

GENERAL REPORT

110

ON THE

Topographical Surveys of India,

AND OF THE

SURVEYOR GENERAL'S DEPARTMENT, HEAD QUARTER ESTABLISHMENT

FOR SEASON

1870-71.



BY

COLONEL H. L. THUILLIER, R.A., F.R.S., &c.,  
SURVEYOR GENERAL OF INDIA.

---

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

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1872.



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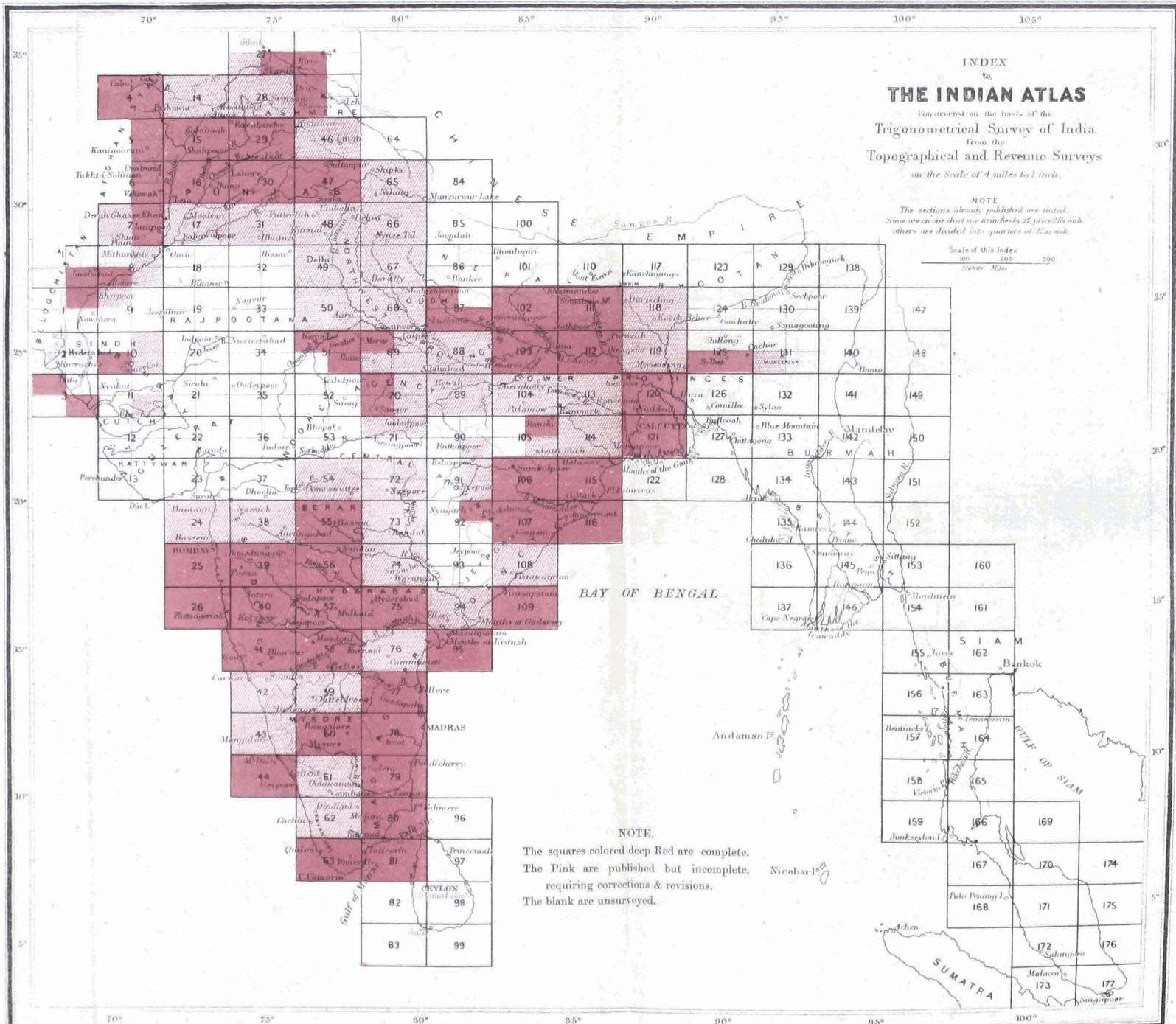
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# STATE OF THE ENGRAVED SHEETS OF THE ATLAS OF INDIA

To January 1872

112-A1

112-A2



INDEX

## THE INDIAN ATLAS

Constructed on the basis of the  
Trigonometrical Survey of India  
from the  
Topographical and Revenue Surveys  
on the Scale of 4 miles to 1 inch.

NOTE  
The sections already published are tinted.  
Some are on one sheet size 40 inches by 25 inches each,  
others are divided into quarters of 12 1/2 each.

Scale of this Index  
100 200 300  
Statute Miles

NOTE.  
The squares colored deep Red are complete.  
The Pink are published but incomplete,  
requiring corrections & revisions.  
The blank are unsurveyed.

176  
No. 150A.

SURVEYOR GENERAL'S OFFICE;  
*Calcutta, 24th January 1872.*

FROM

COLONEL H. L. THUILLIER, c. s. i.,  
*Surveyor General of India,*

TO

THE SECRETARY TO THE GOVT. OF INDIA,  
DEPT. OF AGRICULTURE, REVENUE AND COMMERCE.

SIR,

I have the honor to submit, for the information of the Government of India, my Annual General Report\* on the operations of the Topographical Surveys of India for the past season 1870-71, with the usual detailed account of the working of the Head Quarter Offices up to the end of the year 1871.

\* No. 150 B, dated 24th January 1872.

I have the honor to be,

S I R,

Your most obedient servant,

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



# GENERAL REPORT

OF THE

## Topographical Surveys of India,

AND OF THE

SURVEYOR GENERAL'S DEPARTMENT, HEAD QUARTERS ESTABLISHMENT,

FOR SEASON

1870-71.

### No. 150B, dated Calcutta, the 24th January 1872.

The following are the results of the operations of the Topographical Surveys of India, for the professional season of 1870-71, *viz.*, from 1st October 1870 to the 30th September 1871, and of the work performed in the several branches of my Head Quarters Office, for the year ending 31st December 1870. These details are in continuation of the General Report, No. 87B, dated 18th January 1871.

Number of Surveys in progress.

2. Only six, instead of seven, Topographical Surveys were at work, designated and superintended as before, *viz.* :—

- No. 1 SURVEY.—Gwalior and Central India, under Lieutenant Charles Strahan, R.E., Deputy Superintendent, in portions of the Native States of Gwalior, Tonk, Kotah, Jhalawar and Bhopal in the Central India Agency.
- No. 3 SURVEY.—Central Provinces and Vizagapatam Agency, under Colonel G. H. Saxton, Deputy Superintendent, in Jeypore, Panchpenta and the Saora Hills, within the Ganjam and Vizagapatam Agencies of the Madras Presidency.
- No. 4 SURVEY.—Chota Nagpore Division, now the North-Eastern Division, Central Provinces, under Major G. C. Depree, Deputy Superintendent, in Chang-Bhokar, Korea, Odeypur and Sirgoojah, Gurjat States of the Chota Nagpore Division; Pendra, Mahtin, Korba, Churi, &c., zemindaries in District Belaspur of the Central Provinces and the Talook of Sohagpore in the Native State of Rewah.
- No. 5 SURVEY.—Bundelkund, now the Malwa and Bhopal Division, under Captain R. V. Riddell, R.E., Deputy Superintendent,—Topography in the Native States of Punnah, Clutterpore, Charkari and Bijawur in Bundelkund, and triangulation in the State of Bhopal, all within the Central India Agency.
- No. 6 SURVEY.—Khasia and Garo Hills, under Captain W. F. Badgley, Officiating Deputy Superintendent, and temporarily under N. A. Belletty, Esq., Surveyor, 1st Grade, in the Garo and Naga Hills, and part of Kariabar Pergunna of District Goalpara.
- No. 7 SURVEY.—Rajputana, under Captain George Strahan, R.E., Deputy Superintendent, in portions of Udepur, Bundi, Kota, Gwalior, Holkar's territory, and Jodhpore Native States, of the Rajputana and Central India Agencies, and in part of the British District of Ajmere.

3. The above six Topographical Surveys accomplished an aggregate area of 14,592 square

Total area of topography obtained and triangulation completed in advance.

miles of final Survey, of which 12,715 square miles has been rendered on the scale of one inch to the mile, and 1,877 square miles in the Naga and Garo Hills on half inch to the mile. The triangulation in advance of the detail Survey has been extended over a further area of 20,742 square miles.



4. The total expenditure of the six Survey Parties, inclusive of all charges for superintendence, establishments and contingencies, amounts to Rs. 3,24,225, giving an average cost for each Survey of Rs. 54,038; or an average rate of Rs. 22.4 (in English money £2 4s. 6d.) per square mile, for the 14,592 square miles of final topography completed, inclusive of the cost of the skeleton triangulation in advance.

5. The amount of field work accomplished by each party, and the actual cost of each for the season, is given in the following tabular Statement:—

Designation of Survey.	Final Topography completed in square miles.	Triangulation completed in square miles.	Stations observed at.	Number of points fixed.	Square miles to each point.	Heights trigonometrically determined.	Square miles to each height.	Amount of fair map-pug rendered.	Total cost.	REMARKS.
No. 1 Survey.—Gwalior and Central India ...	2,853	4,020	62	563	8.2	225	20.5	3,240	Rs. 57,283	
No. 3 Survey.—Central Provinces and Vizagapatam Agency ...	1,053	450*	65	175	2.6	155	3.5	1,053	62,528	* Triangulation on the Neilgherry Hills.
No. 4 Survey.—Chota Nagpore Division and North-Eastern Division, Central Provinces ...	2,669	5,000	117	303	10.5	104	25.9	3,448	50,009	
No. 5 Survey.—Bundelkund and Malwa and Bhopal ...	2,189	4,207	103	550	7.7	495	0.8	2,189	56,055	{ Of this Rs. 12,530 is due to the triangulation executed in Bhopal.
No. 6 Survey.—Khasia and Garo Hills ...	1,877†	3,912	49‡	66‡	...	61‡	...	...	30,550	{ † Scale 2 miles=1 inch. ‡ Exclusive of Stations observed at and points fixed by the triangulation in the Naga Hills.
No. 7 Survey.—Rajputana ...	3,551	2,493	43	193	12.9	150	19.0	3,048	55,136	Includes cost of the large scale Survey of Mount Abo on 6 inches=1 mile.
	14,592	20,742	469	1,850	...	1,210	...	13,579	3,24,225	Or an average rate for final Survey of Rs. 22-3-6 per square mile.

6. The general average rate per square mile of final topography delineated, including the Remarks on the average rate of final cost of the very large area of triangulation in advance, Rs. 22-3-6, is very reasonable, though slightly in excess of the average cost per square mile of the previous Season. This trifling excess is partly due to the increasing difficulties of the ground allotted to the different parties; portions of the country which have come under Survey during the season under review had never before been explored or visited by Europeans, and are almost uninhabited; provisions had to be carried about and stored for each camp, and wholesome water for drinking could only be procured in many instances from long distances. Also, to the fact of reductions of establishments entailing a diminished area, the efficiency and economy of a Department like the Survey, being greatly affected by the completeness of the parties, and the relative proportion of European and Native Agencies, and the extent of the working power on the Superintendence.

7. In 1869-70, there were seven Survey Parties at work, whilst during the season under review, owing to the reduction of establishments and the breaking up of No. 2 Party—Central Provinces Survey—only six parties have been employed; there has therefore been a decrease of 1,543 square miles of final Survey, and a decrease of expenditure of Rs. 30,182-0-0.

	Area in Square miles.	Total Cost.		Average mileage rate of final Survey.		
		Rs.	...	Rs.	A.	P.
Season 1869-70 ...	16,135	3,54,407*	...	21	8	0
" 1870-71 ...	14,592	3,24,225	...	22	4	0
Decrease ...	1,543	30,182	...			

\* Inclusive of Rs. 7,459 for the Mount Abo 6-inch Survey, but which amount is excluded in reckoning the average mileage rate of the season's 1-inch scale regular Survey.

	1869-70.	1870-71.	Difference, Square Miles.
† Triangulation in advance in Square Miles ...	13,218	20,742	+ 7,524
Points fixed trigonometrically.	1,760	1,850	+ 96
Heights trigonometrically determined ...	1,773	1,216	- 557

8. In the triangulation† in advance of topography there is a marked increase, whilst there is an increase in the number of points fixed, and a decrease in the heights determined trigonometrically.

9. This decrease in the number of heights is solely due to the heavily forest clad and wild, sparsely populated nature of the country over which the triangulation has been extended, more specially by Nos. 1, 4 and 6 Surveys. In extensive forest tracts, the selection of station points and erection of marks at regular intervals necessitate much clearance of hill tops: this item alone adds considerably to the

expense of Survey operations, as laborers must be induced at high rates of remuneration to enter these forests, which they generally object to do, and even after payments are made to them in advance, they desert or are soon prostrated by fever.

10. It is therefore absolutely necessary to allow some latitude to the Deputy Superintendents in charge of Surveys, who are on the spot, to determine, with reference to the nature and character of the country, the number of points and heights which it is desirable to fix, so as to obtain a reliable basis for the detail Survey or topographical delineation of the ground, without incurring expense for which no absolute return can be obtained. In open and cultivated localities, no such option is allowed, and the rules in force, fixing a scale of trigonometrically determined points and elevations for every 10 square miles of area, are rigidly enforced.

11. The average number of points fixed and heights determined trigonometrically, compared with similar results of the previous season, are as follows:—

		In 1869-70.	In 1869-70.	
Points fixed	... ..	1 to every 7½ square miles.	1 to every 9 square miles.	The results of the triangulation of No. 6 Survey have been excluded, as the final computations of the Naga Hills triangulation are not completed.
Elevations	... ..	1 to every 7½ square miles.	1 to every 14½ square miles.	

Considering the nature of the country brought under triangulation, these results are favorable, and clearly exhibit that, notwithstanding every difficulty and obstacle against which the Topographical Survey Parties have to contend, in notoriously unhealthy and frequently in almost uninhabited and extensive forest tracts, the Deputy and Assistant Superintendents leave no means untried to maintain the required standard in the ground work or basis for the after Survey in detail.

12. The following Table exhibits the nature and value of the triangulation completed, and the average number of plane-table fixings in each Survey:—

SURVEYS.	NUMBER OF TRIANGLES.				TRIANGULAR ERROR IN SECONDS.		MEAN DIFFERENCES IN COMMON SIDES IN INCHES PER MILE.				Average plane table fixings in each square mile of Survey.	REMARKS.	
	1st Class.	2nd Class.	3rd Class.	4th Class.	1st Class.	2nd Class.	1st Class.	2nd Class.	3rd Class.	4th Class.			
No. 1	...	...	138	43	050	...	5.1 <sup>11</sup>	...	3.7	3.5	6.1	not given	Ground difficult in portions of country.
" 3	...	...	875	...	...	...	4.0	...	not given.		...	5.1	123 triangles on the Neigherry plateau and 252 triangles, points interpolated on triangulation of previous season in Jeypora.
" 4	...	...	12	153	385	...	1.2 4.4	...	1.5	16.0	15.6	5.1	Ground difficult for triangulation. Plateaux covered with forest.
" 5	...	10	240	1052	...	3.2 <sup>11</sup>	8.2	0.7	4.0	8.5	...	5.0	Triangulation in Bhopal, ground favorable.
" 6	...	...	...	127	150	...	16.7	...	14.1	...	20.9	0.4*	Observations chiefly made to opaque signals with 7 and 8-inch theodolites, excluding the Naga Hills triangulation. * Scale of Survey 2 inches 1 mile. Ground difficult and covered with dense forest.
" 7	...	11	52	524	...	2.7	5.1	0.0	3.9	0.8	...	5.8	Portions of ground difficult for triangulation.

13. These results are most satisfactory, and prove that every reliance can be placed on the triangulation executed during the season under review. The average number of plane-table fixings in each square mile of Survey is also good, except in the case of No. 6 Survey, but the work of this party in the Garo and Naga hills on the scale of 2 inches to the mile is altogether exceptional, in fact only a rapid reconnaissance of a hilly tract politically and physically almost closed to us, and cannot be compared with the regular 1-inch Topographical Surveys of other parties.

14. The Deputy Superintendents report very favorably on the quality of the final topography completed, which has all been duly checked either by routes through the work of each plane-table, or by examination and tests in situ, while the Surveyors were at work, and my examination of the results proves the validity of this statement.

15. The total area represented by the standard 1 inch scale maps, rendered at Head

Remarks on the Season's Fair Maps, and the amount of mapping rendered.

Quarters in sheets or sections of 15 minutes of Latitude by 30 minutes of Longitude, is about 13,600 square miles, and comprise 37 sheets of double elephant size paper. These having all been at once carefully examined have, with but few exceptions, been immediately reproduced to scale by the photozincographic process, and issued to Government Officials and Departments, and have proved of great utility and value.

16. The geographical results from actual Survey, as above described, furnish excellent materials for portions of the sheets of the Indian Atlas as given below, and a great portion has already been reduced at Head Quarters from the scale of 1 mile to the inch to that of 4 miles to the inch, is now in the Engraver's hands and under addition to the respective copper plates.

- No. 1 SURVEY.—Portions of the Native States of Gwalior, Tonk, Kotah and Jhalawar ... } Atlas sheet 52 Eastern portion.
- No. 3 SURVEY.—Portions of Jeypore and Panchpetta and the Saora hills in the Ganjam and Vizagapatam Agencies ... } Portions of Atlas sheets 93, 107 and 108.
- No. 4 SURVEY.—Portions of Chang-Bhokar Korea, Odeypore and Sirgoojah Gurjat States in the Chota Nagpore Division, and of the zemindaries of Penda Mahtin, Korba and Churi in the Belaspur District, Central Provinces } Portions of Atlas sheets 89, 90 and 105.
- No. 5 SURVEY.—Portions of the Native States of Punnah, Chutterpore, Chirkari and Bijawar in Bundelkund ... } Portions of Atlas sheets 69 and 70.
- No. 6 SURVEY.—Portions of the Garo and Naga hills and a small portion of the Munipur State ... } Portions of Atlas sheets 119, 130 and 131.  
Note.—The fair standard maps of this Survey are still due.
- No. 7 SURVEY.—Portions of Ajmere and Mairwara and of the Native States of Jeypore, Udeypore, Kotah and Bundi in the Rajputana and Central India Agencies. ... } Portion of Atlas sheet 34.

17. Of the general finish and execution of the fair maps (standard) rendered by each party, the following relative opinion has been formed.

Relative value of standard sheets.

Of No. 1 Survey (Lieutenant Charles Strahan's) the delineation of ground is good and the drawing is well executed. All the sheets have reproduced fairly by the photozincographic process, and in this respect there is a marked improvement on the work of previous seasons.

