E.; and 105, S. W. ...	Half Sheet Atlas ...	11	
8 " = 1 "	Map of Eastern Bengal. Sheets, Nos. 7 & 9 ...	Imperial ...	4	
8 " = 1 "	" Assam and North-Eastern Frontier, Sheets Nos. 1 & 4. ...	Ditto ...	6	
8 " = 1 "	Map of Western Bengal, Sheets Nos. 14 & 18 ...	Ditto ...	4	
128 " = 1 "	Military Map of India ...	Ditto ...	4	
4 " = 1 "	Map of District Bhaugulpur ...	Double Royal ...	2	
4 " = 1 "	" " Cuttack ...	Atlas ...	1	
4 " = 1 "	" " Patna ...	Super Royal ...	1	
4 " = 1 "	" " Sylhet ...	Double Elephant ...	1	
4 " = 1 "	" " Champaran ...	Atlas ...	1	
4 " = 1 "	" " Balasore ...	Ditto ...	1	
4 " = 1 "	" " Bogra ...	Super Royal ...	1	
64 " = 1 "	Map of Assam ...	Foolscap ...	3	
64 " = 1 "	" Bengal ...	Ditto ...	3	
64 " = 1 "	" North-Western Provinces, Oudh, &c. ...	Half Super Royal ...	3	
64 " = 1 "	" Burmah ...	Super Royal ...	3	
64 " = 1 "	" Bombay Presidency ...	Ditto ...	3	
64 " = 1 "	" Madras Presidency ...	Ditto ...	3	
64 " = 1 "	" Rajpootana and Central India Agency ...	Half Sheet Imperial ...	2	
320 " = 1 "	" Arabia and East Coast of Africa ...	Half Super Royal ...	5	
110 " = 1 "	" Malayan Peninsula, Sumatra, and Siam ...	Super Royal ...	3	
32 " = 1 "	" Panjeb with Kashmir ...	Atlas ...	3	
16 Chains = 1 "	" District Tullah Blangah ...	Half Sheet Foolscap ...	4	
2 inches = 1 mile	Plan of Chundernuggur ...	Foolscap ...	6	
32 miles = 1 inch	Map illustrating the distribution of forests in Assam ...	Half Sheet Imperial ...	4	
32 " = 1 "	Sketch map of Bengal Province, illustrating the distribution of comparative mortality from cholera. ...	Atlas ...	4	
32 " = 1 "	Map of India to illustrate the Annual Report of the Sanitary Commissioner with the Government of India for 1875. ...	Half Sheet D. Royal ...	1	
8 " = 1 "	Outline Geological Map of part of Himalaya Mountain. ...	Foolscap ...	6	
8 " = 1 "	Map of District Kangra Routes ...	Half Sheet D. Royal ...	6	
4 " = 1 "	9 maps illustrating spread of cholera over the Nimar District, eastern and western section of District, Hoshangabad and Nursingpoor, &c., ...	Various sizes ...	18	
8 inches = 1 mile	Wreck Chart of the Coast of India for 1875 ...	Antiquarian ...	1	
2 miles = 1 inch	Plan of Calcutta ...	Super Royal ...	4	
	Map of the Geology of Khelat and surrounding countries. ...	Half Sheet Imperial ...	4	
1 mile = 1 "	Geological Section from East to West of 24 miles Harbui Mountain ranges, &c. ...	Half Sheet Foolscap ...	4	
12 Statute miles = 1 inch.	Sketch map of El shehal in Oman ...	Ditto ditto ...	1	
2 miles = 1 inch	Sketch of Duffla Hills ...	Ditto ditto ...	6	
150 " = 1 "	General Cunningham's Report, Plate No. 31 ...	Ditto ditto ...	1	
			141	
COLORING GEOLOGICAL MAPS.				
256 miles = 1 inch	Map of India, No. 1, showing the present state of the progress of the Geological Survey for 1875. ...	Foolscap ...	3	
			144	

ABSTRACTS.

Districts and General Maps ...	...	...	...	6 Sheets.
Revenue Survey Maps ...	...	...	...	15 "
Plans	4 "
Miscellaneous Drawings	89 "
Color stones prepared	144 "
				TOTAL ... 258 Sheets.

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Abstract of printing executed at the Surveyor General's Office, Lithographic Branch, from 1st January to 30th September 1876.