Of No. 3 Survey (Colonel Saxton's) the intricate and difficult nature of the hill features is well described in most of the sheets. In some of the sheets (drawn by Mr. R. W. Chew) the style of hill drawing is stiff and wanting in relief for the relative differences of elevation. With the exception of two sheets, on which the subordinate features and fall of the ground has been drawn in fine faint lines, all have reproduced fairly.

Of No. 4 Survey (Major Depree's) all the maps are clearly and boldly drawn, and convey a good idea of the nature of the country. Most of the sheets have reproduced well in photozincography.

Of No. 5 Survey (Captain Riddell's) all the maps are drawn in a clear bold style, well suited for photozincographic reproduction; possibly some of the details characteristic of the ground may have been somewhat sacrificed in the efforts to render the delineation of the broken ground and smaller hill features, in a style exactly suitable for clear photozincographic reproduction.

Of No. 6 Survey (Captain Badgley's) none of the fair (standard) maps for the season have, I regret to say, been received as yet, owing to the early deputation of the party with the Military Expedition to the Eastern Frontier.

Of No. 7 Survey (Captain George Strahan's) all the maps are drawn in a clear and effective style. The ground is well delineated in every respect, and all the sheets have reproduced well. The plans of Mount Aboo (6 inches) and of the plateau (24 inches to the mile) are excellent specimens of large scale topographical drawing, and are highly creditable to this officer.

18. For the reasons assigned in para. 27 of my last report, the professional computations,

General reports of professional results, computations, &c.

angle books, and General Report Volumes are no longer submitted annually exactly according to the limits of Survey, for record in this office, but the new system of combining

these important computations into uniform volumes, representing square degrees of each Survey, will render them far more useful, intelligible and complete, than they ever were before for reference and record.

19. In Appendix A "Remarks, Professional, Geographical and Statistical by Executive Officers," several interesting and valuable notes and descriptions of the country surveyed, and its inhabitants, their manners, customs and traditions, &c., will be found.

20. The Topographical and Revenue Surveys during the season under review, have accomplished a total area of 31,530 square miles, obtained at an aggregate cost of Rs. 10,88,970 for the field-work, including the mapping and computations, or an average rate of Rs. 34-9 equal in English money to £3-9-1½ for every square mile surveyed.

*Area brought under Topographical and Revenue Survey in season 1870-71 with the cost and average rate of Survey.*

	Square Miles.	Total Cost.	Average rate of Survey per square mile.
Upper Circle, viz., North-Western Provinces, Oudh, Central Provinces and Punjab ...	10,596	Rs. 5,09,102	Rs. A. P. 48 0 0
Lower Circle, viz., Bengal Proper and Assam ...	6,342	2,55,043	40 5 0
Revenue Survey Total ...	16,938	7,64,745	45 3 5
Topographical Survey ...	14,592	3,24,225	22 4 0
<b>GRAND TOTAL ...</b>	<b>31,530</b>	<b>10,88,970</b>	<b>General Average rate. Rs. 34-9-0 or in English money £3-9-1½.</b>

21. The table in the margin is given to show the combined results of the detail work mapped for publication, and reduction to various scales for general maps, by the Topographical and Revenue Surveys. The operations of the Revenue Survey Branch are separately reported on in detail, by the Deputies Surveyor General

in their respective circles of superintendence.

22. The decreased out-turn in the combined results of the two branches, is entirely due to the reduced number of parties, both Topographical and Revenue, employed during the season, caused by the diminution of the estimates. The figures represent the survey professional year and not the financial period, the expenditure therefore differs from the sums passed in estimates for periods not applicable to the survey working seasons.

23. In my last report (para. 31) the combined out-turn and cost of the Topographical and Revenue Surveys up to 1870 was given, and the following Statement completes this information up to date, showing a total area of Survey accomplished of 6,65,909 square miles, of every variety and description of country at the very moderate rate of £2 12s. 0d. per square mile:—

	Area accomplished in square miles.	Total cost in Rupees.	General average rate of Survey per square mile.
Total of Topographical and Revenue Surveys up to 1870 ...	6,34,379	1,62,26,820	Rs. A. P. 25 9 0
Ditto ditto ditto 1871 ...	31,530	10,88,970	34 9 0
<b>GRAND TOTAL up to end of 1871 ...</b>	<b>6,65,909</b>	<b>1,73,15,790</b>	<b>26 0 0</b>

24. This vast area of 6,65,909 square miles representing three times the area of France,\*

* France ... ..	2,10,939 square miles.
† England and Wales ... ..	56,320 "
Scotland ... ..	31,324 "
Ireland ... ..	32,512 "
<b>Total British Isles</b>	<b>1,22,156</b>

and nearly five and half times the area of the British Isles†, has been accomplished in the period specified in a former report‡. It does not include the old Topographical Surveys of portions of the Madras and Bombay Presidencies, nor the Topographical Surveys of the Himalaya Mountains, Gurhwal, Kattiwar and Guzerat, completed or in progress by the Great Trigonometrical Survey, nor any portion of the new Revenue and Settlement

‡ *Vide* para. 35 of annual report for 1868-69, dated 15th January 1870, page 13.

Surveys or measurements in progress in Madras and Bombay, independent of the direction of this Department, and of which the Surveyor General has no cognisance.

Inspection of Survey Parties.

past recess. The programme in each

- No. 1 Gwalior.
- " 4 Chota Nagpore.
- " 5 Dundelkund.
- " 7 Rajputana.

and no pains or labor are spared to render it worthy of a great national work. It affords me great pleasure to be able to speak in terms of commendation of the several officers employed, whose continued indefatigable and successful exertions are very prominent.

26. During my tour, I likewise had facilities for inspecting the several Revenue Survey Parties as per margin, which I gladly availed myself of, and derived much pleasure and instruction from the details presented to me of the present mode of rendering the Revenue Surveys, as well as the leveling. The accuracy and clearness with which the large scale (4 inch = 1 mile) sheets of the

Bijnour	...	Major Vanrenen.
Bahawalpore	...	Captain Tanner.
Ditto	...	Mr. E. T. Johnson.
Delli and Hissar	...	Captain D. Macdonald.
Central Provinces	...	W. Lane, Esq.

Revenue Surveys are now prepared, is highly creditable to that branch of the Department, and to the officers conducting it as specified. This Survey is now so well based and connected with the Great Triangulation, as to leave nothing to wish for, whilst the intricacy of its details, both as to topography and levels, furnish the most reliable maps, alike useful for the Engineer and Civil Administration.

27. The entire Survey Department during the past year was transferred from the jurisdiction of the Home to that of the new Department of Agriculture, Revenue and Commerce of the Government of India, by the orders quoted in the margin\*, and a Resolution affecting its future administration was issued in the Proceedings, dated Simla, the 5th August last, No. 109, to the following effect:—

\* No. 2749A, dated the 6th June 1871.

**RESOLUTION.**—"The entire Survey Department in all its branches, having now been brought, by the recent Special Committee appointed to consider Survey interests, under the direct administration and control of the Government of India, it seems to the Governor General in Council that the time has arrived for a careful consideration of the manner in which the existing Survey Establishments may be most effectually utilized.

2. "The operations of the Survey have not hitherto by any means invariably proceeded on any regular system in the selection of localities, but have too often been governed by local wants and the demands of the moment. His Excellency in Council is of opinion that a regular plan of operations for a period of not less than five years should now be sketched out, in order to give greater certainty to the progress of the work; and His Excellency in Council is disposed to think that if during this period any unforeseen emergency should require other Survey work not included in the general progress programme to be undertaken, it might be advisable to rule that such work should be separately arranged and paid for, so that the steady march of the great work should not be interrupted.

- PRESIDENT:**  
Honble B. H. Ellis.
- MEMBERS:**  
Col. C. H. Dickens, R.A., C.S.I.  
A. O. Hume, Esq., C.D.  
R. B. Chapman, Esq.  
Col. H. L. Thunillier, R.A., C.S.I.  
Major T. G. Montgomerie, R.E.

3. "In considering the manner in which these results might best be attained, many conflicting interests, *e. g.*, the interests of geography and science, of revenue and administration of public works, will have to be weighed and discussed from different points of view. Accordingly the Governor General in Council is pleased to resolve that a Committee shall be appointed, consisting of the members named in the margin, charged to examine and report upon the whole question.

4. "Among other matters the Committee should direct its attention to the engraving establishment which may possibly require to be strengthened. It is to be borne in mind that good maps are the interest which the State receives on the capital expended in Surveys. If the materials for good maps are left to lie unutilized in the Office of the Surveyor General, the interest on the capital invested in the collection of those materials is being virtually sacrificed.

5. "It seems to the Governor General in Council not to be true economy to keep the publishing branch below the level of the accumulating branch; and the Committee should consider whether, if it should be considered impossible to sanction any increase on the total present expenditure of the department, the present charges might not be so re-adjusted as to enable the compiling and engraving branches to produce for the use of the Government and the public geographical materials as fast as they are accumulated in the field by the executive branch.

6. "Finally, in connection with these matters, the Committee should bring closely under review the whole Survey Budget, in all its branches, including offices and all establishments."

28. In conformity with these views and orders of the Supreme Government, the Committee "appointed to consider and report upon a plan for the prosecution of Surveys in India, and other questions connected with the Survey Department," sat several times at Simla for the discussion of the arrangements by which the progress and conduct of the Topographical as well as the Revenue Surveys, employed in the different local jurisdictions, were in future to be regulated on imperial principles, and the Budget Estimates of the Department were to be framed and limited. The great advantages likely to arise from bringing all the Revenue Surveys under the control of the Supreme Government and treating the estimates as a whole under imperial considerations, instead of, as formerly, permitting the operations to be affected according to the local pressure, wants and necessities of the subordinate Governments and jurisdictions, are manifest, and I anticipate the greatest possible improvement in the working of the Revenue Survey Branch from the above important change.

29. One of the chief questions treated has been the state of the Indian Atlas and the best means of filling up the several blank sheets, so many of which still appear in the Index Map. To this end, I have recently submitted two full and detailed reports as per margin†, to which reference can be made, showing precisely "how far the Atlas would be completed by the

Precise state of the Indian Atlas.

† No. 186F, dated 13th June 1871.  
No. 803F, dated 28th October 1871

end of the year 1871" as enquired by the Government, as well as further specific information regarding every sheet composing the Atlas, not colored deep red (*i. e.* complete) on the Index Map, and giving the best practicable estimates, both as to time and cost for completing all the Surveys, both Topographical and Revenue, at present in hand, or in contemplation, with the view of bringing the first Survey of all India to a close, and filling up the whole of the remaining sheets of the Great Atlas on the geographical scale of 4 miles to the inch.

30. The Statement furnished regarding the blank or incomplete sheets of the Indian Atlas not colored deep red on the Index Map, embraced the following information:—

Estimate of the time and cost for filling up the remaining sheets of the Atlas.

Whether the whole, or any portion of the country in each sheet had been surveyed.

The date and character of the Survey.

The nature and extent of the materials available towards the preparation of a complete map.

The materials not yet available for the purpose.

The time and cost likely to be involved in obtaining these materials.

31. The aggregate results of the above, so far as they can at present be estimated or realised, proved to be in round numbers—

			Square Miles.
Area remaining for Topographical Survey	...		2,51,243
Do. do. Revenue do.	...		2,11,356
Total Square Miles			4,62,599

32. Both descriptions of Survey, it is contemplated, may be executed within the next

Square mllcs.	No. of Survey Parties.	Probable Time.	Probable Cost.
4,62,599	7 Topographical, 15 Revenue.	20 years.	Rs. 1,50,27,346

20 years, provided the existing strength of machinery is maintained in tact on the work in question, and not diverted for other purposes; also, that the scales of Survey are not increased. With the total number of parties now employed, it is probable that such

an area may be got through in the time specified; but with smaller agency or reduced estimates this will not be possible.

33. An Index Map showing the state of the engraved sheets of the Atlas of India on the 1st January 1872, is annexed. The squares colored deep red are published and complete, the pink squares are published, but incomplete, requiring revisions and additions. The blank are unsurveyed.

34. During the past year much correspondence has taken place on the subject of introducing both Topographical and Revenue Surveys into the Bombay Presidency, referred to more particularly in my annual report for 1868-69, paras. 26 to 29, which has resulted in the deputation from the existing machinery of the Department, and without any increase to our estimates on this special account, of one party for the Topographical Survey of Khandeish and the Native States on the Northern Division of that Presidency, lying between the Nerbudda and the Taptee Rivers, west of that portion of the Sathpooa Range already completed in the Central Provinces. This party, revived as No. 2, is now at work in the neighbourhood of Dhoolia and Bhosawul junction, on the Great Indian Peninsula Railway, under Mr. F. B. Girdlestone, Officiating Deputy Superintendent, whose services have been given back by the Bombay Marine Department for this purpose.

35. In the same manner, a Revenue Survey Party has been formed and organised out of the existing establishments, and deputed to the Nassick District, where the Bengal system of Revenue Survey has been inaugurated on rigorous principles, in combination with the detailed measurement of "Fields," as heretofore conducted by the Settlement Department, and which is still to be carried on, as directed by the Supreme Government, as a separate and distinct operation under the guidance of the Bombay Revenue Settlement Officers.

36. It is deemed that a Cadastral Survey showing "Fields" or the cultivators' holdings on the large scale, will thus be obtained, in a very perfect manner. No doubt, this will be the case; but it will, I think, be at the higher expense of divided authority, by two distinct departments, and whether this will be found to answer in a financial point of view, at a time when so much is expected to be done with reduced estimates, and extended sphere of employment for the available number of Survey Parties, remains to be proved.

37. A new Cadastral Survey has been inaugurated and started in the Muttra and Moradabad Districts of the North-Western Provinces, on the scale of 16 inches to the mile, under the sole management of this department, in conformity with the views of the Supreme Government, as contained in the correspondence marginally cited, the orders in which were based on the results of the conference held with the Supreme Council at Simla in the month of August last. The re-introduction of the Cadastral principle or measurements of the Fields by the Professional Survey Establishments (called in India the "*Khusrah*"), is a very important step, likely to influence the proceedings of this Department in a very marked manner, the full effects of which can scarcely be appreciated at the present moment.

38. At the time of the old Revenue Survey of these Provinces, the whole of the duties of Survey and measurement of the "Fields" were always conducted by the Professional Survey Officer, so that the combined operations proceeded simultaneously, the one checking the other; but of late years, this vital principle has been set aside in all the local jurisdictions in favor of independent measurements, the "*Khusrah*" (record of the "Fields") being obtained by the Settlement Department without any reference to the Professional Survey. The return therefore to the old system (which is fully admitted and described in the late Mr. Thomason's "Directions to Settlement Officers") of making the Survey Department responsible for all *measurements*, is quite in accord with the views held and advanced by myself, as well as by all Professional Officers, and as clearly set forth in the "Manual of Survey for India," which was published 21 years ago.

39. Details under this head however are rendered in the reports of the Superintendent Revenue Surveys; the great change just now introduced in the conduct of the operations, being merely adverted to in this place as a matter of history, connected with the leading events of the Department, during the year under review, which it is my duty to chronicle.

40. The work accomplished in the Drawing and Geographical Compiling Branch of my Head Quarters Office under the immediate superintendence of Mr. J. O. N. James, Assistant Surveyor General, is given in detail in Statement B attached to the Appendix of this Report. A very large amount of compiling and manuscript drawing on reduced scales, for the Atlas of India and other General and Miscellaneous Maps, has been performed, and the re-drawing in Standard Sections in pen and ink (horizontal hill drawing) of the desultory Maps, on the inch scale, of several of the older Topographical Surveys, which were originally drawn in brush shading and highly colored (consequently not being susceptible of photozincographic reproduction) has been vigorously pushed on, so as to endeavour to complete the series of sheets of each Survey, at the earliest practicable moment, in uniform style.

41. Thirty-two new quarter original manuscript sheets of the Atlas of India, representing the latest Survey results, have been projected, compiled and the drawings in outline, with names of places and boundaries of States and districts inserted, completed as far as materials have been received, and nearly all of these are now in the engraver's hands, with a view to certain steps being advanced, according to the competency of the hands available to take up the plates. The features of the ground (hills, ravines, &c.), will be given on the engraved outline proofs from copper, as it has been found that by furnishing distinct originals for the outlines, with names and the delineation of ground separately, the engraving progresses more satisfactorily in the different stages of outlining, writing and hill etching on copper; the last process (hill etching) being taken up after the outlines and writing have been carefully examined and revised.

42. In addition to the manuscript drawings for Atlas Sheets, progress has also been made with several important General Compilations, such as the 32 miles Standard Map of India, from actual Survey results. A photographed reduction of this unfinished map, on 64 miles to the inch, has been taken, and the remainder is also in progress, in which the unsurveyed portions of India will be filled up from the best materials extant, and it will be engraved in four sheets to meet the urgent demand for a reliable map of a convenient size, to illustrate reports and projects for roads, railways, canals and water-supply systems, and other imperial questions of importance.

43. A new General Map of the Province of Sindh, scale 16 miles to the inch, has also been finished, and will soon be in the engraver's hands. A Map of Oudh (scale 16 miles=1 inch) has been completed and is now engraving. A Map of the Lower Provinces of Bengal (scale 16 miles=1 inch) is under compilation as a sister map to those of the Punjab and North-Western Provinces, which is also to be engraved when means admit. A second sheet of the Map of the World (scale 10 miles=1 inch) under publication by Sir Henry James, Director of the Ordnance Survey of Great Britain, containing Eastern Bengal and the Eastern Frontier, between the Meridians of 90° to 94° and the parallels of 20° to 25°, has been completed, and a third sheet, containing the Punjab, has been commenced.

44. During the year, eleven new quarter plates\* of the Atlas of India have been engraved on copper and published, the production of combined European with a certain amount of Native Agency; making in all 13 quarter plates engraved and published in India. Twenty-one quarter size plates, in addition to the above, are in various stages as detailed in the Appendix, some well progressed, others just commenced.

ENGRAVING.—		• Quarter Plates	
Do.	3	S. E. and N. W. Sindh.	
Do.	10	N. E. S. W. and S. E. Sindh.	
Do.	11	S. E. Sindh.	
Do.	51	S. E. Central India, Gwalior, &c.	
Do.	87	N. W. and S. W. Oudh.	
Do.	125	S. W. Eastern Bengal.	
Do.	131	S. W. ditto.	

45. An entirely new and very beautiful Map of Orissa, to illustrate the Gazetteer, has been engraved and published, scale 12 miles to the inch, and 1,350 impressions have been furnished to W. W. Hunter, Esq., Director General of Statistics. Corrections and additions have been made from time to time to the plates of Simm's Plan of Calcutta, of which a new edition is greatly desired; but owing to the numerous new roads, buildings and improvements which have come into existence since the plan was engraved, there will be some delay before a correct edition up to date can be published. Other miscellaneous work has also been completed, all of which is given in detail in the Statement showing the progress of work in the Engraving Branch, in Appendix C of this Report.

46. I am very well satisfied with the exertions of the Superintendent and his small staff of European Engravers. The Native Engravers and Apprentices have made fair progress, and the general out-turn of work, both in quality and quantity, of this small establishment speaks well of the industry of each individual member. The training of Natives in this difficult art is a very slow process indeed, and it will be some time before this sort of agency can be entrusted with the sheets of the Atlas of India, though their aptitude is great and the teaching powers of the Superintendent Mr. Coard all that can be desired.

47. The number of proofs, transfers and impressions of maps, &c., taken from engraved copper plates, are as follows:—

Proofs of various kinds of maps, charts, plans and diagrams, &c. ....	607
Transfers of tints, scales, maps and charts .....	561
Impressions of maps, charts, scales, section paper, protractor, plans and diagrams...	20,732
<b>Total impressions taken</b> .....	<b>21,900</b>

48. The Statement given in the margin shows the working of the Engraving Branch, and

YEAR.	PLATES OF THE ATLAS OF INDIA.			PLATES OF MISCELLANEOUS AND GENERAL MAPS, PLANS AND DIAGRAMS, &c.			DRAWINGS AND MAPS HELD OVER FOR WANT OF ENGRAVERS.
	In hand.	Completed.	Remaining.	In hand.	Completed.	Remaining.	
1869	16	..	16	8	3	5	4
1870	20	2	18	11	9	2	11
1871	32	11	21	16	8	8	16

how very fast new materials are accumulating, which the existing trifling establishment cannot hope to provide for. In addition to the work already existing, several important large compilations (general maps), urgently requiring the engraving process, as well as Atlas sheets are fast approaching completion in the Drawing Office, whilst a large proportion of the old engraved copper plates of the Indian Atlas originally published by the Geographer at home, which have during the past year been received from the India Office, and others shortly expected, require revisions and additions to a very considerable extent, to complete them up to date for the publication of new editions.

49. It is essential that the whole of the duty of publishing the Atlas of India, must now be conducted in India under the guidance of this Department, and for this purpose the whole of the old copper plates should be sent out from the India Office. A batch has recently been indented for. Those new plates commenced in 1868 by the Geographer at home, as agreed



upon when I was deputed to England on duty, ought of course to be completed there, the more especially as our existing means in this country are so inadequate to our wants.

50. Most of the plates now engraving or to be taken up have heavy hill drawing to be etched on, and it is in this special element of hill etchers that the establishment is very weak, there being only one trained artist available to proceed with the intricate portions of this extensive work. Some of the native apprentices evince aptitude for hill etching, and may be taught in time, but they cannot yet be entrusted with such a tedious and difficult process on the Atlas of India, the more delicate portions of which, and the finishing touches, now devolve on the Superintendent.

51. It is obvious that the introduction of only six engravers into India, to deal with the enormous extent of geographical materials produced by such a large executive, amounting to 35,000 or 40,000 square miles of country annually, to say nothing of the maps previously produced and waiting to be taken up, is totally inadequate for the purpose of dealing with a work of such magnitude. The engraving staff requires therefore to be considerably enlarged. A proposal for a suitable increase has already been mooted and is now under the consideration of Government.

52. The pressure on this important and useful branch of my Head Quarters Office, under the immediate charge of Captain W. G. Murray, Assistant Surveyor General, is still on the increase. In Appendix D, a detailed statement of the description and value of the work performed by this branch is given. The general results which are highly satisfactory, briefly are as follows:—

	Number of original drawings completed on transfer paper or stone.	Number of complete copies of each map printed.	Number of Pulls.	Value or selling price.
Maps appertaining to this Department, the results of Surveys completed and in progress ...	128	49,564	100,163	Rs. 59,434
Departmental professional forms, orders, reports, memoranda, &c. ...	.....	130,056	218,314	4,399
For various Departments, Miscellaneous Maps, Plans, Diagrams and Sketches for reports and Government publications ...	398	115,832	162,294	19,089
<b>TOTAL</b> ...	<b>526</b>	<b>295,452</b>	<b>480,771</b>	<b>82,922</b>

53. The above Statement shows at a glance the proportion and value of the work performed by the Lithographic Branch for the Survey Department, and for other Public Offices and Departments.

54. During the past year of 1871, the cost or expenditure under all heads, permanent and contingent, is as follows:—

	Rs.	Rs.
Permanent establishment ...	32,554	
Contingent expenses ...	2,945	
Extra contingencies ...	3,989	
Actual cost of paper, &c., used ...	6,365	
		45,853
Estimated value of the work executed during the year ...		82,922
Balance in favour ...		37,069
Or deducting Rs. 4,399, the value of departmental forms, &c. ...		32,670

55. The most important maps lithographed and issued during the year are as follows:—

	Scale.
Province of Sindh, nine sheets (1 to 6 and 9 to 11) ...	4 miles=1 inch.
District Bhundara (Central Provinces) ...	4 " =1 "
" Cachar (Eastern Bengal) ...	4 " =1 "
General Map of the North-Western Provinces in 4 Sections ...	16 " =1 "
Postal Map of ditto ditto ...	16 " =1 "
Eastern Bengal and parts of China, Burmah and Siam ...	32 " =1 "
Ramree Island (Revenue Survey Circuits 1 and 2) ...	1 mile=1 "

	Scale.
Sindh (22 Revenue Survey sheets or sections, 15 minutes of latitude by 30 minutes of longitude) (Nos. 21, 34, 35, 42, 49, 51, 54, 56, 63 to 65, 73 to 75, 78, 79, 82, 83, 86, 87, 90, 92, 93 to 102) ...	1 " = 1 " Mile. Inch.
District Lohardugga, Chota Nagpore Revenue Survey (sheets 3 to 6) ...	1 " = 1 " "
" Purneah (Bengal) in 18 sheets ...	1 " = 1 " "
Military Cantonment and Environs of Meerut ...	1 " = 6 inches.

The lithographic process is resorted to with great advantage in all cases requiring superior execution, or where the originals have not been expressly prepared for photographic reproduction.

56. The report and attached statements in the appendix E furnish details of the nature and value of the work performed in this branch, under the management of Captain J. Waterhouse, Assistant Surveyor General. The outturn has considerably increased, and there is a marked improvement in the quality of the plans and maps reproduced. These improvements are in part due to the greater efficiency of the establishment gained from experience, and in part to the requirements of the photozincographic and carbon transfer process becoming better understood by Executive Officers of the Department generally, as well as by other Departments which resort to this office for the rapid reproduction of maps, charts, diagrams, and sketches, and for whose special information and guidance in the preparation of original drawings, intended for photozincographic reproduction, a special memorandum explaining clearly the several requirements of the process, was prepared and printed in the several Government gazettes, and copies were also issued to all the principal Government offices.

57. The total outturn of work accomplished is as follows :—

	Number of sections or sheets.	Number of negative plates.	PRINTS.		Transfers to zinc and stone.	Number of pulls.	Number of complete copies.
			Silver.	Carbon.			
<i>Subjects.</i> —Topographical and Revenue Survey Maps; District and General Maps; Plans of Forts, Cities, and Cantonments; Miscellaneous Plans; Diagrams and Sketches.	1,035	1,816	2,565	1,829	671	96,725	111,503
							<i>NOTE.</i> —Fourteen thousand four hundred and twenty-six impressions were taken from maps transferred by the anastatic process and 800 impressions from zincographed subjects.

	Rs.	P.
The value of the work performed amounts to ... ..	68,692	4 0
The total cost of the Photographic Branch, inclusive of all charges for the year ending 31st December 1871, is ... ..	50,549	14 0
Balance in favor ... ..	18,142	6 0

The early issues of the maps of the survey of India thus provided for by this speedy and most useful process, prove of the highest advantage to the public service.

58. The combined outturn of the three printing offices attached to my head quarters, *viz.*, plate printing, lithographic and photozincographic, is shown in the following statement :—

	Number of copies of maps, &c., printed.	REMARKS.	
Engraved maps, &c., from copper plate ... ..	20,732	} Exclusive of proofs taken, transfers, departmental forms, circulars and orders.	
Lithographed maps from stone ... ..	165,396		
Photozincographed maps from zinc or stone ... ..	111,503		
Total for the year 1871 ... ..	297,631	<i>NOTE.</i> —Maps published during previous year :—	
Total for the previous year 1870 ... ..	161,726		In 1867 ... .. 57,482
			1868 " ... .. 106,805 Increase 49,323
			1869 " ... .. 135,741 Do. 28,936
Excess in favor of the year 1871 ... ..	135,905	1870 " ... .. 161,726 Do. 25,985	

59. This excess alone of 1,35,905 is equal to the publications of 1869, clearly proving how the work of the several printing establishments is increasing.

Despatch of geographical maps, charts, plans, &c., to the India Office.

60. During the past year of 1871, three large despatches of maps, charts and plans from the results of surveys completed and in progress, have been forwarded to the Geographical Department of the India Office, London. These publications are for record in the India Office, issue to Government officials and sale to the public in England; they fairly represent the labors of this department in all its branches, and the progress of survey operations nearly up to date. Arrangements have been made to despatch all available publications

Date of despatch.	No. of mps.	No. of sheets.	Total value.
			Rs.
6th February 1871 ...	632	1,652	1,658
15th April 1871 ...	1,262	2,282	2,176
21st August 1871 ...	30	30	22
11th October 1871 ...	670	3,330	3,651
<b>TOTAL</b> ...	<b>2,594</b>	<b>7,294</b>	<b>7,502</b>

regularly at the commencement of every quarter.

61. The sale and issue of the several publications of this Department to the public and to Government officials in India, is steadily increasing, and entails a multiplicity of business. The following statement exhibits the transactions under this head of the year ending 31st December last, for engraved lithographed and photozincographed publications :—

	Total number of maps.	Value. Rupees.
Maps issued to Government officials, free of charge, on the public service only ... ..	24,017	87,776
Ditto Superintendent, Revenue Surveys, for record, and issue on the public service..	17,895	40,385
Ditto Agents for sale and for issue on the public service ... ..	3,359	7,289
Ditto despatched to Geographical Department, India Office, for record and sale to the public in England ... ..	2,594	7,502
<b>TOTAL</b> ... ..	<b>47,865</b>	<b>1,43,352</b>

62. The cash account connected with map sales up to the 31st December 1871, since the last account was rendered, is as follows :—

Dr. *Abstract Cash Accounts from 1st January to 31st December 1871.* Cr.

Items	Amount.	Total amount.	Items	Amount.	Total amount.
<b>TO CASH ACCOUNT.</b>	Rs. A. P.	Rs. A. P.	<b>BY TRANSFER ACCOUNT.</b>	Rs. A. P.	Rs. A. P.
Balance in the Bank of Bengal as per printed Report for 1869-70 ...	1,262 11 0		Amount paid to Government by cheque No. 380, dated 20th January 1871, as per Comptroller General's receipt No. 5765, dated 20th January 1871 ... ..	3,000 0 0	
Do. on account of outstanding ...	491 0 0		Do. credited to Government of Bombay by Bombay Agent, as per his No. 1744, dated 9th May 1871 ...	50 0 0	3,050 0 0
Do. in hand ... ..	260 10 6		<b>BY CASH ACCOUNT.</b>		
Do. on account of sale of maps since realized ... ..	2,025 11 0	4,460 0 6	Balance in Bank of Doulgal on 1st January 1872 ... ..	2,823 0 2	
<b>TO MAP SALE ACCOUNT.</b>			Do. in hand ... ..	269 10 6	
Amount received from Sundries ...	1,095 3 9		Do. on account of sale of maps with Agents ... ..	17,025 12 0	10,618 7 6
Sales by Messrs. Thacker, Spink and Co. Do. Curator, Government Books, North-Western Provinces ... ..	6,075 8 9		<b>TOTAL</b> ... ..		13,668 7 6
Do. Manager, Punjab Printing Company, Limited ... ..	326 4 0				
Do. Curator, Government Books, Central Provinces ... ..	324 0 0				
Do. Executive Engineer, Bombay Presidency ... ..	296 0 0	9,100 6 11			
<b>TOTAL</b> ... ..		13,668 7 5			

\* Since deposited in General Treasury Rs. 6,000.

63. The amounts realized from the sale of maps this year are larger than usual, and include the value of the War Maps referred to in paragraph 61 of my last Report.

64. Subsequent to the closing of the Account Current above given, a further sum of Rs. 6,000\* has been paid into the Government Treasury for the proceeds of sales, the money of which has been realized to date,—the current account sales with the Agents not being payable until April next. The sums thus paid into the Treasury are now noted on the contingent bills of this Office, and will be so dealt with periodically.

65. The operations of each Topographical Executive Survey Party are described in detail as follows :—

EXECUTIVE ESTABLISHMENTS.

No. 1 TOPOGRAPHICAL SURVEY.

GWALIOR AND CENTRAL INDIA.

66. The operations for the season, both triangulation and topographical delineation, lay within the meridians of 77° and 79°, and between the parallels of 23° 30' and 25° in the Native States, marginally named.

Portions of the Native States of Gwalior, Tonk, Kotah, Jala-war, &c.

STRENGTH OF PARTY.		Square miles.
Lieutenant Charles Strahan, R. E., Deputy Superintendent, 3rd grade, in charge.		00 in addition to some triangulation.
Lieutenant T. H. Holdich, R. E., Assistant Superintendent.		11 Ditto
Mr. H. J. Bolst, Surveyor, 2nd grade		Triangulation.
" R. D. Farrell, Assistant Surveyor, 1st grade	...	271 square miles.
" C. Scanlan Do. 2nd grade	...	361 "
" G. K. Allnutt Do. 3rd do.	...	301 "
" T. D. Ryan Do. 4th do.	...	293 "
" W. J. Cornelius Do. 4th do.	...	325 "
" C. Templeton Do. do. do. Probationer	...	120 "
	Sub-Surveyors.	
Joala Pershad	...	234 "
Abdul Samad Khan	...	241 "
Abdul Subhan	...	256 "
Churamu Lall	...	180 "
Total of Topography completed	...	<u>2,653</u> square miles.

67. The field parties started from Agra on the 11th November 1870, and commenced plane-tableing on the North, East and South-east of Goonah about the end of the month, while Lieutenants Strahan, Deputy Superintendent, and Holdich, Assistant Superintendent, with Mr. Bolst, Surveyor, undertook the triangulation in advance, South and West of Goonah and Sironj.

68. The ground for topographical delineation, West of the Betwa River and Chandairee up to the Bombay and Agra road, was difficult, being intricate and covered with bush and tree jungle,

but 2,653 square miles of country was completed, and each plane-table was duly examined and tested in the field by the Deputy Superintendent, who reports favorably on the style and quality of the work accomplished.

69. The triangulation completed in advance of detail survey up to the meridian of 77°, covers an area of 4,620\* square miles. Observations were taken at 82 stations, from which 563 positions were determined and 225 heights obtained.

* Lieutenant T. H. Holdich, R. E.,	...	2,950 square miles.
Mr. H. J. Bolst	...	1,670 "
TOTAL...	...	<u>4,620</u> "

70. Of the triangulation completed by this party in advance South of the parallel of 24° down as far as Bhilsa, it has been found desirable to make over about 3,200 square miles to No. 5 Survey of Bhopal and Malwa, so as to embrace the whole of the Bhopal territory within the operations of the latter (No. 5 Survey), and to equalise more conveniently the field of operations for both parties, which have still a large area before them.

71. The total cost of the season's operations, topography and triangulation combined, amounts to Rs. 57,263, yielding an average rate per square mile of Rs. 21-9-0 for the final detail work. This rate, considering the difficult nature of the ground delineated and the large amount of triangulation completed in advance, is within fair limit.

72. The party did not return to recess quarters at Mussoorie until the end of May 1871, in order to close a good season's outturn, and was employed on the usual professional duties, completing the computations and maps as follows:—

- Fair copies of 2 Horizontal Angle Books.
- Ditto 2 Vertical ditto.
- Complete sets in duplicate of computations of Triangles, Latitude, Longitude and Azimuths with Synopsis Sheets for the triangulation of 4,620 square miles of triangulated area.
- 7 Fair Standard Maps, 1 inch scale.
- 1 Plan of Goonah City and Cantonments, 12 inches = 1 mile.
- 1 Chart of Triangulation.
- 1 Ditto for No. 5 Survey of Bhopal and Malwa, and outlined blue prints of reduced Standard Maps for ½ inch Degree Sheet VIII.

73. The party was inspected by myself at Mussoorie early in June, and I was glad to find the field work better squared up and completed than in the former season. The relations between the members of the party and the political authorities in the field, had also been of a more satisfactory character, and I was satisfied of improvement in several ways.

The style and character of the topography laid down is excellent, and the establishment generally in efficient order.

74. During the current season, the triangulation in advance of detail survey will be extended over the area, within the degree formed by the lines of Latitude 24° to 25° and Longitude 76° and 77°, while the plane-tables will take up portions of country, East of

Sironj, on either bank of the Betwa River, and West of Sironj, right and left of the Agra and Bombay Trunk Road.

75. Lieutenant Charles Strahan, Deputy Superintendent in charge of this survey, having obtained furlough, proceeded to Europe on the 3rd December 1871 for 24 months, and was relieved by Lieutenant T. H. Holdich, R. E., Assistant Superintendent, whose

Change of Executive Officer.  
Vide Military Department, Government General Order No. 983, dated 4th November 1871.

excellent services during the Abyssinian Expedition, combined with his professional knowledge and departmental experience, fully prove him deserving and competent for the executive charge of a survey party.

76. Extracts from the Deputy Superintendent's report, together with notes on the State of Ulwar, and some notes by Messrs. Scanlan and Cornelius, Assistant Surveyors, on the "Tradition of Budi or old Chanderi," are given in the appendix, and are useful additions to the survey professional report.

## No. 2 TOPOGRAPHICAL SURVEY.

### KHANDESH AND BOMBAY NATIVE STATES.

77. This old party formerly employed in the Central Provinces, was broken up and abolished at the close of 1870, and the Officiating Deputy Superintendent transferred for special marine survey duty to the Government of Bombay. During the entire season therefore it ceased to exist as described in para. 93 of my last report. It has again been revived under the same superintendence, and has very recently broken ground in Khandesh with the strength as per margin, and brings the department back to the same number of parties as before.

- F. B. Girdlestone, Esquire, Officiating 3rd grade Deputy Superintendent in charge.
- Mr. N. A. Bellefry, Surveyor, 1st grade.
- " P. J. Doran, Assistant Surveyor, 3rd grade.
- " W. C. G. Barclay, Probationary Assistant Surveyor, 4th grade.

described in para. 93 of my last report. It has again been revived under the same superintendence, and has very recently broken ground in Khandesh with the strength as per margin, and brings the department back to the same number of parties as before.

## No. 3 TOPOGRAPHICAL SURVEY.

### CENTRAL PROVINCES AND VIZAGAPATAM AGENCY.

78. **Recess duties terminated at Ootacamund on the 17th November, and on the 12th December the several field parties were detached from Vizagapatam to the ground respectively detailed to each for survey in the Native Tributary States marginally noted.**

Jaypur and Panchipetta in the Vizagapatam Agency, and the Saora Hills partly in Ganjam and Vizagapatam Agencies.