SUBJECTS.	No. of Sheets.	No. of Copies.	No. of Pulls.
LITHOGRAPHIC BRANCH.			
District and General Maps	16	3,031	7,088
Index Map	1	401	401
Revenue Survey Sheet Maps, scale 1 mile = 1 inch	9	2,808	2,808
Plans	9	896	1,758
Re-prints	83	8,439	24,456
Miscellaneous Maps	71	22,729	60,570
Miscellaneous Plans, Sketches, &c.	86	47,397	56,651
Geological Maps	1	864	3,456
Cadastral Maps	92	4,600	4,600
TOTAL ...	368	91,165	151,788
TYPE DEPARTMENT.			
Departmental Order	24	2,959	4,104
Memoranda and forms for use of the Department	288	108,489	150,371
Forms of Topographical and Revenue Surveys	55	65,752	168,382
Transfers of headings, foot-notes, references, &c., to published Maps	Items, 1,479	9,986	9,986
TOTAL ...	1,846	187,186	332,843

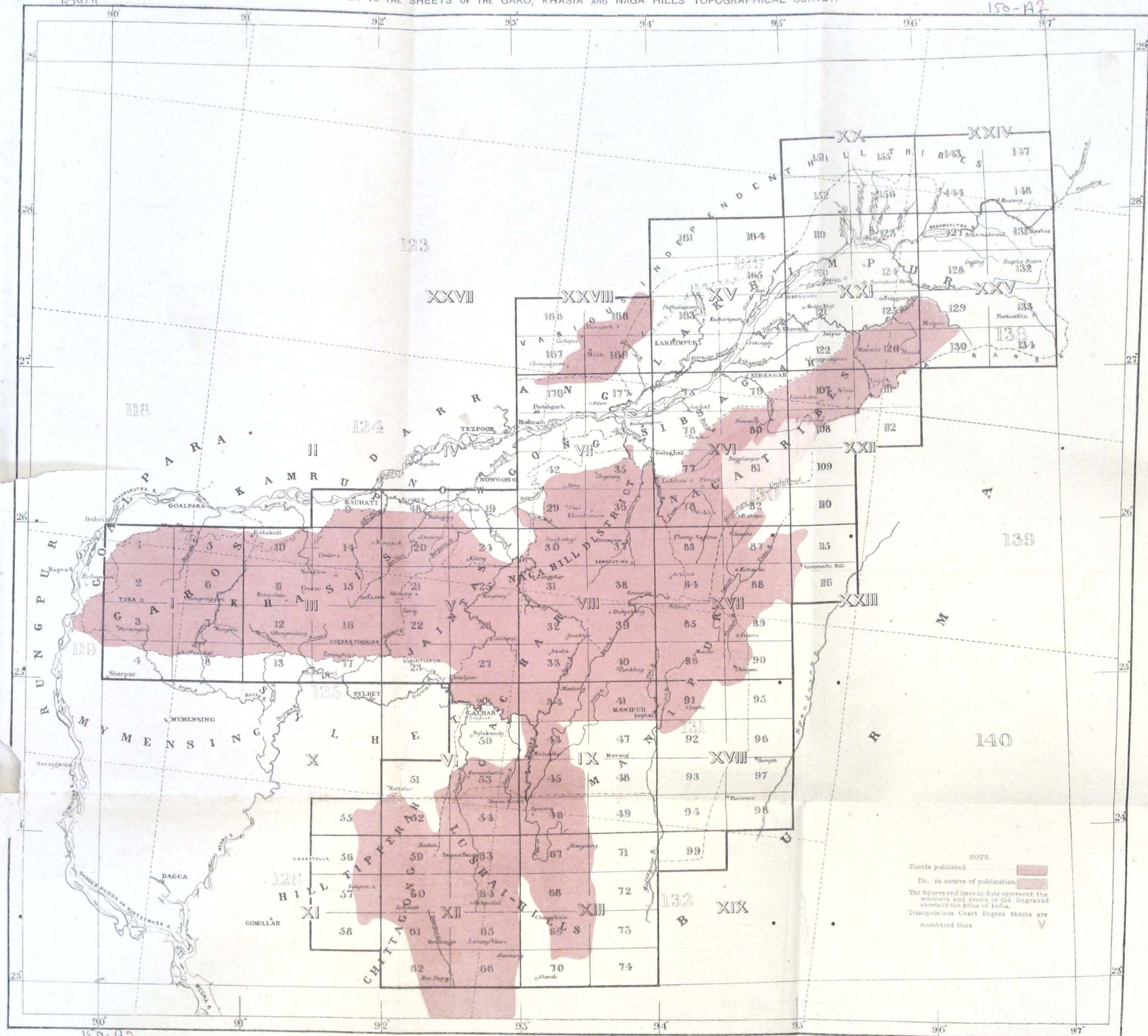
Statement of cost of the Lithographic Branch, Surveyor General's Office.

	Rs.	A.	P.
Permanent establishment for nine months to 30th September 1876	24,784	12	9
Contingent expenses for ditto ditto	3,442	4	0
TOTAL ...	28,227	0	9

R. V. RIDDELL, *Capt., R.E.*,
Assistant Surveyor General,
In charge, Lithographic Branch, S. G. O.

SURVEYOR GENERAL'S OFFICE;
LITHOGRAPHIC BRANCH,
Calcutta, the 2nd December 1876. }

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NOTE
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 Do. in course of publication
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 Triangulation Chart Degree Sheets are numbered thus

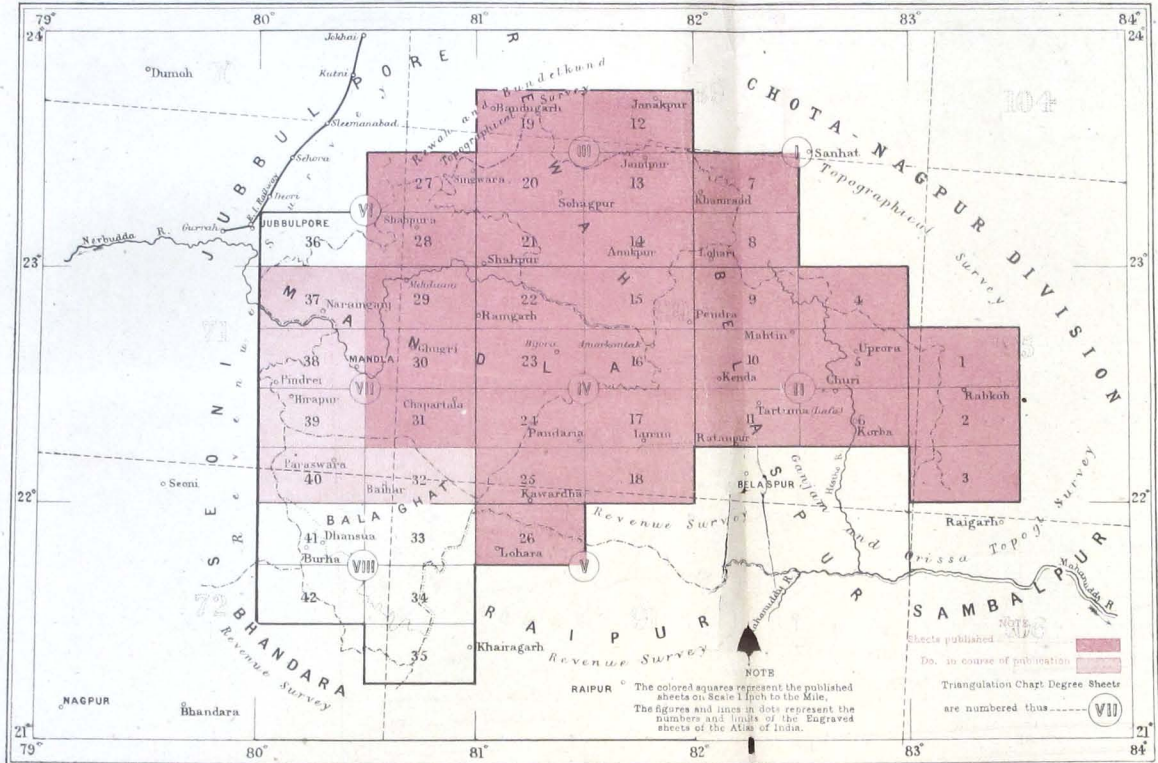
No. 4 PARTY

INDEX TO THE SHEETS OF THE NORTH EAST DIVISION CENTRAL PROVINCES TOPOGRAPHICAL SURVEY.

On the Scale of 1 Inch = 1 Mile.