#### STRENGTH OF PARTY.

Colonel G. H. Saxton, a. c., Dy. Supdt., 1st grade, in charge.	Sq. Miles.	}	Of Topography.		
Mr. R. W. Chew, Surveyor, 3rd grade ...	321				
" J. Harper, Do., 4th grade ...	259				
" J. A. May, Asst. Surveyor, 1st grade ...	216				
" F. Adams, Do., Do. ...	251				
" T. Claudius, Do., 2nd grade ...	234				
" W. F. Pettigrew, Do., 3rd grade ...	180				
" A. Cooper, Do., 4th grade ...	188				
<b>TOTAL ...</b>	<b>1,653</b>				

79. The triangulation in advance of topography having been well extended during previous season, the attention of the Deputy Superintendent was entirely devoted to interpolating secondary points for the plane-tables, wherever necessary, and in inspecting the detail survey.

80. Towards the close and in anticipation of the completion of the field season, Colonel Saxton was directed to proceed to Ootacamund for the special object of

completing the triangulation of the Neilgherry plateau, and forming a proper junction with the new series of the Great Trigonometrical Survey referred to in para. 101 of my last report, which he successfully accomplished, covering an area of about 450 square miles without hindrance to his other work. The results of this triangulation have been furnished to the Superintendent of the Madras Revenue and Settlement Survey, and it is hoped that a good and reliable map, based on geodesical data connected with the Great Triangulation of India, will soon be available, as the want of such a trustworthy map is greatly felt, and it is essential that a correct delineation of this important plateau should be given on the old Atlas Sheet 61, without further delay.

During the season observations were made at 65 stations, from which 175 points were laid down, and 155 heights trigonometrically determined.

81. The topographical delineation of the Saora Hills, long an unsightly gap in Atlas Sheets 107 and 108, has at length been accomplished, together with a portion of Jeypur and Panchipetta, in the Vizagapatam Agency. In all 1,653 square miles of hitherto unexplored and difficult ground. This out-turn is very small, but some time was lost in marching from the ground in the Saora Hills to that requiring survey in Jeypur, and the inhospitable country would not permit of longer detention of the party.

82. The party were obliged to retire from these parts by the end of April, and returned to recess quarters at Ootacamund in May, where they were employed on professional computations and fair mapping, of which the following have been completed :—

Fair copy horizontal angles, 179 pages in duplicate.	
Ditto vertical do. 116	do.
Computations of triangles in triplicate.	
Ditto Latitudes, Longitudes and Azimuth, duplicate.	
Ditto Heights, duplicate.	
Synopsis sheets and alphabetical lists in triplicate.	
2 Fair Standard Maps, 1 inch scale, (sheets 20 and 21) complete.	
6 Fair Standard Maps (sheets 1, 2, 3, 4, 7 and 8) filled up to limits of survey.	
2 Charts of triangulation.	
2 ditto	Office copies.

83. The total cost of the season's operations, inclusive of the Neilgherry triangulation, amounts to Rs. 62,528, yielding the very high average rate of Rs. 37-13-0 per square mile for the final topography. This rate is excessively high, but the expenses of this party are altogether exceptional, and the season's work lay in three distinct portions of country, necessitating long marches and consequent loss of time, whereby the area of outturn was reduced.

84. During the current season no triangulation will be undertaken, as 6,500 square miles of triangulated ground still remains for detail survey, but the Deputy Superintendent will improve on the triangulation of previous seasons, and fix additional points wherever necessary, and closely inspect and test the work of his plane-table-parties, and I trust realise a larger area, although his establishment has been somewhat weakened by resignations and transfers, necessary for important work in other directions.

85. The topography of the country between the meridians of 81° 30' and 83° 15', and the parallels of 18° 15' and 18° 30', embracing portions of Jeypur in the Vizagapatam Agency, and Bustar and its dependencies in the Central Provinces, will be taken up.

86. Extracts from the Executive Officer's report and notes by his assistants, descriptive of the country visited during the season, and manners and customs of the people, are given in the Appendix.

## No. 4 TOPOGRAPHICAL SURVEY.

### CHOTA NAGPORE, AND NORTH-EASTERN CENTRAL PROVINCES, DIVISION.

87. The operations of this party for the season under review were mainly conducted in the

NATIVE STATES, AND BRITISH TERRITORY.

† Chang Bokhar, Koven, Odoypore and Singoohal of Chota Nagpore, Sohagpore of Rewah, Districts Belaspore and Mandla of Central Provinces.

STRENGTH OF PARTY.

Major G. C. Depree, Deputy Superintendent, 1st grade, in charge.	Sq. Miles.
Captain W. F. Badgley, Assistant Superintendent, 1st grade (transferred to charge of the No. 6 Khasia and Garo Hill Survey Party on service with the Lushai Expedition) ...	30
Lieutenant R. G. Woodthorpe, R. E., Assistant Superintendent, 2nd grade (transferred to No. 6 Party, Khasia and Garo Hills Survey, on service with the Lushai Expedition.)	
<i>Surveyors.</i>	
Mr. G. A. McGill, 2nd Grade, (on triangulation) and ...	40
„ J. Vanderput, 3rd grade ...	306
<i>Assistant Surveyors.</i>	
Mr. A. G. Wyatt, 2nd grade ...	330
„ A. James, 2nd grade ...	275
„ J. A. Barker, 3rd grade ...	390
„ J. H. Wilson, 3rd grade, (on triangulation) ...	90

North-Eastern Districts of Belaspore and Mandla of the Central Provinces, and the State of Sohagpore belonging to Rewah, at the same time in taking up and completing the topography of the few isolated patches of small area left unfinished in the States of the Chota Nagpore Division last season. In my last report, paragraphs 110, 111 and 123, I fully described the new tract of country for the future operations of this party, in continuation Westward of the work of the Chota Nagpore Division Survey, the final accomplishment of which was reported as approaching completion, a repetition is therefore needless. The tracts through which the season's operations were conducted, and the strength of the party, are named in the margin.

88. The area topographically delineated lies mainly in the Belaspore District of the

Sub-Surveyors.			
Baboo M. S. Dutt, Soujor	...	...	400
" H. Dutt	...	...	272
Enauf Shareef	...	...	377
Shalk Omer	...	...	100
			2,669

Central Provinces, between the parallels of 22° 15' and 23° 0', and meridians of 82° 15' and 83° 15' of Atlas sheet 90, with a few outlying small pieces of the States of Chang Bokhar, Korea, Odeypore and Sirgooja of Chota

Nagpore above alluded to, the total area completed being 2,669 square miles, a very fair outturn indeed, considering the very wild, unhealthy, inhospitable and hilly nature of the country through which the topography was carried. The usual tests were applied to the detail in the field, and the correct delineation of the work of the surveyors has been very favorably reported by the Deputy Superintendent.

89. The Deputy Superintendent (Major Depree) took up the triangulation in the Mandla

Triangulation in advance.

District, and after fixing the position of Ummurkuntuk, ran a series of triangles, emanating from the side Lafa H.

S. to Gora H. S. of the triangulation of last season by Lieutenant Sale, in a South-Western direction, along the lower hills which form a sort of fringe to that remarkable plateau, proposing to connect with the stations of the Jubbulpore Series Great Trigonometrical Survey, in Balaghat; while Mr. McGill, assisted by Mr. Wilson, was deputed to complete the triangulation of Sohagpore, confining himself to the low ground North of the Mekul and Ummurkuntuk plateaus, and then to extend his triangulation so as to cover the plateaus of Upper Sohagpore and Ramgurh. In carrying out this programme for the triangulation, a great deal of judgment was required, as the "Páts" (flat topped hills) being of an uniform height, run parallel to each other and extend many miles without a break, and it is most difficult to obtain a view over them.

Area of Triangulation executed.

	Sq. Miles.
Major G. C. Depree	1,490
Mr. G. A. McGill	3,600
TOTAL	5,090

90. The area covered by this triangulation is 5,000 square miles. Observations were taken at 117 stations, and the positions of 303 points were fixed, or an average of 1 point to every 16½ square miles. The heights of 194 positions have also been trigonometrically determined, inclusive of the ground levels of all valleys.

91. The cost of the season's entire operations amounts to Rs. 56,693, inclusive of the cost of the triangulation in advance, giving a rate of Rs. 21-3 nearly per square mile.

92. On the 15th May the entire party assembled at their new rendezvous station, Jubbulpore, and from thence proceeded to Mussoorie for their recess duties. The following maps and usual professional computations have been completed, viz.—

Computations in duplicate.

12	Secondary triangles, 1st class.
153	ditto, 2nd "
385	Minor ditto, 3rd "
301	Deductions of Latitudes, Longitudes and Azimuths, with synopsis.
194	Deductions of heights.
55	Pages abstract of horizontal angles.
217	" horizontal angle book.
52	" vertical ditto.
77	" alphabetical list of trigonometrical stations and villages.

Maps, Charts, &c.

8	Fair standard maps 1 mile=1 inch.
1	Chart of triangulation 2 " =1 "
2	Ditto ditto 2 " =1 " Commenced and in progress.
2	Exaggerated ½ degree sheets (2 miles=1 inch) on blue prints for reduction.

93. During the field season the health of the party was on the whole better than usual,

Health of the party.

though Messrs. Vanderputt, James and Barker reported considerable sickness from fever in their camps. Since their return, however, to recess quarters more than the usual amount of serious illness has been reported. The Deputy Superintendent refers in high terms to the persevering steadiness and zeal displayed by all his assistants in carrying out the season's operations, and of their endurance and tact in managing the wild natives of these insalubrious tracts, as well as in feeding their camps in a country so sparsely\* populated, where the scanty crops are much destroyed by herds of wild elephants. Provisions had to be brought from a great distance, and without the material assistance of the chiefs named in the margin, the survey camps could not have existed, and the operations must have been brought to an abrupt standstill. It affords me pleasure to bring to the notice of Government the great aid afforded to the survey by these chiefs.

\* The estate of Uprora covers 450 square miles; there are 390 huts only in all its villages.

Rajah Bideseri Persad Sing, c. s. r., of Sirgoojab.

Rajan Lall Moheseri Persad Singh of Sirgoojab.

Zemindar Futteh Narain Sing in Chang Bokhar.

94. Captain W. F. Badgley, Assistant Superintendent, 1st grade, who reported his return from furlough to Europe on the 20th January 1871, was posted to this party, but owing to the advanced stage of the field work and the impracticability of the country, took but a small part in the season's operations. Owing to the death of Captain A. B. Melville, Deputy Superintendent in charge of No. 6 Survey, Khasia and Garo Hills, Captain Badgley, the next available senior officer, qualified for an executive charge, was at the close of the field season transferred to No. 6 Party by G. O. cited marginally, and assumed charge of it on the 8th May at Daeca.

No. 158, dated 28th April 1871, from the Secretary to the Government of India, Home Department.

95. Lieutenant R. G. Woodthorpe, R. E., whose appointment to the Topographical Survey was sanctioned by Government Order marginally noted, was attached to this party, which required a Military Assistant, and joined on the 28th July, but from the 1st October he was temporarily transferred to No. 6 Party, for special employment with the expeditionary force against the Lushais on the Eastern Frontier.

96. Mr. G. A. McGill, the Senior Surveyor of the Party, whose excellent services have already been noticed, I regret to record, has suffered so severely from ophthalmia during the recess as to apprehend the loss of his right eye, which has necessitated his obtaining six months' leave on medical certificate. His services, which have always proved valuable, will thus be lost for the entire season. An interesting extract from the report on his operations in the Sohagpore State, will be found in the appendix.

97. During the ensuing season the whole party, with the exception of the Deputy Superintendent in charge, who will extend his season's triangulation in order to connect with the stations of the Jubulpore Series, Great Trigonometrical Survey, as already mentioned, will be employed in topographical delineation, the large area of 5,000 square miles of triangulation being well in advance. The ground to be occupied by the detail parties or plane-tables will embrace the talook of Sohagpore in Rewah, and the zemindaries or Estates of Mahtin and Pendra to the North of the Belaspur District in the Central Provinces.

98. Owing to the completion of the field assigned to this party in the Chota Nagpore Division, its operations have been extended into the adjoining Central Provinces, and its designation will in future be No. 4 Survey North-Eastern Division, Central Provinces.

## No. 5 TOPOGRAPHICAL SURVEY.

### BUNDELKUND.

#### TO BE DESIGNATED IN FUTURE "BHOPAL AND MALWA SURVEY."

99. The programme of operations laid down for this party for the season under review, was described fully in paragraphs 139 and 140 of my last printed report, but is briefly referred to here, as owing to the completion of the remaining portion of Bundelkund, a new and detached field has been assigned to it for future operations in Bhopal and Malwa (Central India) comprised within the meridians of  $73^{\circ}25'$  to  $78^{\circ}50'$ , and the parallels of  $22^{\circ}$  to  $24^{\circ}$ , or from the Saugor frontier on the East, to the limits of the Bombay Presidency on the West, and from the Southern limits of Scindiah's territory down to the Nerbudda River. The designation of the party will therefore be altered in future reports to suit the new ground in which it will hereafter be employed.

#### STRENGTH OF THE PARTY.

Captain R. V. Riddell, R. E., Deputy Superintendent, 3rd grade, in charge.		Sq. Miles.
Lieutenant J. R. Wilmer, S. C., Assistant Superintendent, 2nd grade		211
Mr. A. J. Wilson, Assistant Surveyor, 1st grade	...	Triangulation.
" C. F. Hamer, ditto, 2nd "	...	200
" A. W. Cheunnell, ditto, 2nd "	...	Triangulation.
" C. Kirk, ditto, 3rd "	...	235
" E. A. Wainwright, ditto, 3rd "	...	316
" H. T. Kitchen, ditto, 4th "	...	271
" W. H. Lilley, ditto, 4th "	...	242
	<i>Sub-Surveyors.</i>	
Nubbikush	...	209
Prem Raj	...	271
Abdulahim	...	204
Abdulahman	...	204
	TOTAL	2,432

100. Owing to the small area remaining for detail survey in Bundelkund, it was decided that Captain Riddell, Deputy Superintendent in charge, with two assistants, should break ground in the new field West of the Saugor District, which separates Bundelkund from Bhopal, allotted to the party in Bhopal for the purpose of reconnoitring the new ground and laying out and completing some triangulation in advance for the new season's topography; while Lieutenant J. R. Wilmer, Assistant Superintendent, with the remainder of the party, took up and superintended the completion of the area in Bundelkund, still requiring topographical delineation.



101. After a slight detention at Nagode, owing to the heavy rain which fell over the whole of the North-West Provinces during October 1870, the party started on the 31st of October in two detachments. Captain Riddell and two Assistant Surveyors proceeding *via* Saugor towards Bhopal, and Lieutenant Wilmer with the rest of the party marched *via* Punnah and Rajgrh into Chutterpore and Bijawur, Bundela States, and commenced the detail Topographical Survey of the country extending from Latitude 24° to 25° 15', and Longitude 79° to 80°.

102. The petty States through which the detail survey was carried are named in the margin. The ground on the South of the tract under detail survey embraces a portion of the Vindhia Range, much broken and covered with jungle, while that on the North is for the most part flat and open, and interspersed with low hills between two and three hundred feet high.

103. The area remaining for Topographical Survey in Bundelkund was 2,432\* square miles, the whole of which has been duly completed, and the standard sheets submitted with two large scale (12 inches = 1 mile) surveys of the towns of Chutterpore and Bijawur in addition. All these maps have already been published. Check routes to test the accuracy of the details were run as usual by Lieutenant Wilmer, and the whole outturn is very favorably reported on by the Deputy Superintendent.

104. The triangulation in the new ground in Bhopal was started from and based on the stations Tins, Lakoli and Narmoa of the Calcutta Longitudinal Series, Great Trigonometrical Survey, and extended East and West of the meridian of 78°, connecting on the West with the stations of the Great Arc Series, running between the meridians of 77° 30' and 78°, the Northern limits being the parallel of 23° 30', and the Southern, the River Nerbudda. An area of 4,267 square miles was covered, observation being taken at 103 stations which fixed the positions of 556 points, giving an average of 1 point to every 7½ square miles of ground. The heights of 435 points were also trigonometrically determined, or 1 elevation in little less than 10 square miles of ground.

*Cost of the season's operations.*

	Rs.	As.	P.
Topography of Bundelkund ...	43,518	0	0
Bhopal Triangulation ...	12,539	3	5
<b>TOTAL</b>	<b>56,055</b>	<b>3</b>	<b>5</b>

105. The total cost of the whole outturn of the season amounts to Rs. 56,055-3-5, which gives a rate of Rs. 17-14-3 per square mile for final topography.

106. The recess duties of the party commenced at Mussoorie on the 1st May, the usual professional computations, maps, charts, &c., having been completed, *viz.* :—

*Computations in duplicate.*

- 16 Principal triangles.
  - 246 1st class secondary triangles.
  - 26 1st class ditto ditto, with two sides and included angle.
  - 1,062 2nd class secondary triangles.
  - 195 Computations of Latitudes, Longitudes and Azimuths.
  - 806 Computations of heights.
  - 372 Pages of horizontal angle books.
  - 226 Ditto vertical ditto ditto.
- Volume III of the General Report of the Bundelkund Survey.

*Standard Maps, Plans, Charts, &c.*

- 7 Sheets standard maps 1 mile=1 inch.
- 2 Large scale (12 inches=1 mile) city plans of Chutterpore and Bijawur.
- 1 Triangulation chart embracing ½ degree sheets XIV, XV, XVI and XVII.
- 4 Exaggerated blue prints of ½ degree sheets X, XI, XII and XIII outlined.
- 3 Large scale published plans of Rewah, Punnah and Adjygrh, colored.
- 27 Copies of published sheet maps colored.

107. These results of the operations of this party for the season under review are very satisfactory. They contrast favorably with those of previous seasons. The Deputy Superintendent reports favorably the steady application of the several members of the party throughout the season, and my own frequent inspections at Mussoorie of the office, during the early part of the recess, satisfied me that the praise was deserved. The party is in a good state of efficiency, and possesses my confidence. With the view of effecting conciliatory relations with the Begum of Bhopal, and rendering our proceedings and our wants quite clear and intelligible to her Durbar, I proceeded to Bhopal, and after several most satisfactory interviews with Her Highness the Begum and the Political Agent, I obtained the fullest assurances of co-

Opinion of the season's operations and inspection of party.

operation and support, and have no doubt that under the judicious management of Captain Riddell, and the instructions he has received on the subject, the progress of the survey will be all that will be desired.

108. During the ensuing season, this party will take up the detail survey of the Eastern portion of Bhopal, for which the large area of triangulation in advance, now reported, has been executed, and it is expected that the 1st degree sheet of the topography of that tract between the meridians of 78° and 79° and parallels of 23° and 24° in Atlas Sheets 53 and 71, will be the resulting out-turn, as the labors of the whole party can be devoted to its completion, there being sufficient triangulation in advance for more than the present season.