142A1

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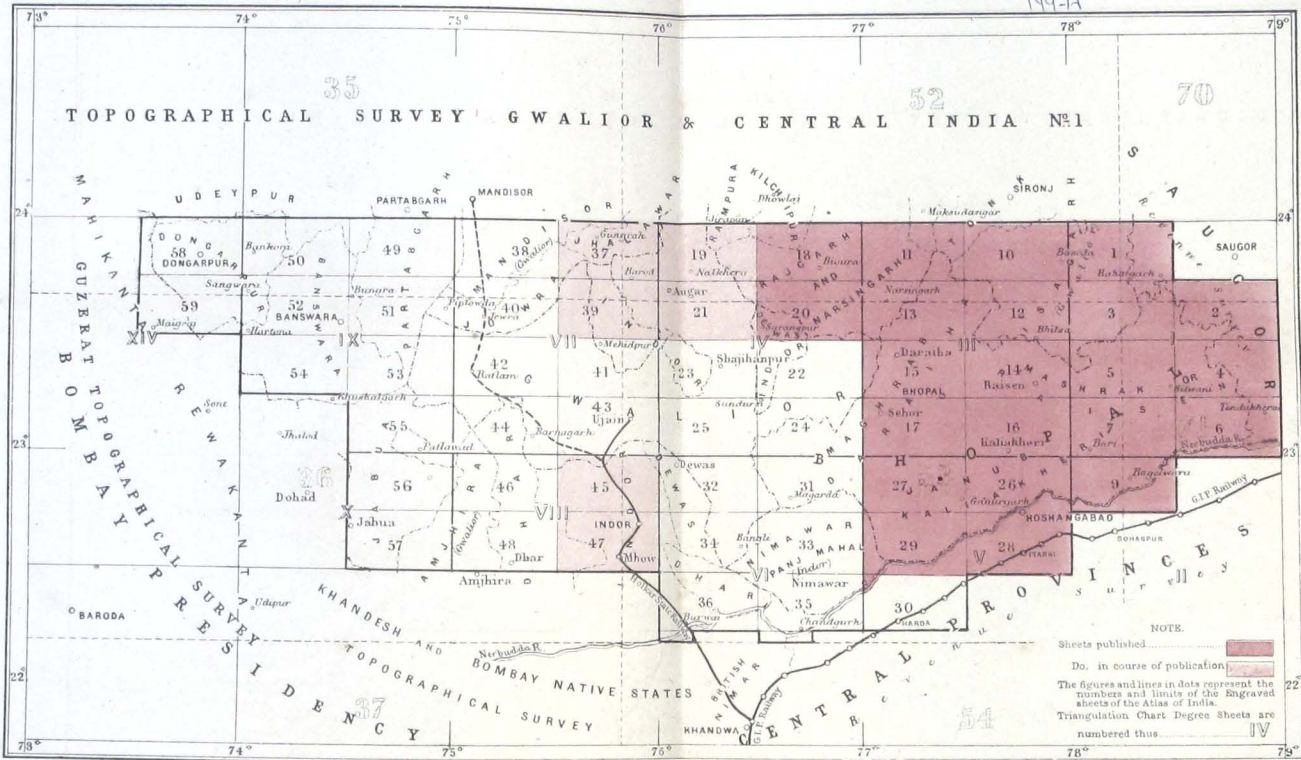
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INDEX TO THE SHEETS OF THE BHOPAL & MALWA TOPOGRAPHICAL SURVEY.

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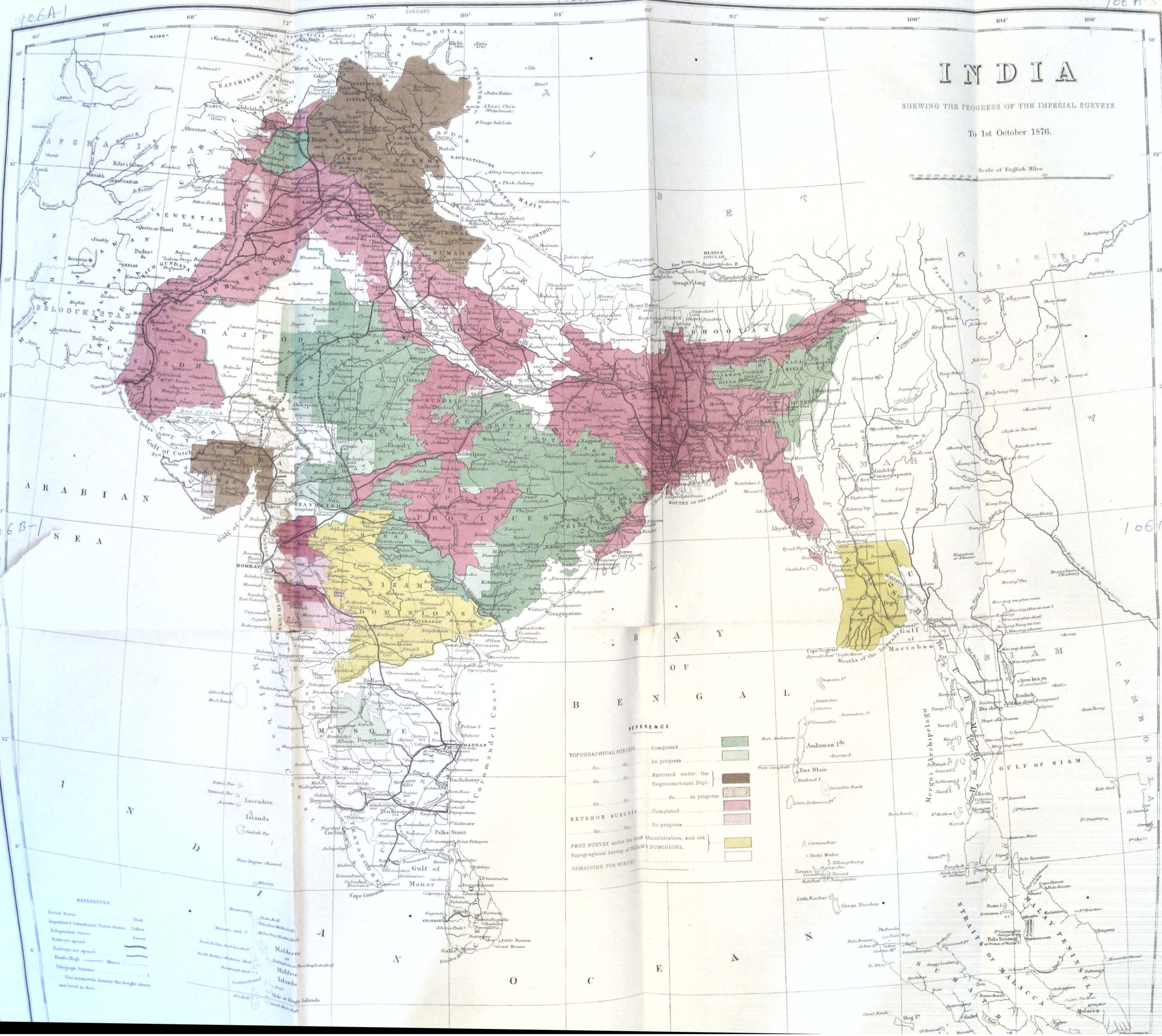
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 Sheets published.
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INDIA