109. Extracts from the executive officer's report, descriptive of the country triangulated in Bhopal, and of the portion of Bundelkund topographically surveyed, are given in the appendix.

## No. 6 TOPOGRAPHICAL SURVEY.

### KHASIA AND GARO HILLS.

110. The numerous difficulties and obstacles which this survey has to contend against, have repeatedly been described in my previous reports on the administration of the department, and it is needless to record them again; but working as the party is, on a frontier inhabited by semi-independent tribes jealous and suspicious of the slightest advance into their country of any Europeans, it would be unfair to show the slow rate of progress, without also referring to the causes which so materially tend to retard the operations and to render them so expensive and difficult.

Portions of the Garo and Naga Hills District in the North-East Frontier Agency.

Captain A. B. Melville, Deputy Superintendent, in charge, died at Mymensing on the 15th February 1871.  
 Mr. N. A. Belletty, Surveyor, 1st grade.  
 " M. J. Ogle, Assistant Surveyor.  
 " P. J. Doran ditto 3rd grade.  
 " W. Robert ditto Probationer, 4th grade.  
 " J. McCay ditto ditto.  
 " R. A. Gibson, ditto ditto.  
 Sub-Surveyors.  
 Shah Nasiruddeen and Sheikh Daliludin.

party, but while *en route* to the

\* *Vide* letter to Secretary to Government, Home Department, No. 364, dated 6th March 1871.

available to replace him.

111. For the reasons assigned in paras. 151 to 155 of my last report, the party was reduced to the strength marginally shown. Captain Melville, Deputy Superintendent, rejoined from leave to Europe in January 1871, (*vide* para. 159 of last printed report), and was posted to the charge of this field, he was suddenly taken ill at Mymensing, and died there on the 15th February 1871, as was duly reported to Government.\* The services of this experienced and accomplished officer, on whose ability and tact I greatly relied for the success of the season's operations, were thus I greatly regret to say lost, and no qualified successor was available to replace him.

112. The Senior Surveyor, Mr. N. Belletty, was consequently directed to carry out the arrangements for the field season's work, and he accordingly formed camp at Tentor at the Southern base of the Garo Hills about the middle of December 1870, but was unable to obtain much assistance from the local authorities, or the people of the country, who later in the season murdered one of the signalmen sent to clear a hill. Mr. Belletty's powers were therefore inadequate to the occasion, and very little has been achieved under his direction. Another assistant Mr. Doran's health also failed while he was on his way to the field, and he did not rejoin from sick leave until the 20th January 1871, and having been medically declared quite unfit to remain at Dacca, was transferred to head quarters for the greater portion of the recess.

113. Messrs. Ogle and Robert, Assistant Surveyors, as stated in para. 156 of my last report, were deputed to conduct special work on the Muneepore boundary and in the Naga Hill District at the extreme East, and were thus entirely detached from the main party for the whole of the field season.

Season's outturn.

	Square miles.	
† Mr. Belletty ...	90 1/2	Of Triangulation in the Garo Hills.
" Doran ...	508 1/2	
" Ogle ...	2,500	Triangulation in the Naga Hills.
<b>TOTAL</b>	<b>3,912</b>	

114. The triangulation completed as a basis for the topography, amounts in all to 3,912 square miles,† of which

Messrs. Belletty and Doran executed 1,412 square miles in the Garo Hills, and Mr. Ogle 2,500 square miles in the Naga Hills and along the Muneepore boundary. Some notes by the Surveyor on the country triangulated in the hills are given in the appendix.

115. The total area of finished topography executed on the scale of 2 miles=1 inch, covers

	Square miles.	
* Mr. Ogle ...	608	Final topography in the Naga
" Robert ...	765	Hills and Munciepora State.
" McCay ...	399	
Shah Nasiruddeen ...	63	Final topography in the Garo
Sheik Daliluddeen ...	45	Hills.
<b>TOTAL</b>	<b>1,877</b>	

an area of 1,877 square miles,\* of which 1,370 square miles surveyed by Messrs. Ogle and Robert is in the Naga Hills and Munciepora State, and the remaining 507 square miles in the Garo Hills. But for the superior exertions of Messrs. Ogle and Robert, who deserve great praise for the ability and untiring

zeal they have displayed under very trying circumstances, the season's field operations would have proved almost a blank.

116. The party returned to recess quarters at Dacca by the middle of May 1871, and

Recess duties. New Executive Officer. Captain W. F. Badgley, Officiating Deputy Superintendent, who was transferred from No. 4 Survey, Chota Nagpore Division, assumed charge on the 8th May, and conducted recess duties.

117. Owing to the reduced strength of the party, the relapses of malarious fever from which most of the assistants and Sub-Surveyors suffered, and the deputation of Captain Badgley and Mr. Ogle to my head quarters for a short time, to prepare the necessary equipment to enable them to accompany the Lushai Expedition, the recess duties did not progress satisfactorily, nor have any portion of the final results of the season's operations, I regret to say, been lodged in this office as yet.

118. The total cost of triangulation and final topography completed on the  $\frac{1}{2}$ -inch scale,

Cost of the season's out-turn.

amounts to Rs. 36,550, yielding an average rate of Rs. 19-7 per square mile for the finished work.

Mr. Belletty, whose services with this party have proved but of little utility, was trans-

ferred at the close of the recess to the new No. 2 Survey of Khadesh and Native States in Bombay, lately organized under the orders of Government marginally noted, and it is hoped he will be more successful in this new field, than he has been for the last two or three seasons.

Department of Agriculture, Revenue and Commerce letter No. 193, dated 6th September 1871.

119. Mr. Doran (whose health had completely broken down and who was declared unfit for further service in the Garo Hills) was temporarily attached to my Head Quarters Office, and subsequently posted to the new No. 2 Survey; Mr. Gibson, probationer, also suffered severely in health, and was compelled to obtain medical leave for three months to proceed to sea. The two Sub-Surveyors Shah Nasiruddeen and Daliluddeen have also been temporarily attached to my Head Quarters Office, as their services were not needed and could not be utilised with the party on a military expedition during the current field season.

120. His Excellency the Commander-in-Chief having applied for the services of a survey party to accompany the left column of the Lushai Expeditionary Force, starting from Cachar, Captain Badgley, Officiating Deputy Superintendent in charge, was with the sanction of the Government of India (Agriculture, Revenue and Commerce Department letter No. 205, dated 13th September 1871) directed to arrange and equip No. 6 survey for this duty, and as the work to be performed was of an exceptional character, requiring the lightest field marching equipment both in instruments and baggage, he was directed to proceed with Mr. Ogle to my Head Quarters Office at the Presidency, and there to provide himself with every necessary and suitable article for the special nature of the operations in which he was to be employed.

121. Every aid was rendered him, and he was duly provided with all instruments, professional instructions and advice, as to the necessity for a good and faithful reconnoissance of a tract of country hitherto totally unexplored, but the geography of which is of the utmost importance; this has been fully impressed on him and on every member of his party. Lieutenant Woodthorpe, R. E., Assistant Superintendent, No. 4 Survey, and Lieutenant Leach, R. E., Assistant Superintendent, appointed to the Department by the orders specified below,\* both Engineer

Officers of high promise and superior qualifications, have been temporarily attached to the party, which now is composed of the strength marginally noted, and I have the most sanguine hopes that the results of the season's

Captain Badgley, s. c., Officiating Deputy Superintendent in charge.  
Lieutenant Woodthorpe, R. E., Assistant Superintendent.  
Leach, R. E., ditto ditto.  
Mr. M. J. Ogle, Assistant Surveyor.  
" W. Robert ditto.  
" J. McCay, ditto probationer.

explorations, if not retarded by military and political considerations, will, under the able hands of Captain Badgley and his staff, prove a most valuable contribution to the geography of our Eastern Frontier.

122. On return the party will recess at Shillong, it being of the first importance to give the members the benefit of a hill climate, after such trying duties. Another rainy season at Dacca would completely incapacitate the party.

No. 7 TOPOGRAPHICAL SURVEY.

RAJFOOTANA.

123. The field operations of this party commenced on the 1st November 1870, in the Southern portion of the British District of Ajmere, and in the Native States named in the margin.

124. The ground for detail survey previously triangulated, as described in para. 162 of the

<i>Strength of the Party.</i>		Sq. Miles.
Captain George Strahan, R. E., Deputy Superintendent, 3rd grade, in charge	...	120
H. Horst, Esq., Assistant Superintendent, 1st grade	... ..	168
<i>Assistant Surveyors.</i>		
Mr. E. S. P. Atkinson, 1st grade	...	605
" R. Todd, 2nd grade	...	206
" C. Tappell, 2nd grade	...	307
" F. Kitchen, 3rd grade	...	205
" W. Stotesbury, 3rd grade	...	270
" W. McNair, 3rd grade	...	540
" F. Warde, 4th grade	...	170
<i>Sub-Surveyors.</i>		
Kalka Persad	... ..	120
Harball Singh	... ..	330
J. Noah	... ..	270
TOTAL	... ..	<u>3,551</u>

last Report, was situated principally in the Native State of Udepur, with a few detached portions in the States of Kota and Boondee, the whole comprised within the square degrees formed by the Parallels of 25° and 26° and the Meridians of 74° and 75° and 75° and 76° of Atlas sheets 34. The Topographical delineation of 3,551 square miles, as shewn in the margin, including 17 square miles of overlap into the work of the Gwalior Survey, in standard sheet 29, along the Meridian of 76°, was completed. The ground was for the most part very intricate, being clothed with heavy Forest and intersected by numerous ravines clad with low dense jungle. In addition to the above area, 20 square miles of the Aboo Survey, on the scale of 6" to the mile, were also completed, and the remaining portion of the Mount Aboo Map, as stated in para. 161 of last Report, has now been fair drawn and published.

125. The whole of the Southern half of the area surveyed being clothed with dense Forest, minute Triangulation in such country could only be carried on at a great sacrifice of time and money, very few interpolated points were therefore fixed by previous Triangulation. This omission Captain Strahan supplied by adopting the plan of traversing between Triangulated points, which enabled the Surveyors to complete the detail survey of this most troublesome tract without much difficulty. The traverses, 39 miles in length, were conducted, computed and corrected in the usual manner, and the error, which was found to be very trifling, proportionally distributed. The points so fixed were found to be thoroughly trustworthy for detail surveying.

126. The Triangulation in advance was extended Westward from the Meridian of 74°-30', between the parallels of 25°-20', and 26°-20', through portions of Mhairwarra, Udepur and Jodhpur, and continuing the series of 1st Class Triangles mentioned in para. 162 of last Report; another Pentagon, Hexagon and double figure were successively laid out and observed, the total area covered being about 2,493 square miles. Observations were taken at 19 stations fixing the positions of 324 points, or 1 point to every 7½ square miles of ground, and 156 heights were determined trigonometrically, giving on an average 1 height to every 16 square miles of ground.

127. The whole of the work of the detail surveyors was duly examined and tested in the field by check lines in the usual way, and the Deputy Superintendent reports favorably of the entire accuracy of the whole generally, and of the style in which the work has been executed, considering the difficulties of the country by every member of the party. The ground has been very carefully and faithfully delineated on the fair standard maps.

128. Recess duties commenced at Mussoorie on the 2nd May, when the usual charts, fair maps, computations, &c., as noted below, were completed and received, viz. :—

In Duplicate	...	11 Principal Triangles.	
		52 Secondary Triangles.	
		324 Second class Secondary Triangles.	
		64 Deductions of Latitudes, Longitudes and Azimuths.	
		230 Ditto, ditto	Heights.
		144 Pages of Horizontal angles.	
		60 Pages of Vertical angles.	
		5 Figures reduced by least squares.	

STANDARD MAPS, PLANS, CHARTS, &C.

- 7 Standard Maps, 1 inch completed.
- 1 Plan Aboo Cantonment, 24 inches = 1 mile.

- 1 Sheet plan (2nd) of part of Mount Aboo 6 inches = 1 mile.
- 13 Copies of published sheet maps, colored.
- 1 Exaggerated map, 1 inch, degree sheet V.
- 1 Chart of Triangulation ditto.
- 1 Ditto ditto, Office copy.
- 2 Index charts of progress.

In addition to the above, the General Report volume of Degree sheet V, reported in paragraph 165 of last Report as in progress, has also been completed and received.

129. The total cost of the season's operations from 1st October 1870 to 30th September 1871 amounts to Rs. 55,135-10-4, the average rate per square mile on the above outlay which includes charges for the Triangulation in advance, and the pay of Police Guards for the party (an item not hitherto paid in cash by the survey), is Rs. 15-13-11, a considerable reduction of the rate reported last season; the very large out-turn of the season, viz., 3,551 square miles of valuable Topography, and 2,493 square miles of Triangulation with part of the large scale survey of Mount Aboo, notwithstanding the difficult nature of the country operated upon, is really good, and reflects the greatest credit on this party, and the able management of Captain George Strahan, the Deputy Superintendent in charge.

130. During the early part of the recess, this party was frequently inspected by myself, and I have the greatest pleasure in again placing on record its high state of discipline and thorough efficiency. All the records were in perfect order, and there are no arrears of any sort.

131. Mr. Henry Horst, the Assistant Superintendent, has been conspicuous for his zeal and energy as usual, and Captain Strahan reports most favorably of his ready assistance both in the field and in recess, and of the excellence of his work, which I fully endorse. The whole party is conspicuous for zeal and energy.

132. During the current field season the triangulation of the country around Delhi, required by the Quarter Master General's Department for the camp of exercise, has been taken up by Mr. Horst, Assistant Superintendent, who has also completed a traverse survey of the Western side of the Sambhur Lake, and then proceeded to assist Captain George Strahan, Deputy Superintendent, in triangulating in advance, Westward from the meridian of 74°30', and Southward of the parallel of 25°-30', so as to square up Degree Sheet VI, the Western half of which is traversed by the Arabulla range, and contains much intricate Hill work.

133. Further important employment has been found for this party, which is peculiarly qualified to undertake difficult ground of an intricate character. The sanatorium of Simla has long needed a careful survey on an adequately large scale (12 inches to the mile), and as all the other Hill Stations in the other jurisdictions have been satisfactorily provided for, the time for making a really good survey of Simla seems to have arrived. It is therefore proposed to withdraw the Rajpootana party from their current field work by the end of March, to proceed to Simla where they will recess, and thus be able to prosecute the new survey in the Hills, for a couple of months before the rainy season commences. This new object will thus not interfere with the ordinary course of the survey in the plains which will proceed as usual, except that some of the members of the party will perhaps proceed to recess quarters a little earlier, and leave a little later than they otherwise would do. In this way, I hope to obtain good plans of the several Military Stations noted in the margin in addition to Simla, within the next few years, and to this end No. 7 party will continue to recess in these Hills, instead of at Mussooree, as heretofore.

Jutog.  
Kussowlee.  
Dugshai.  
Subathoo.

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

SURVEYOR GENERAL'S OFFICE, }  
CALCUTTA, }  
24th January 1872.

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APPENDIX.

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## REMARKS, PROFESSIONAL, GEOGRAPHICAL, &amp; STATISTICAL,

BY

## EXECUTIVE OFFICERS.

*Extract from the Narrative Report of LIEUTENANT CHARLES STRAHAN, in charge, No. 1 Topographical Survey, Gwalior and Central India.*

The greater part of the country, surveyed in detail this year, lay in the southern portion of Gwalior, East of Goonah and the Sironj District of Tonk.

## G WALIOR.

Betwa River, the boundary between Gwalior and British territory. Here Mr. Cornelius had hilly jungly country all around Chandairi, which city fell in his board\*. Between the hills and the Betwa River is a strip of flat cultivated country, but the hills themselves are rugged, and only the valleys here and there have a little cultivation

with a few small villages. The general direction of the range is nearly North and South, rising in steps up to the plateau on which Isgarh and Shadakra are situated, a height of 450 feet to 500 feet above the Betwa River. The River Orr runs through these hills in a North-east direction. The small range of hills running in a North-east direction over the Sironj District is all part of the same, but here the belt of hills and jungle is much narrower, and there is but one step on to the plateau; the country above is highly cultivated and undulating with a few stony, rocky, isolated hills of no great height scattered over it. The Sind River flows through it from South to North, and on either side the ground is cut up by nullahs generally more or less covered with bush jungle, sometimes sufficiently thick as to render Survey work troublesome. In the hot weather numbers of tigers take refuge in these nullahs and cause great havoc amongst the cattle.

Lieutenant Holdich's report of the country triangulated by him is as follows:—

Degree Sheet VIII, South of Kanaota and Sihora, comprises about 40 miles of the western basin of the Betwa River, and is very unequally divided into portions of rocky country covered with most luxuriant jungle and open plains where grain is largely cultivated. The jungle is heaviest in the immediate neighbourhood of Deogarh, where the Betwa is overlooked on either bank by rocky cliffs once sacred to Hindu shrines, whose ruins display the utmost profusion of the art of sculpture, but which now hardly ever top the surrounding trees. One temple of great magnificence with a broad paved causeway leading from the foot of the hill on which it stands, along the face of the rocks, is of great archaeological interest, some of the sculptures being well preserved. On the ruins of another the Trigonometrical Station of Deogarh has been made. A few miles South of Deogarh the jungly rocks disappear, and the Betwa River runs through an open plain so fertile and richly cultivated in parts that corn is extensively exported. The country is still rich in architectural remains. At Iran, on the banks of the Binn, a tributary of the Betwa, is the celebrated pillar supposed to represent the exact centre of the empire of Hindoostan, on which is inscribed one of Asoka's famous edicts. The Mahomedan State of Kurwai borders the left bank of the Betwa in the South-eastern corner of this Degree Sheet. Degree Sheet No. 1 of the Malwa and Bhopal Survey, where it adjoins Degree Sheet VIII, presents the same appearance of open cultivated plains. South and East of the ancient city of Udiipur (now more than half in ruins) lies a curious group of peaks rising direct from the plains to a height of 300 or 400 feet, with scarped inaccessible sides and flat tree-covered summits, which here and there show traces of old stone forts and loopholed walls. The peak which overlooks Udiipur is only accessible with difficulty from one point, and there was considerable doubt about the possibility of carrying a 14-inch theodolite to the summit. This hill has been more elaborately fortified than any other, and a large tank has been constructed for the use of a garrison. It is a splendid landmark to all the country North and West of it, and invaluable as a Trigonometrical Station. From this group extending in a south-easterly direction, the country becomes more broken, hilly and jungly, but grain is extensively cultivated where any extent of level ground and black cotton soil affords the chance of cultivation with success.