SHEWING THE PROGRESS OF THE IMPERIAL SURVEYS.

To 1st October 1876.

Scale of English Miles



REFERENCE

TOPOGRAPHICAL SURVEYS	Completed	
do	In progress	
do	Executed under the Trigonometrical Dept.	
do	do	
do	do	
REVENUE SURVEYS	Completed	
do	do	
do	do	
PRG SURVEY under the local administration, and old Topographical Survey of SIAM'S DOMINIONS.		
REMAINING FOR SURVEY		

REFERENCES

- British States
- Independent & Subsidiary Native States
- Yellow
- Independent States
- Green
- Railways opened
- Railways not opened
- Roads, High
- Roads, Minor
- Telegraph systems
- The numerals denote the height above sea level in feet

The numerals denote the height above sea level in feet

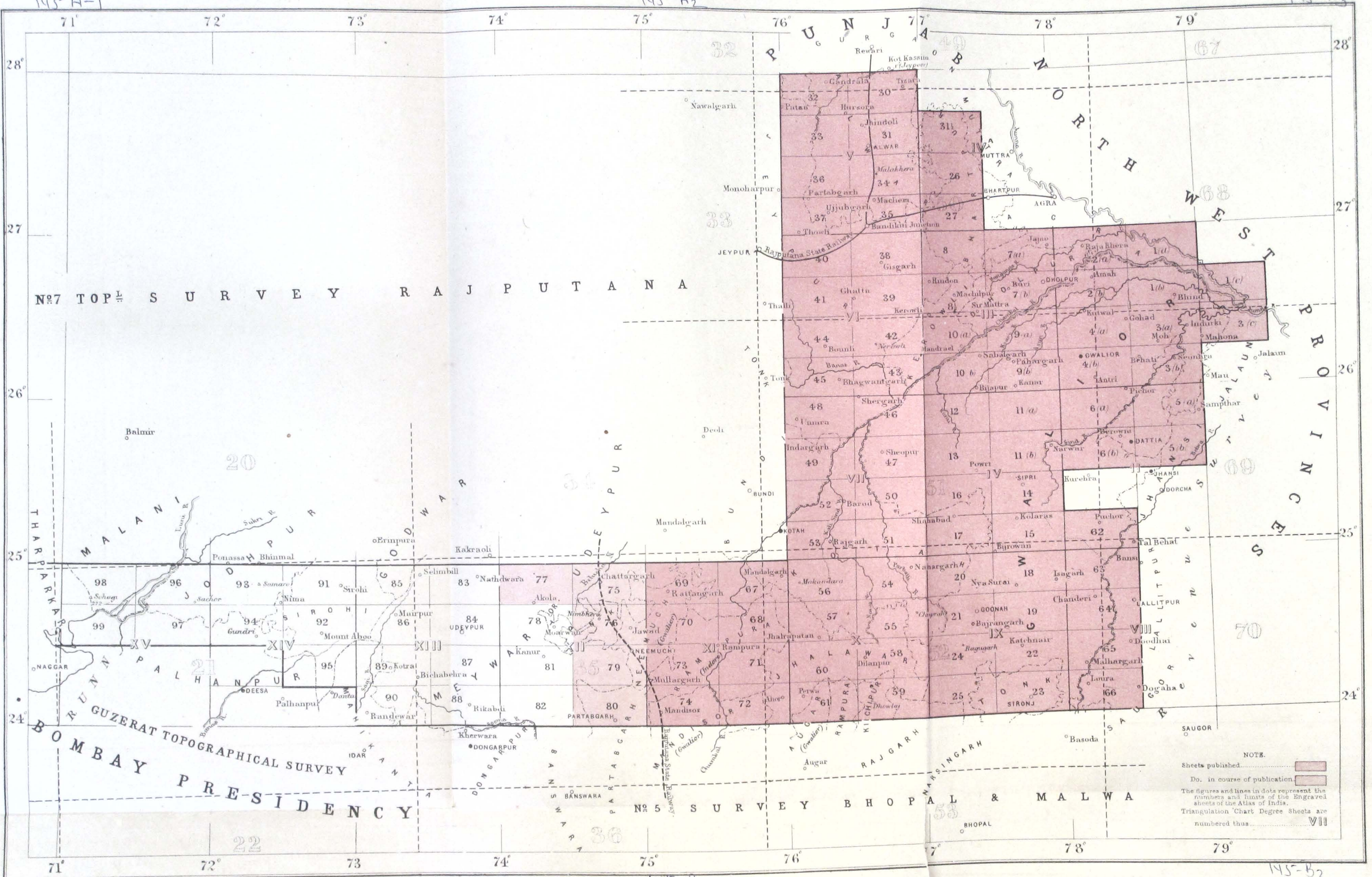
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145