The small State of Nawab Basoda comprises an extremely picturesque area of scarped jungly hills and cultivated valleys lying between, nor does the character of the country alter much through Serwas down to the extreme south-eastern limit of Nahmao. The general level of the country rises towards the South, while the hills break up and become more and more irregular, jungle becomes the rule and cultivation the exception, till the watershed that divides the Nerubudda basin from that of the Ganges is reached. To the West of a line joining Udiipur, Gargaja and Lakoli, the country again breaks out into open highly cultivated plains, so regular as to afford some difficulty in selecting suitable sites for Trigonometrical Stations. This open cultivation includes both banks of the Betwa River and continues westward into Degree Sheet II of the Bhopal Survey, till



hills and jungle again limit it Eastward of  $77^{\circ} 30'$ . So extensively under cultivation is this part of Gwalior, that it is with some difficulty that a path can be found from point to point without interfering with the crops. Grain of all sorts form the mass of these crops, and the fertility of the soil is very apparent. The land is well watered and the population dense. On the extreme Southern boundary of Gwalior, and near to the source of the Betwa, lies the far-famed city of Bhelsa with its little outlying hill of Lohangi. About six miles South-west of Bhelsa, is the group of celebrated Buddhist topes which have made Sanchi famous, and the whole country hereabouts is rich with Buddhist remains. Casts of the Sanchi gateways and the more important sculptures have already been sent to England, and General Cunningham has fully described this most interesting part of India. Westwards from the Meridian of  $77^{\circ} 30'$  hills and jungle again predominate, and roads are scarce and difficult.

Mr. Bolts describes the country visited by him thus :—

The country comprised within the limits of  $23^{\circ} 30'$  and  $24^{\circ} 30'$  North Latitude, and  $77^{\circ} 0'$  and  $77^{\circ} 30'$  East Longitude, embracing parts of Gwalior and Bhopal and Tonk, is, with the exception of a small portion to the South, hilly, covered with jungle, sparsely inhabited and poorly cultivated. It is drained by the Parbutty River, which, entering at its Southern extremity, preserves a Northerly course very nearly through its centre. The Agra and Bombay Road runs through the North-west corner for a distance of 30 or 40 miles. This extensive tract of country possesses nothing of interest of any description. The hills running in continuous ranges grouped together or rising up abruptly and singly. Their summits and sides covered with dense jungle present the same unvaried appearance, while the narrow valleys which lie uncultivated add to the general monotony. Lower down South the fine open country with richly cultivated fields forms a pleasing contrast. As might be supposed, the above-mentioned jungles afford a safe retreat for thieves. Those men, generally speaking, are cattle-lifters. They attack the herds of neighbouring hamlets, drive the cattle into the forest, and, if resisted, do not scruple to shed blood. They have certain haunts where they meet to mature their plans, and although these places are known, no measures are taken to secure or exterminate the depredators. One of these haunts is supposed to be at a place called Tasia, where stand the ruins of a very old fort and a shrine to which numbers of people assemble from great distances; travellers also make this a resting place, because of the sweet water procurable from a well close to the shrine. I may mention here that water is scarce all about this tract of country. The only places of importance are the towns of Chichora and Nursingarh in the Gwalior District. The former a couple of miles off the Grand Trunk Road, and the latter picturesquely situated on a hill at the foot of which is a large tank. The roads about the hills are inferior, simply foot-paths, practicable for laden donkeys and bullocks. The four principal stations of the Great Trigonometrical Survey were found partially destroyed, the centre mark-stones having been dug up in consequence of the general belief among the villagers, that treasure was buried under them.

*Report on the Native State of Ulwar compiled from Notes taken during the operation of the Gwalior Survey by* LIEUTENANT CHARLES STRAHAN, R. E.

The State of Ulwar in Rajputana is bounded on the North and North-east by the British Districts of Jhujjur and Goorgoon, on the East and South-east by the independent State of Bhurtpur, and on the West and South by that of Jeypur. Its area may be reckoned at a little more than 3,000 square miles.\* Originally it formed part of Jeypur, but the present Rajah's grandfather, Pertab Singh, revolted and took forcible possession of the country now known as Ulwar, including a small portion of what then belonged to Bhurtpur. The capital was formerly at Rajgarh, but of late years it has been removed to Ulwar, where the last Rajah built a fine palace, a short distance out of the town, in the centre of a large and well-cared-for garden. There is also a good palace inside the city at the foot of the hills.

RAJPUTANA—ULWAR.

Introduction.

\* The county of Devonshire is nearly 2,600 square miles in area.

It should be borne in mind throughout all the following description of Ulwar, that a small portion of the State to the North of the 28th parallel of Latitude came under the operations of the Rajputana Survey, and is not included in this report. This should be more particularly remembered in that part which treats of the principal towns and forts, for as regards the country itself it is almost all flat, without any very distinctive features.

The Eastern portion of the State is open and highly cultivated, with straight ridges of hills of no great height, but very steep and rocky, running in a direction S.S.W. to N. N. E. It is a curious fact to be noticed

General description of the hills.

in the hills in Ulwar that they by no means mark the watershed of the country, the drainage breaking through the hills in numbers of places, at right angles to the general run of the hills. As you proceed Westward you come to the hilly portion of Ulwar, which stretches from the South almost to the North of the country. This mass of hills is principally composed of parallel ridges, but in many places they are so contorted and twisted that the formation is almost lost sight of. To the West of this range is a long valley, in which Gazi-ka-thana is situated, running completely through from North to South; to the West of this high rocky ridges rise again in the Jeypur State, but never forming such a mass as these now mentioned. These central hills are of a most rugged nature; covered with jungle abounding with large game, such as tigers, leopards, sambhur, nilgai, pig, four-horned deer (their local name is Guntali), &c.; no bears or cheetal, however, are found anywhere in the Ulwar State. In the plains are great quantities of antelope with black buck and reindeer (chikara). As the Rajah preserves all game, with the exception of pigs, very strictly, it has been steadily increasing of late years, and now the different kinds of deer and antelope have become a

serious annoyance to the cultivators, more especially near the hills. Pigs became so troublesome that a petition from the ryots was sent to the late Rajah, begging that they might be allowed to shoot them, which was granted, and now wild pigs are comparatively scarce. In consequence of the peculiar formation of these hills above mentioned in their being in parallel ridges, the drainage in places takes a strange form. Thus very often a stream may rise on one side of a ridge, flow along its base until it reaches the end, when it will pass completely round and flow along parallel to its former course, but in the opposite direction and within a mile of it. Or again one stream may rise and flow between two ridges from South to North, meet another which has risen in a similar way, but flowing from North to South, and both together pass through a break in the hill to the East. The hills are all very rocky and precipitous and for miles inaccessible, except for mules and bullocks, and that only where some small path has been made. Without paths, even to men on foot, they are often impracticable; were it not for the large valleys cutting completely through the range, which will be pointed out, they would form a most effectual barrier across the country. Although covered with grass and jungle, there is but very little, if any, timber of importance. The great mass of wood is of "Dhuo" and "Dhak" kind, which never grows to a sufficient size to be called timber. The "Babool," which yields a very tough hard wood, but of small scantling, is preserved; a good deal of it being grown around the city of Ulwar. The scenery in these hills is in many places very striking, here and there precipices of 500 and 600 feet overhanging a running stream of water, flowing through rich jungle intermingled with palm trees; as these streams never run dry, the valleys are always green and pretty to look at, whereas the tops and sides of the hills become brown and colorless in the dry season. In the early part of the cold weather, the hills are completely covered with spear grass, which makes it very irksome walking about them, and near the streams in parts grass grows up to 6 or 8 feet in height. In several of these valleys the Rajah has built little loopholed houses for shooting purposes, from which he shoots a good many tigers at night. Some of these shooting boxes are most picturesquely situated.

The Bádi or Báraki\* Nadi rises in the hills to the West of Rajgarh, and flows in a North-east

Streams and drainage system.  
The drainage to the East.

\* This name more particularly applies to the branch which flows out of the hills at Bara.

direction into the State of Bhurtpur. This small river receives all the drainage from the hills on the Eastern side. One large branch rises in the Gazi-ka-thana valley amongst the small hills to the South of that town. It starts at first in a Northerly direction nearly up to Gazi-ka-thana when it bends to the East and flows right through the range past Siriska and Kushalgarh, and emerges again at Bara, joining the Bádi at a point about 14 miles East from that place. It has no distinct name near Gazi-ka-thana, being generally known as the Siriska Nadi and beyond Kushalgarh as the Bara Nadi. At Kushalgarh it is joined by another stream nearly as large, which rises in the open country to the East of Narainpura, also in the Gazi-ka-thana valley, and flowing nearly due South meets the Siriska Nadi as above mentioned. The valley thus formed is more open and forms an easier pass through the hills, the Siriska Nadi entering the hills through a narrow rocky gorge, forcing the road to Gazi-ka-thana to pass over the lower spurs of the hills on its South bank.

Near Hamirpur to the North-west of the capital, another stream rises, flowing at first almost due South, but bending gradually to the South-east, and joins the Bádi Nadi in the open country, 6 or 7 miles West of its junction, with the Bádi at Silisir. Just before it leaves the hills, it is dammed up by a large masonry dam built right across the valley, which at this spot, in consequence of a small detached hill, is only 300 yards or 350 yards in width; a large lake is thus formed of an irregular shape, about one mile in extreme length, and at its widest nearly half a mile. From this lake two canals have been built, the one running direct to the Ulwar city and the other to the Rajah's garden; they are about eight miles in length, and for the greater part of the distance are built of masonry. The source of this Silisir stream has but one small range of hills between it and the open country to the West.

Immediately to the North of the city of Ulwar is a large basin in the hills, the main stream of which flows from North to South and rises about  $3\frac{1}{2}$  miles South of Khairtal, making a complete break in the hills. All the drainage from this basin unites about five miles North of Ulwar, and flows in one stream into the open country near Jatana. It takes a South-east direction as far as the hills near Ramgarh, after passing which on the South it bends gradually Eastwards to within half a mile of the Bádi Nadi, which, however, it does not join, but takes a North-easterly course, and crosses the Bhurtpur boundary near the North of that State. It will thus be observed that the central range of hills does not in itself form a watershed, all the principal streams from it either rising from the extreme Western ridge or from the valley beyond, the Bádi alone rising in the Northern faces of a somewhat detached portion of the range in which Rajgarh is situated. The general direction of all these streams too is not according to the run of the hills, but more or less at right angles to them.

Turning now to the Southern drainage, a glance at the map will show that, so long as the streams are amongst the hills, they run all North and South, and all join one stream, which rises in Jeypur to the South-west of Ulwar State, and has an Easterly course, eventually joining the Banganga. The most Western stream of these rises amongst the hills to the West of Gazi-ka-thana, and is kept to its Southerly course by the hills, forming the Western side of that valley. The next stream, going Eastwards, rises South of Gazi-ka-thana, near where the Siriska or Bádi Nadi was described as rising, but flows due South through the lower portion of the Gazi-ka-thana valley. The third stream has a curious course, for it rises in a narrow valley less than two miles to the West of Kho, flows due North to Kankwari on a level with the source of the last-mentioned stream, then

Southern drainage.

takes a sudden turn to the South and flows again past Kho, but  $1\frac{1}{2}$  miles to the East of it, and soon after joins the stream described as flowing Eastward into the Banganga. Thus this little river flows for 10 miles almost due North, and for 18 almost due South. There is one other stream which, although it is almost entirely in Jeypur, should be mentioned here; it rises in the basin of the hills South of Rajgarh in which Baswa (Jeypur) is situated, and after rounding the hills to the East of its source, flows due East into the Banganga, at a point where that river forces its way to the East through one of the narrow ridges of hills, described as being in the Eastern portion of Ulwar. The boundary between Ulwar and Jeypur just touches the Banganga at this point.

To the West of Ulwar in the Jeypur territory flows the Sabi River; as it approaches the boundary it takes a Northerly course, and for some 14 miles forms the division between Ulwar and Jeypur; it then again turns to the North-East, which is its general direction. The Sabi is, except during the rainy season, quite dry having a sandy bed with low banks, and varies in width from almost 200 yards to nearly 2 miles. The banks, as a rule, are but very little broken up by the nullahs so constantly seen on both sides of Indian rivers. Into this river flow 4 streams worth mentioning. The first commencing from the Westward rises in the Gazi-ka-thana valley from the hills to the South-west of the town, and flowing almost due North, past Narainpura, joins the Sabi at about 8 miles thence.

The second stream has several sources all around Bânsur, and these together flow into the Sâbi in a somewhat tortuous course, but in a general N. N. E. direction. The third stream rises in the hills to the West of the Silsir Lake, flows parallel to the stream, supplying that lake at a distance of only 2 or 3 miles, but in a directly contrary direction past Hamirpur and Horsora, and joins the Sâbi not far to the South-east of Shahjehanpur. The fourth and last stream rises to the East of Hamirpur, flows to the North-east between Mandoar and Harsuli, and crossing the Northern boundary of the State, joins the Sâbi in the Kot Kasim District of Jeypur.

Gazi-ka-thana is thus shown to be, although in a valley, on the principal watershed of Ulwar, for streams, rising thence flow North, South and East. No streams at all in Ulwar, except very small branches, have a Westerly course. This completes the drainage system in Ulwar, which consists entirely of small streams except the Sabi, which, however, cannot be called a river as it is nothing more than a drain, and has no springs at all in it. The Sota, an exactly similar river, has been omitted, but as it joins the Sâbi in less than 4 miles after entering Ulwar, it can hardly be said to belong to that State.

The soil in the valleys of the hills and to the East is good, a great deal of it being what is commonly called black cotton soil, but to the West of the hills it gets poor and sandy, more and more so the further West you go. Where the soil is good, a great deal of wheat is grown, but in the sandy portion this crop is hardly worth sowing, unless there is water very handy for irrigation purposes. Barley is also grown. Cotton is tolerably plentiful, and is taken to Agru or Delhi. A great deal of gram, bajra, jowar is cultivated, but very little opium.

Water is plentiful throughout the country, for amongst the hills there are plenty of running streams, and in the open country water is very easily got at by digging wells. The late Rajah did a good deal for the country, principally owing to Captain Impey's (the then Resident) influence. It was under him that the Silsir Lake was formed, and the two canals to Ulwar above alluded to, were made. At a ghât on the Badi Nadi is a good masonry dam which turns the water out of the river into a small canal dug in the soil, one branch of which is carried Southwards, the other Eastwards, each decreasing gradually as the water is expended by the zemindars for their fields. This dam is only kept closed for half the year, the remaining half it is opened, and the water allowed to flow on into the Bhurtpur territory. Other canals were found amongst the hills, but all except these had been allowed to get out of repair, and were not used. There is a large sheet of water not far from Rajgarh, about the same size as the Silsir Lake, called the Deoti Lake, made by closing a gap in a ridge of hills through which a stream ran. No canals are made from this.

Places of note in Ulwar.

The principal towns in Ulwar are as follows :—

Ulwar the present capital.	Rajgarh the old capital.		
Ramgarh.	Behrohar.	Mâlakeri.	Jhindoli.
Gazi-ka-thana.	Narainpur.	Bârod.	Lachmangarh.
Tijâra.	Rampura.	Ajabgarh.	Kishengarh.
Bâhadarpur.	Pertabgarh.	Marakpur.	Macheri.
Govindgarh.	Katambar.	Mandawar.	Reni.
Naganwa.	Bânsur.	Khairtal.	Horsora.

Besides these may be mentioned Nimraun, the property of a small independent Rajah, and the jagirs of Tasing, Titarpur and Harsuli.

The town of Ulwar itself is situated as nearly as possible in the centre of the State, immediately below the Eastern slopes of the hills, and is protected by a wall around the city which communicates with a large fort on a hill above it. The wall is of mud, high and strong with circular bastions at intervals and a ditch below it. The city enclosed in this is rectangular in form, the Northern and Southern sides being nearly equal in length, and about twice as long as the Eastern side. The Western side rests on the lower slopes of the hills and is unenclosed, but the Southern wall is

carried up the slope, and is connected with a bastion of the fort alone, and the Northern wall is also carried up to the top of the hill, where it terminates in a watch tower, but this hill is separated by a deep valley from the fort. The steepness and rocky nature of this hill on both sides, and the fact of the valley having no exit to the North, practically completes the connection with the fort. In this city there are 5 masonry gateways with draw-bridges over the moat, 2 on the North side, 2 on the South and 1 on the East. The principal street runs from the Eastern gate through the centre of the city and ends at the Rajah's city palace, which is situated at the foot of the hills; from the back of this palace commences the ascent to the fort, which is paved the whole way and enters the fort in the centre of the Eastern face. The latter part of the ascent is considerably steeper; close to the gateway it is very steep. This is called the Surajpal Darwaza. The whole way up the road is in full view from the walls above. There are three other gateways, one of which the Lachmipal Darwaza in the Southern face has been built up; the Chándpal Darwaza at the Western extremity is still used and there is a foot-path up the hill to it from the village of Rawan Deora in the valley below; half-way up, this path is defended by a watch tower on a small rocky eminence in the side of the hill, but is not connected with the fort. The whole length of the path is visible from the battlements above. The fourth gateway is the Andheri Darwaza in the North-west face; this is also in use, but to no great extent, and there is but a small pathway up to it. A large broad valley about 150 to 200 feet deep running from South to North divides the fort hill into two parts, its exit being at the Audheri Darwaza, but it narrows so at this point that the interior of the valley is almost completely deflated from the hills opposite. There is a plentiful supply of water in this valley, with some masonry buildings and small gardens; no doubt if the place were besieged the garrison would take refuge here as they would be quite safe from any direct fire, but at present the sepoys' barracks and the killadars' house are on the top of the hill close to the Surajpal Darwaza. There is also a small palace on the highest point of the hill overlooking the city. The fort hill itself is unconnected with the hills around it, is very steep, in many parts precipitous, and surmounted as it is with a high strong masonry wall so dovetailed into the rock as to become almost part of the hill; it is almost, if not quite, impervious to escalade. On the West, North and East it is surrounded by a hill, which runs parallel to the shape of the fort, and except on the Eastern side is as near as possible the same height as the highest point of the fort hill. A large deep valley with rocky precipitous sides separates it from the fort, thus forming an immense natural moat on these three sides. The highest point of this valley is below the North-east face, and from this the drainage flows in opposite directions, the one stream flowing round the Northern point under the Western face and joins the stream below the Southern face, the other and shorter stream runs under the Eastern side and fills a masonry tank close to the Rajah's city palace. The hills on the South do not form one unbroken line, but are cut up by vallies running in a Northerly direction; the drainage is all into the stream, described as being below the Southern face of the fort. This stream just before it flows into the Southern suburbs of the city and into the open country, is dammed up, and forms in the rainy season a tolerably large sheet of water. These so-called streams are in reality only drainage lines, being quite dry all the hot weather. The height of the fort hill is almost exactly 1,000 feet above the city, and 1,920 feet above the sea. The highest point to the South, over the village of Rawan Deora, is the same height, and the top of the hill to the North is about 30 feet lower.

It would be most difficult, if not impossible, to get guns up on to the hills to the South, but approaching the fort from the North, I see no reason why guns should not be taken up to the top of the ridge surrounding the fort on that side, and thence a commanding fire at a range of 800 or 900 yards could be obtained on the Andheri Darwaza. At the mouth of the valley described as almost dividing the fort in two, on all the commanding points of the hills around, are isolated watch towers. A plan of the fort and city and the hills immediately around has been carefully executed on a scale of 12 inches to 1 mile, and may be obtained on the full scale or on half at the Surveyor General's Office, Calcutta. The heights of the most important positions are shown on this map, and a reference to it and the standard map of the country on the scale of 1 inch=1 mile, give a better idea of its position and strength than pages of written description. This is the only really large and important fort in the whole State.