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NOTE.

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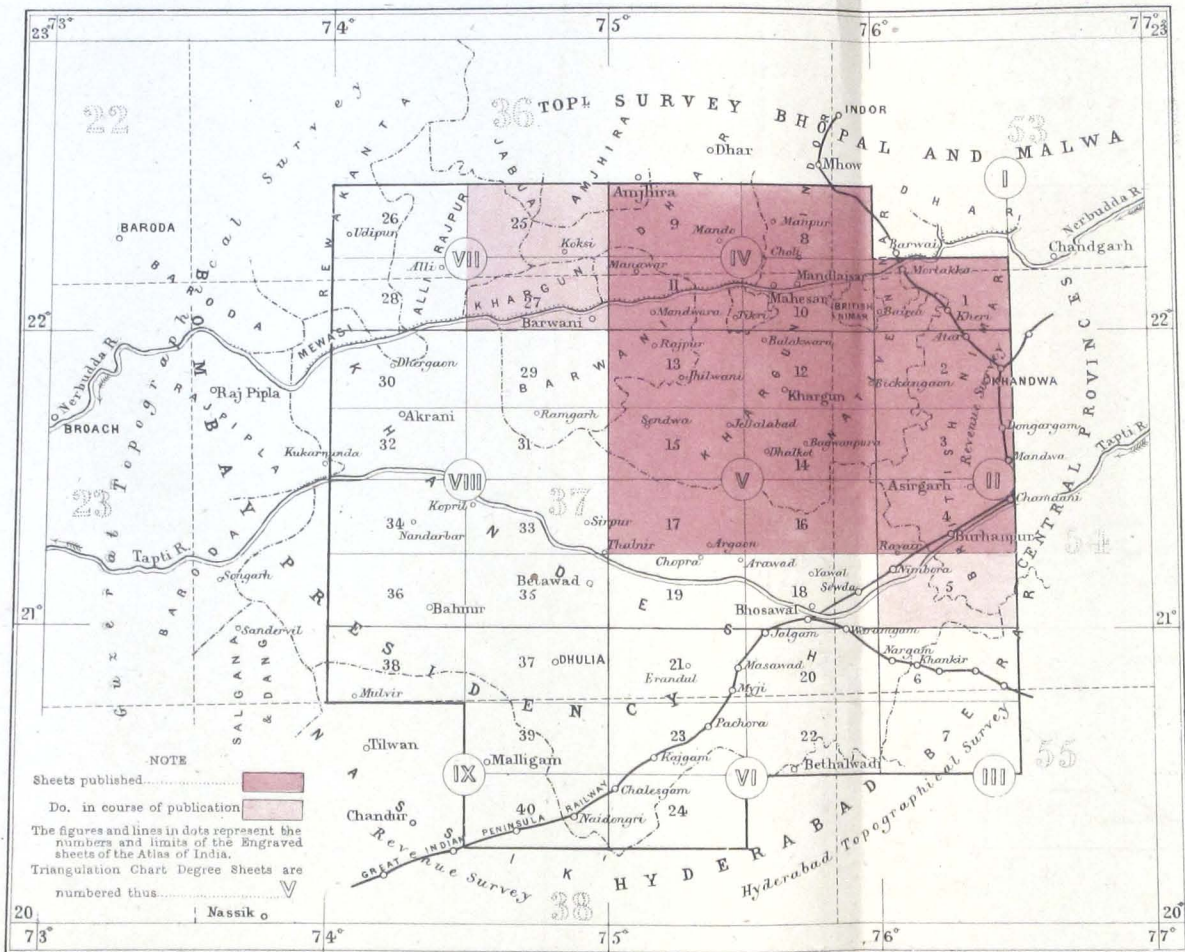
Do. in course of publication.....

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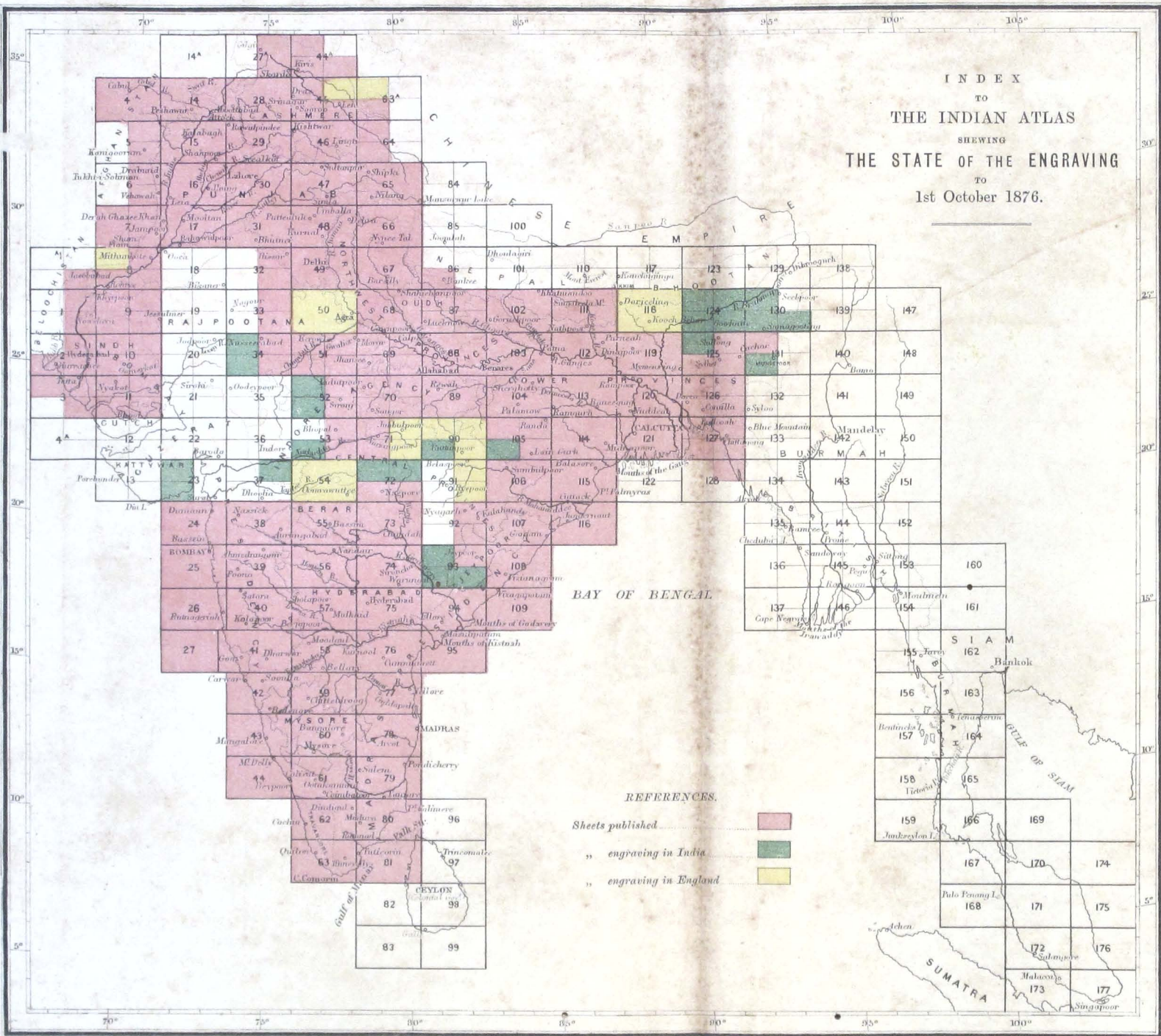
Triangulation Chart Degree Sheets are numbered thus..... VII

INDEX TO THE SHEETS OF THE KHANDESH & BOMBAY NATIVE STATES SURVEY.