Rajgarh is a large town well fortified by a masonry wall with an outer wall of mud, and the whole surrounded by a ditch. It is embedded amongst hills, which, however, are of not nearly so great a height as those over the city of Ulwar. The hills to the South which are nearest to the city are about 200 feet above it, and are defended by three small forts connected by a curtain wall, having bastions here and there.

At Hamirpur are the remains of a very large fort, which is said to have been built by the Emperor of Delhi, but the site seems to have been objected to, as it was commanded from the South by a portion of the hill, which could not well be defended. In consequence of this defect it was deserted, and the present fort of Ulwar was built.

There is also a large fort on a small hill near Tijara, but this also, although of recent date, is so much out of repair as to be valueless as a place of strength. There are several large masonry buildings still standing, but the walls have been allowed to go to pieces. There was some talk, at the time the Survey was made, of the Rajah rebuilding it.

At the following places are small masonry forts of no real strength or importance, and not capable of holding more than 400 or 500 men at most:—

## Small Forts.

Gazi-ka-thana.	Titarpur (Jagir),	Bhodohka,
Kankwari.	Kishengarh,	Bansur,
Tehla,	Bahadrapur.	Hajipur,
Chooberja (in ruins).	Lachinagarh.	Pertabgarh,
Kasin Kot.		

and at

Ragoonathgarh.	Chandrah.	Badeogarh.
Bajrangarh,	Bairohar.	

are mud forts.

Noganwa, Barod, Nimrana (belonging to a small independent Rajah), and Malakeri, are towns enclosed by a wall and more or less fortified.

## Walled towns.

The fort of Kankwari mentioned in the above list is on a small hill situated in a valley, and is very difficult of approach. It is but a small place and is completely commanded from many points at a distance of about a mile. It is now used as a place of confinement for political prisoners, or was so a few years ago. The water is all more or less very bad, especially from one particular well, which is said to be so bad that no man constantly using it will survive a twelve-month. Rumour says that this water was given to any prisoner whom the Rajah wished to get rid of quietly.

## Kankwari.

In the North of Ulwar the inhabitants are mostly Mohamedans (Mavatis), but of by no means a strict sect. In the days of the Mohamedan rule they were forcibly converted, and have always continued to be almost as much Hindoo as Mohamedan. None of the aboriginal tribes of India are to be found in Ulwar. In the South they are almost exclusively Rajputs, but all over the country a great number of the officials are Mussulmans.

## Inhabitants.

The road between Delhi and Jeypur passes through the North-west corner of this State over a sandy soil. As this route is one of those described in the published book of routes in the Bengal Presidency, it would be useless to enter particulars about it here.

## ROADS.

The Delhi and Jeypur Road.

From Ulwar to Tijara is a partially metalled road; for a good many miles out of Ulwar it is in good repair, with all or nearly all the nullahs bridged. Those that are not bridged present no great difficulty. The last two or three miles into Tijara are also pretty good, but in the centre it is but little more than a country road, no attempt having been made to keep it in order. Beyond Tijara towards Delhi it is not metalled, but as far as the operations of the Gwalior Survey were carried, only six miles beyond Tijara, it presented no obstacles to wheeled vehicles. From Ulwar to Tijara is thirty miles, the halting place between being at Khanpur, half a mile to the East of the road, and sixteen miles from Ulwar. There is a small bazaar here, and if notice is given there is no difficulty in procuring a large quantity of supplies. Water is plentiful from wells and a large tank which never dries. Tijara itself is a large town, with a bazaar.

## Ulwar to Delhi.

The first five or six miles of this road are metalled. Between the fifteen and sixteen miles it crosses the Badi River unbridged, but the passage is not difficult, the road being cut through the high banks on either side. The bed of the river is gravelly. At eighteen miles the road reaches Basoda, a large village, thence in less than three miles it crosses the boundary into Bhurtpur.

## Ulwar to Bhurtpur.

From Ulwar to Rajgarh a road was laid out and commenced by Captain Impey at the time he was Resident at Ulwar, but when he left it was not carried on and has never been finished. At about 13 miles it passes through Malakeri and 11 thence to Rajgarh. At 8½ miles from Ulwar it crosses the Baraki Nadi, and 2 miles beyond Malakeri two dry nullahs. The original idea was to carry this road on through Baswa and Sainthal to Jeypur, but some difficulty arose between the two Rajahs and put an end to the plan. After leaving Rajgarh six miles brings you to Beswa, and ten miles further to the large village of Guda, both in Jeypur; as far as this there would be no difficulty, but from Guda to Sainthal, twelve miles, the road crosses a branch of the Banganga River, which has an intricate net-work of nullahs on either side.

## Ulwar to Jeypur.

A good country road. It passes through one of the breaks in the hills mentioned in the description of them, and so escapes any difficult pass, but all along the valley crosses strong nullahs; there is no attempt at bridging these, but the road is sloped down at a fairly easy angle on either side, and thus makes the crossing pretty easy. For the first three miles it passes close under the hills, after which it bends slightly to the left, leaving Jatana about half a mile on the right. At about the 5th mile it crosses a nullah, a second at 5½ miles and a third between the 6th and 7th miles. It then continues up the valley between two nullahs, till within half a mile of the village of

## Ulwar to Riwari.

Ghatta, when it crosses another smaller nullah. Ghatta is a moderately large village, nearly thirteen miles from Ulwar.  $2\frac{1}{4}$  miles after passing this village the road leaves the hills, and in  $3\frac{1}{2}$  miles arrives at Mator, and in  $5\frac{1}{2}$  at Rasgaon, when it crosses a nullah.  $2\frac{1}{2}$  miles from Rasgaon it crosses another nullah, after which it takes a direction nearly North-East up to the foot of the Mandoar hills, within about  $1\frac{1}{2}$  mile of that town. Mandoar is  $11\frac{1}{2}$  miles from Ghatta and  $24\frac{1}{2}$  from Ulwar. From Mandoar it runs nearly due North through Banot, nearly 5 miles from Mandoar, and the small village of Ajerako at 7 miles. In less than 1 mile thence it reaches the Sábí river, where it crosses into the Naba territory, from which river Riwari is about 16 miles. The Sábí is a dry sandy river bed, about half a mile across.

A mile after passing Jatana on this last described route, a road branches off to the left, and passing up the valley goes to Jhindoli. A mile before reaching that place it crosses the hills; the pass is altogether about  $\frac{3}{4}$  of a mile long and very rocky, but the road is made fairly practicable by rough paving; country carts cross easily. Jhindoli is nearly 13 miles from Ulwar. From here there are several good country roads in a Northerly direction, but about which it is not necessary to make special mention.

The Jhindoli pass might be made use of in going to Narnoul, and it would be the most direct route, but the best road would be that described as going to Riwari, branching off from it to the North-West at Mator,  $16\frac{1}{2}$  miles from Ulwar. At  $1\frac{1}{2}$  miles from Mator, it crosses a nullah, and another at 2 miles; and thence for 8 miles without any obstacle, till it crosses a small stream, a branch of the Sábí.  $11\frac{1}{2}$  miles from Mator is the village of Jajharpur, half a mile to the South of the road. At a little less than 15 miles from Mator, it crosses the Sábí river, which is here only 200 yards across.  $7\frac{3}{4}$  miles beyond the Sábí and  $37\frac{1}{2}$  miles from Ulwar is the town of Bairolar. After another  $4\frac{1}{2}$  miles, the road passes close to the village of Moharajwas, from which place the boundary into the British territory of Jhujjur is only  $8\frac{1}{2}$  miles, 7 or 8 miles inside which is the town of Narnoul. The probable halting places on this route would be Ghatla, 13 miles, Jajharpur  $27\frac{1}{2}$ , Moharajwas 42, Narnoul 53 or 54, the distances being reckoned from Ulwar city.

There is a good country track throughout the whole length of Ulwar from Shahjehanpur, a British Thannah in the North of Ulwar to Sainthal in Jeypur. It crosses the Sábí at Kasim Kot, which is  $5\frac{1}{2}$  miles from Shahjehanpur; it then proceeds Southward to Jhajapur 10 miles, Samda  $12\frac{1}{2}$ , close by Babaria  $15\frac{1}{2}$ , Saipur  $18\frac{1}{2}$ , Bansur  $22\frac{1}{2}$ , Narainpura  $34\frac{1}{2}$ , Gazi-ka-thana 42, Bangroli 44, Guda 46, Bamanwas  $50\frac{1}{2}$ , Ajabgarh  $58\frac{1}{2}$ , ruins of Bhangarh 65, Sainthal 69. As far as Narainpura the country is all open, with only small nullahs here and there, with the exception of the Sábí at Kasim Kot, which is nearly 1 mile wide. At Narainpura it enters the Gazi-ka-thana valley; (from Narainpura to Bamanwas there is a direct road leaving Gazi-ka-thana on the left, whereby  $1\frac{1}{2}$  mile is saved) : as it approaches Ajabgarh, the valley rapidly narrows, and the drainage, which has hitherto been from South to North into the Sábí, now runs from North to South, and flows into the Bangunga. For more than 5 miles after leaving Ajabgarh the valley is only about 1 mile wide, the hills being continuous and steep on either side. At Bhangarh the hills on the left hand or east side cease, but those on the West continue for nearly 3 miles further.

This road starts in a Southerly direction, skirting the hills, and passes half a mile to the West of the village of Uman at  $5\frac{1}{2}$  miles from Ulwar, and reaches Akbarpur in 9 miles. At Uman it crosses a large nullah. Within a mile of Akbarpur it crosses 2 more nullahs, and at 2 miles from Akbarpur or 11 from Ulwar it enters the hills at Bara, when it continues due West to Kushalgarh,  $15\frac{1}{2}$  miles from Ulwar, with hills covered with jungle on both sides. It crosses the stream of this valley more than once between Bara and Kushalgarh. From Kushalgarh there is a road branching off to the North up a side valley, past the hot springs at Talbrich to Narainpur, about 11 miles; there is no pass over the hills this road, the valley being open at either end. The Gazi-ka-thana road follows the main valley to the South-West, and in  $5\frac{1}{2}$  miles, after crossing and recrossing the stream, reaches Siriska. For 3 miles after leaving Siriska the road is very rocky, passing over some of the lower spurs of the hills, but is quite passable for carts, and, after once more crossing the stream on emerging from the hills, reaches Gazi-ka-thana, 9 miles from Kushalgarh and  $24\frac{1}{2}$  from Ulwar. The stream referred to as running down this valley is a running stream of no great depth in the cold weather, with a rocky or gravelly bottom. Where it is crossed near Gazi-ka-thana the stream has high banks, but the road is gradually sloped off on either side. This road through the Kushalgarh valley continues across the valley beyond Gazi-ka-thana to Bairat in the Jeypur territory, 9 miles on passing through a gap in the hills on the opposite side of the valley.

From Uman on this last road, another branches off, turning round in a Northerly direction, and runs past the Silsir Lake for more than 15 miles up the valley, with high rocky hills on either side, and crosses the hills at the end by a roughly paved road, half a mile from Hamirpur. It is a jungly rocky road, constantly crossing the drainage from the hills. From Hamirpur to Harsora about 5 miles, it crosses several dry nullahs. From Harsora are good country roads to Bairolar 13 miles, and Riwari about 31 miles, and also to Shahjehanpur by the Shahjehanpur and Sainthal road before described at Sathdar 3 miles from Harsora.

These are all the principal roads and passes in Ulwar. All over the eastern and more open parts of the State are numerous tracks, all more or less easy for carts, and many large villages, making it easy to march in any direction that may be required.

At Mandri iron ore is smelted, but the ore is brought from Bori-ka-thana at a distance of about 20 miles. Near Rajgarh iron ore is also found, and is there smelted. From the hills in the neighbourhood of Bairohar,

Tasing, Tehla, and Akbarpur, iron ore is also obtained and is smelted in these places or villages near them.

Near Judawas, a few miles South of Gazi-ka-thana, copper ore is found; the rock is hard and generally below the surface; some of the mines are 50 or 60 feet deep, but seldom, if ever, deeper. To break the rock and

make it easy to pick out, the miners light large fires in the bottom of the mines, and the heat causes the rock to break up, and it is then easily quarried with their rude instruments. The stone yields from 1 to 5 seers of pure copper to 1 maund of ore. One-fourth of the produce goes to the treasury, the remainder belongs to the miners. South of Rajgarh, in Jeypur, copper ore is also worked.

At Bhangarh are the ruins of a fine city, beautifully situated in a small basin in the large hills running from Ajabgarh Southwards. Towards the east it is open, but there are the remains of a strong wall protecting

this portion. A stream of water flows through the city. In the upper part of the basin overlooking the city, are the remains of some large buildings and a garden; the stream has here been made to fall over a partly natural and partly artificial water-fall into a deep pool, and over this pool is a temple still inhabited by some Brahmins, now the only inhabitants of the place. On the prominent points of the hills around are some old buildings and temples very picturesquely situated. The streets of the city itself can still be traced; several temples around it are in very fair preservation. The reason given for its being deserted is, that a Brahmin once cursed it, and ever after the place was haunted, and the inhabitants would not stay there. It is said now that you may still hear music and unnatural sounds in the bazaar at night.

Amongst the hills about 4 miles West of Talha are the remains of what must have been a very fine city, known as Paraganar; the heights around are fortified by a wall and small forts, more or less in a state of

preservation, but the city itself is in total ruins, with the exception of one temple called "Lilkant," which is said to be 1818 years old. It is prettily situated under the hills amongst large trees, and is itself a sight worth seeing in consequence of the very rich carving with which it is covered. Some Brahmins live there, who were very civil, but would not allow me to enter unless with bare feet, so I did not see the interior. This temple has, I was told, been photographed, and notes have been taken about it, which doubtless the Asiatic Society possess. A fair is held here every year. All the stones scattered about the site of the city are carved, some most elaborately, with grotesque figures, but little more than the foundations of the original buildings now remain. There is one curious slab, with an enormous figure carved in relief on it; it has been only partially excavated, the lower portion still being hidden. From the feet to the shoulders is one single slab of stone, but above the shoulders is in a smaller slab joined on. It must be altogether about 15 feet in length, by 5 in breadth. They say that it represents the old Hindoo God Nogja. Across the valley in which the city was situated and close to it are the remains of a good masonry dam, which must have held up a considerable body of water.

At Talbrich, at the foot of the hills East of Narainpur, are some very old temples, date unknown, built round a hot spring. The water, which is quite clear to look at, fills three cisterns, built about 8 feet below the ground;

the highest temperature I could obtain was 108° Fahrenheit. A small well close by of no great depth is sensibly warm. The overflow from these cisterns is carried off by a small drain, which flows away through a dense patch of palm and tree jungle of the thickest description.

Notes by MESSRS. C. A. R. SCANLAN and W. J. CORNELIUS, Assistant Surveyors attached to No. 1 Topographical Survey.

#### TRADITION of BUDI or OLD CHANDERI.

According to the fable, of which the following is about as accurate a translation as I can give, I have been unable to determine with anything like approaching to precision the exact age in which the narrative begins, from the circumstance of the *Mawantar* not being alluded to, but as "Indian chronology consists of fabulous periods of extravagant duration," it will be immaterial for me to endeavour to trace the initial date here, veiled in the darkness of myth, which even the twilight of local tradition does not assist me to unravel. Therefore I shall at once proceed with my narration:—

In the satya (or first) yug, the name of this place was Chandrawatti; it was founded by a *Raksh Mordiant*, who in the tretu (or second) yug was killed by *Srikrishna Bhagwan*. After him *Uparchar Bas*, the Raja of Chandarwansi (of the lunar dynasty), Indra's great friend, obtained possession of the city through the latter's machinations. The appearance of the place was like unto the light of the moon, and hence its name *Uparchar Bas*, descendant. *Rajacheth* was born in the Dwapar (or third) yug, and from that day the old name of the town was discarded and was known under that of *Cheth Purri Nagar*. Towards the close of this third age *Shishupal* ascended the throne, and under his régime we find that Chanderi was called by the name which it now holds,—so much I am told is gathered regarding the *old locale* from the shaster. The site of this ancient town has been traced and

determined on the banks of the river, or about 7 miles North of the present one. After the last mentioned reigning prince, Raja *Karam Pal* assumed the regal purple, and established his capital on a new site. One day out on a shooting excursion he espied a pool of water, and being probably hot and weary in his pursuit of game, he made for it and laved his hands in it, and found to his astonishment and joy that his hands had recovered from the leprosy from which he was suffering. In grateful acknowledgment of the miracle the waters of this pool had effected on him, he caused it to be made *pucca*, and gave it his own name. It is now said to be in existence, and is known by the name of *Parmeshwar Talon*. At a quarter of a *kos* off he raised a shrine to *Jageshwari* (Devi), and there he raised the city and fort, the old ones having been abandoned by him and his people. Here ends the heroic age, and we begin to approach a period on the narrative of which we can perhaps place a little more reliance.

We are told that the *Rajpûts* now began to exercise paramount power, under which we are also informed that Mahomedanism had no existence, till from the direction of Mecca came six *Vallis*, Kutbuz Aktah Araf, Shek Suliman Gosh, Shek Abdullaya Jal, Shek Hassan Sarmasth, Makdûm Shek Vazzauddin, Hajji Muzafarajan. They proceeded to Ajmir, where resided Khoajja Saheb, the Sirdar of all the *Vallis*, and to him presented themselves. As he had two other such *Vallis* given certain tracts of country to them, he presented *Chanderi* lands, whither they went with their friends and armed hosts for the purpose of usurping power. Their arrival there dates about the year 643A.D. Owing to their superior force and power, they overcame the lawful lords of the country, whom after displacing they took under their protection, to fully ensure which the *Rajpût* Raja gave over to the possession of the Mahomedans his daughter, to be disposed of at their supreme will and pleasure. She fell to the lot of Shek *Vazzauddin*, to whom she was subsequently married. But notwithstanding this exhibition of their complete subserviency, the Hindus still entertained fears of being unsafe, and consequently sought protection behind the walls of the adjacent fort, Rai Sing, in the possession of a zamindar, with whom they entered into an offensive and defensive alliance. The township of *Chanderi* included 52 parganas, over which the six *Vallis* established their rule, distributing portions of the revenue to their friends and religious associates. They reigned 100 years, after which time we are told that out of their own loins they propagated 12,000 people called *Shek Zaddos*, who built their own wells, houses and mosques. Thus was Mahomedanism with its religious forms and social customs established. After a time the fugitive *Rajpûts* again appear on the scene with their friends of Rai Sing fort, attacking and utterly defeating and demoralising the *Shek Zaddos*, who fled to some locality where *Sherkhan Pathan*, the Commander-in-Chief of the Emperor's forces, was stationed. They related their griefs to him, who with his forces, in conjunction with the remaining *Shahzaddos*, regained possession of *Chanderi*, and from the 52 parganas gave 25 villages for the support of the *Shahzaddos*, the reigning Emperor being then Dowlat Hazarat Nakhos-o-Din Mohommad Mahir Badsha Gazez. The Hindus, under the name of *Golias*, repossessed *Chanderi*. Who these *Golias* were it is hard to discern, but from a *Sannad* which I had perused, they apparently were a section of the *Rajput* tribe, but it seems very inconsistent, for further on they are called *Kamins* (low caste people), probably from their being a sub-divisional class. How they obtained possession of *Chanderi* it is not mentioned, but we are told that subsequently *Ramsai*, a *Bundela*, wrenched the supreme authority from their hands. This *Ramsai* was an inhabitant of *Bundelcund*, and how the word *Bundela* originated appears from the following: They are set forth as *Thakurs*; one of them, to appease the wrath of *Mahadeo*, was offered up a sacrifice, with the ordination that his head should be severed from his body and held over the image of the God, so that one drop of blood (*bund*) may be allowed to fall, on it; hence the agnomen *Bundela*. It appears that *Ramsai*, knowing the weakness of the *Rajpûts* for intoxicating drugs and drinks, encouraged them in it, until at last he succeeded through his emissaries to so obfuscate them as to be easily enabled to secure the stronghold.