On the Scale of 1 Inch = 1 Mile.



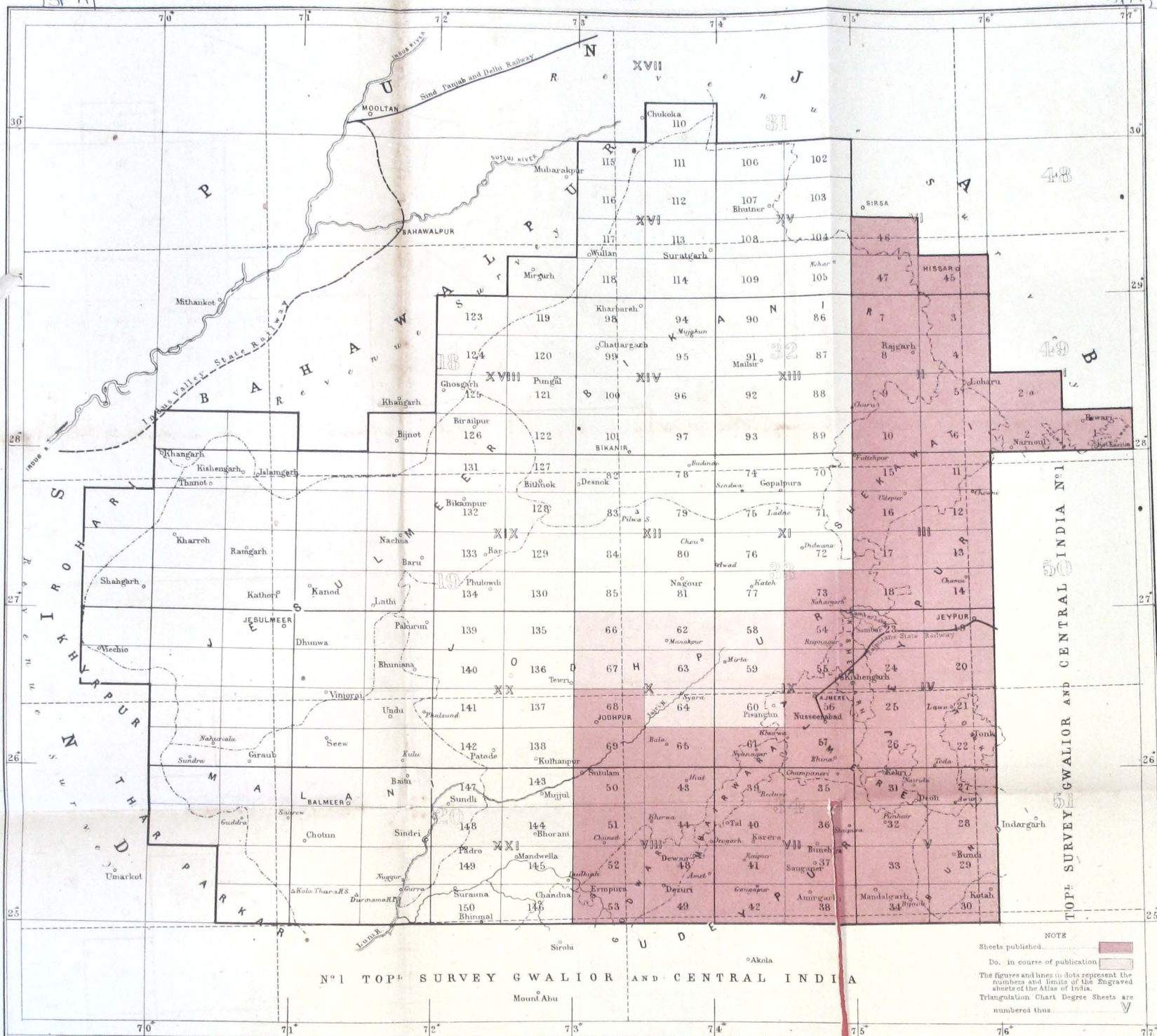
INDEX
TO
THE INDIAN ATLAS
SHEWING
THE STATE OF THE ENGRAVING
TO
1st October 1876.



Engraved under the Superintendence of C.B. Wood.

INDEX TO THE SHEETS OF THE RAJPUTANA TOPOGRAPHICAL SURVEY.

On the Scale of 1 Inch = 1 Mile.



N°1 TOP: SURVEY GWALIOR AND CENTRAL INDIA

Mound Abu

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 Do. in course of publication [unshaded box]
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