We next find the crown being usurped by another family. In *Ondcha* there was a king named *Madkursha*, who had two sons, *Ramsa* and *Vrisang Deo*. *Ramsa* reigned in *Ondcha* 13 years and then marched to *Chanderi*, which he wrenched from the hands of its rulers. After him came in succession *Ramsa*, *Bhnratsna*, and *Devising*. In the reign of the latter, a barber's daughter took service with him, and as is customary in eastern countries with the barber caste, was employed in shampooing him. One day she happened to rub the sole of his feet, which process, instead of affording him any comfort, caused a burning pain over his lower extremities, from which he divined that the girl, instead of being the child of a barber, was that of a brahmin. Having, according to Hindu notions, committed a sin, he convened a council of his trustworthy advisers, and asked what punishment he should suffer to expiate his crime. The penalty inflicted on him was to walk barefooted over seven heated pans, which penance forthwith, it is told, deprived him of the powers of procretniveness. His Rani, not having hitherto borne him any children, in wild despair at the idea of having no child to be heir to the throne when her husband should expire, rushed to the temple of *Jageshwari* and in sadness offered up her prayers to him. She was told by him in no way to despair, but to continue as usual in her household offices, and that she would soon be blessed with a son, whom she accordingly bore, and named *Durag Sing*, who being no doubt the incarnation of *Devi*, was therefore brought up at his feet. The God took the lad under his protection, tutored him in the arts of peace and war, and as a token of his esteem for him, presented him with a sword. When grown to maturer years, he was seated on the throne. He now and again used to visit the Emperor at *Delhi*, and contributed a body guard of 300 sowars to him. In the vicinity of *Delhi*, there came into note a *Banjara*, *Baglia* by name. He had a large following, and gave the Emperor immense trouble by harassing and robbing not only the people of the country, but the very imperial city itself. Every measure had been taken to capture him, but to no avail. At last *Durag Sing* was ordered to place himself at the head of an expedition, and told at all risks to bring in the head of the rebel. *Durag Sing* volunteered to go alone and unaided to effect the commands of lords. It was through the ruse of disguising himself as a bridegroom proceeding to consummate his marriage that he obtained an entree



into the camp of the robber chief, who received him most cordially, and whilst carousing with the disguised chieftain in the act of dispensing hospitality to him cut off his head, which the elated Durag Sing presented to the Emperor, who was exceedingly jubilant at having got rid of so formidable a foe, and as a mark of gratitude and approbation according to an eastern custom "pardonned the young brave three murders," which, I suppose, means had he at any time felt inclined to do away with his own personal enemies, he was allowed by Royal proclamation to dispose of them himself or through his order! He also awarded him permission to sound his *danka* (drum) in the vicinity of the Royal sleeping apartments! We now hear of his return to Chanderi, bearing back with him an ensign made of tow, representing a scalp with the hair depending, which was figurative of the Banjaras' head he had decapitated; he was succeeded by his son Durgan Sing. This man erected some buildings, on one of which there is an inscription still extant, bearing date 1778 Sammad. He established Ramnager in Sammad 1767, and built a nine-storied building and so on. Through three other following generations we find nothing of note recorded, till we come to the fourth, when Praja Pal takes up the gubernatorial reins. I only mention him because he is said to be a man queerly formed with the tips of his fingers hanging below his knees when standing erect, he was called an Ajon Boa. In Sammad 1868 (A. D. 1812) Jan Bathis (John Baptist Filose) was sent by the then reigning Scindia, Janko Ji, with 12 regiments to capture Chanderi, which he succeeded in doing by *sortie*. The captive prince and his retainers were but scantily provided for, and therefore took to committing daring and extensive robberies. When again "Jan Bathis," with another general "Laxshiman Phalke," were again deputed with another force to quieten and settle with these turbulent people, it was at last resolved that two-thirds of the revenues should go to the Gwalior State, and one-third go to the support of the Chanderi Prince, and that he should owe fealty to Scindia. This settlement came about in Sammad 1887, when in Sammad 1900 (A. D. 1844) the Chanderi territory in its entirety was handed over to the British to defray the cost of the Gwalior contingent. During the year of the mutiny, we find Mardan Sing conducting affairs at Chanderi by sanction of the British authorities at Lullutpoo, but his brethren are reputed to have been too obstreperous for him, and we hear of them taking an active part against us in these troublous times. The Resident at Indore took possession of the fort, disarmed the troops, and made a prisoner of the Raja, who is still in durance vile. In Sammad 1918 (A. D. 1862) I am told we exchanged the Chanderi territory for land across the Betwa River, which now for a great length of its course forms our boundary. In conclusion, I must not fail to mention the fancy looms of Chanderi. It was to supply the wants of the households of the Shalzaddas that they were established. The cloth was thus valued, a piece worked up by thread in weight equalling a rupee sold for a rupee. The workers are called *Mominis* and *Kolis*. The starch and glaze peculiar to this cloth is given by a nut called *kanda*, found in the surrounding jungles. It is said in former times, when thread made of the cotton of Berar was used, the texture of the cloth was so particularly fine as to surpass any other manufactured in the country, the names given to them being *manindi*, *gara judami*, *charkhana*, *dorwa*; these were all manufactured in former years, but since the introduction of English thread, and since Scindia took possession of Chanderi, it is declared that the texture of the cloth is much coarser, and that there is now no one to be found who can manufacture the fine thread previously used; all the different kinds of cloths fringed with and made of silk and gold thread in use among the Maharattas, 'such as the *pathal* and *choli* (for women), *prag mandil dhoti* and *dupata* for men,' are extensively made, and some that I saw were nearly first-rate, but I really do not think they surpassed those I have seen turned out in some of the famous looms of the Deccan, though I will admit them equal to them. The workers in this trade at Chanderi religiously assert that the air and water have all to do with the excellence of the material there made.

The town of Chanderi is immediately situate below the head of the second scarp rising from the

#### Physical features.

Western plains bordering the Betwa River. The block known as the city covers an area of more than half a square mile, with a wall which shows that the side of *Debris* extended over a space equal to that of the present Lashkar of Gwalior, and there are distinctly traceable ruins, which prove most clearly that in the North, the suburbs stretched away to a distance of 2 miles, to the West a mile and a half, 2 to the South and 1 to the East. On the extreme North there exists the old palace in fair condition, exhibiting architectural features which call for the admiration of the beholder, and I think it would be worth the labors of the archaeological survey to investigate the Arabic and Sanscrit inscriptions, together with other features in the town itself and the buildings surrounding. I would call to their special attention "Katti Ghatti" to the South of the city, where a cutting has been for the road passing over the hill in solid rock, leaving an archway, sufficiently high for an elephant and howda to pass under with ease. From the top of the hill South of Chanderi, and on which the fort is built (of it I shall speak more fully hereafter), the scenery of plain, forest, and hill is truly beautiful, and the miniature lakes filled with water and swarming with game, especially enhance the scenic appearance presented to the eye of the tourist, and there before him he views a landscape so rural as to remind him of those spots he has wandered over in the mountainous districts of the British Isles. The nature of the adjacent hills is broken, lined with precipices of sand stone formation, covered with dense forest of Sal, Dhaw, Khirni, Khair (*catchu*), &c., and a close undergrowth of heavy grass, and low entangled bush jungle, with water abundant everywhere and of a very good quality.

The fort was built by Raja *Karam Pal*, and was enlarged under the régime of the Shek Zaddas, and it was during their tenure of power that

#### The fort

three water reservoirs, all containing water and 3 specially, dug and lined with masonry. The area the fort occupies measures about  $\frac{1}{2}$  to  $\frac{3}{4}$  of a square mile, the walls extending in length  $2\frac{1}{2}$  miles, and having on the North and West an approximate breadth of 20 feet, while those on the North and East may be gauged at a breadth of 5 feet. The fort is

capable of mounting about 20 guns; it was dismantled, as is already known, by Colonel Keatinge, and as a matter of my own individual opinion, is not now in any position to afford shelter to an Indian force hostile to the British. Its great weakness consists in its sloping to the south, where a neck of about 180 yards in length and 15 in breadth separates it from a hill plateau, commanding its most salient point, and it was from this spot that Colonel Keatinge silenced the guns on the southern and western bastions and effected his entrance, not without having the obstacle of meeting at the rock joining these two hills a deep indentation of about 15 feet in breadth and 10 in depth. The bastion immediately above is known as "Ghadda Burj," and has the following tradition attached to its erection: after several efforts had been made without avail to build it, as after each attempt it came down, it was resolved that a human sacrifice should be made to the Gods, and so an unfortunate old man with his wife was condemned to be buried alive in the foundation with a drum, which was for 12 years afterwards heard ominously sounding at the dead of night. Of course after this offering of two human lives had been made, it is religiously believed that the bastion took form, shape, and stability, and yet in after years it was this very bastion that was blown down by our shot and shell and afforded us the entrance into the fort.

*Extract from the Narrative Report of Colonel G. H. SAXTON, in charge No. 3 Topographical Survey, Central Provinces and Visagapatam Agency.*

Though my movement, as described in the last para., was from east to west, and then from west to east, the result includes the triangulating of a considerable distance along the run of intricate ghâts north and south, up to which the old Ganjam survey extended, as shown in Atlas Sheet No. 108. I observed on Duderri Peak, which, with one exception, is the highest point all along the eastern side of India. The exception is a single peak, a few miles further south, on which I have an intersected signal, and which will come under our detail survey next season. The relative heights are Duderri H. S. 5,470 feet, and Arma H. S. 5,500 feet. The latter peak, though a little higher at the point, has no high plateau around it, but Duderri stands in the centre of an extensive plateau, running for several miles quite treeless on the high portions, and with elevation close upon 5,000 feet, as shown in the maps now being sent in. There are never-failing springs in many places, one of them I observed at and give as 4,756 feet above sea; a comparison between this plateau and that of Mahendargiri, about which a party from Calcutta recently made a special report, and which is also shown on my map (Saora) of this season, would leave no doubt of its superiority in many respects. There are villages and cultivated valleys in the neighbourhood, at comparatively little less elevation. A path constantly used by villagers passes by the water spring above alluded to. The Eastern Ghâts continue to run at an elevation frequently approaching and even exceeding 5,000 feet for a considerable distance south, as shown in this season's maps, and as will be shown in the next two seasons', including the better known Gallikondah range, on which an unsuccessful attempt at coffee growing has been made. The northern portion of the Gallikondah range is included in this season's maps, and I would here notice a very pleasant place where I was this season encamped, given in my map Latitude 18°20', Longitude 83°5', and height of village station 3,740 feet. I was encamped at that elevation in nice open cultivated fields near Puddawala village.

The Saora country, so long an unsightly gap in the old maps, has been completely surveyed.

*Detail survey.*

The preparation of ground by my triangulation of previous season was quite satisfactory, and I think the map now prepared is up to a high standard, and having been completed without exciting any untoward feeling amongst the Saora tribes, so constantly up to a very recent period actively hostile to every approach of civilization, is creditable to my survey party. Mr. Harper especially deserves your commendation. The portion surveyed by him is that inhabited by the most unruly portion of the Saora tribes.

*Notes by Mr. R. W. CHEW, Surveyor, from information collected in the field by himself and Messrs. Adams and Pettigrew, Assistant Surveyors.*

Between the villages Mandigura, Latitude 18°41'54", Longitude 82°59'20", and Bora, Jeypur, Vizagapatam Agency. Subter- Latitude 18°16'24", Longitude 83°3'29", is a small range of hills, beneath the terminating three tops of which flows a river forming a tunnel which has never been explored, and into which the natives of the country are afraid to venture, believing such an attempt would be fatal, as was the case, they say, to a party who accompanied a Mr. Payne in his futile attempt at exploration some years ago. All the people of the country who then entered died, it is reported, a short time after. His Highness the Maharajah of Vizianagram has offered a reward of Rs. 500 (so the villagers say) to any one who succeeds in going through. The legend attached to this extraordinary freak of nature is, that in order to prevent the junction ("marriage") of this nameless stream with the Paddagonda River, one of the Hindoo Deities of anti-conubial propensities threw a hill of earth in the way, but another Deity holding different principles removed all difficulties by piercing the hill with his finger. The length of the tunnel is about  $\frac{1}{4}$  of a mile in a direct line, but its course is said to have many windings.

About midway between Manda village, Latitude 18°35'29", Longitude 82°41'15", in Jeypur, and the Guradi River at the eastern foot of a small ridge of hills, is an oblong stone standing about five feet out of the ground and bearing a lengthy inscription, which is nearly obliterated, said to have been placed

Inscription on stone slab.

there some centuries ago. And on the same ridge is a little top which was the residence of a European during the lifetime of the father of the present Raja of Jeypur. On the slope to the north of this top and between it and the river are the remains of a mud wall ; and it is not unlikely that the hill was at one time intended as a stronghold, but the villagers can give no satisfactory information, and upon being questioned minutely become suspicious and silent. There are two forts in ruins,

**Strongholds.**

Latitude  $\frac{18^{\circ}42'54''}{18^{\circ}41'58''}$ , Longitude  $\frac{82^{\circ}44'50''}{82^{\circ}43'30''}$ , both on the Golagad River, but neither of them, even in their best days, could have offered any resistance to Europeans or troops with fire-arms, though they may have done very well as a protection against arrows.

**Tribes and customs.**

The portion under survey during last season is inhabited chiefly by Gadbas, Purjabs, Konda Doras, and Malis.

The Gadbas are of two distinct castes, though in general appearance and habits they are much the same. They are very fond of brass ornaments, and their women wear coils of brass-wire about six inches in diameter in their ears and about their necks, which are also furnished with a plentiful supply of beads. In addition to these, they have a band of bright colored glass beads and narrow plates of brass on their foreheads, and a bundle composed of thin cord made from the bark of a creeping plant called "Siali," and tied about their loins. This, they say, enhances their beauty and gives them strength, enabling them to perform the exceedingly hard work that falls to their lot ; for with the exception of a little ploughing, the only occupation of the men seems to be to remain in a state of drunkenness. The women make their own cloth from the fibre of a plant growing wild about the hills called "Kerong," which they mix with cotton and weave into a sort of coarse cloth much more durable than that the men wear, which is made of cotton only and purchased from the weavers of the country. The labor in making this kind of cloth is so great that it is difficult to persuade the women to sell a piece even at a high price. Their villages, like those of the Kondas, are in two parallel barrack-like rows of rooms, with a space between, usually furnished with a shed, where all their consultations and festivities are held ; and during the cold weather, small hive shaped huts are built, about 4 feet high, and as many in diameter at the base, of twigs plastered over with mud, to serve as the sleeping apartments of the village boys. The door is just big enough to admit of a boy of ten years creeping in with difficulty on all fours, and the floor is littered with straw. Into each of these 4 or 5 boys creep at night-fall and pass a comfortable night, which their want of clothes and the danger of sleeping by a fire would deprive them of. Their marriage customs are curious ; the bride is purchased for from 10 to 20 Rupees.

The Konda Doras (hill gentlemen) are regarded by the other villagers very much in the same light as the Todas on the Neilgherries, i. e., as lords of the soil. They are comparatively few, as also are the Malis or gardeners, whose villages are extremely pretty ; the nice green gardens of vegetables on the slopes having a very imposing and pleasant appearance. Streams to water these gardens are brought sometimes a distance of two miles, and speak well for the engineering skill of the Malis.

Besides these castes every village has its Doms or weavers, men who are now of no account and usually very poor ; but during the time the Meeriah sacrifices and Kond battles were prevalent, with the Doms rested the question of peace or war ; and as they had the knowledge of both the language of the hills tribes and Ooria, they were indispensable.

**Cultivation and trade.**

Since the new road has been opened, connecting Jeypur with the coast, the cultivation of the table-land is better attended to. Large quantities of Raggy and "Olsi," a kind of oil-seed called Niger by the merchants at Bimlipatam, who export it largely, are carried away by dealers, who purchase it very cheap or barter salt for it. Binjaris from the Central Provinces, who used formerly to take other routes, have been attracted by the new roads, along which thousands of bullocks are to be seen during the dry weather laden either with salt or grain.

**Nowghat Road.**

It has been proposed to render the road up the Panchipanta Ghât accessible to carts ; and towards this the Jeypur Raja has contributed handsomely. A considerable business is also done in skins and horns, and the villagers are glad to buy the skins of sheep or goats which have been slaughtered for the use of the camp.

In Latitude  $18^{\circ}30'3''$ , Longitude  $82^{\circ}43'12''$ , is Tuba, a village of fifty houses, which is inhabited by Mussulmans, whose number is being rapidly augmented by converts, who can be easily distinguished from their Hindoo brethren by their scanty beards and the ridiculous airs they give themselves in imitation of those whose religion they have embraced.

In Latitude  $18^{\circ}33'43''$ , Longitude  $82^{\circ}45'57''$ , is the large and remarkable village of Nandapur on the Gangasani River. It is the residence of a Nigaman, a revenue collector and overseer in the pay of the Jeypur Rajah, a Police station, and the head-quarters of a Subordinate Magistrate. Near it are three temples now in ruins, of very elaborate workmanship, and composed of huge slabs of stone fastened together by strong bolts of iron, one about a mile North, and the others close together about the same distance East.

*Notes about the Saora, by J. HARPER, Surveyor, assisted by Messrs. May, Claudius, and Pettigrew, Assistant Surveyors.*

The tract of country lying between North Latitude  $18^{\circ}50'$  and  $19^{\circ}15'$ , East Longitude  $83^{\circ}50'$  and  $84^{\circ}30'$ , inhabited by the Saoras, and hitherto known as the "Saora Gap," was, till within the last few years, almost a "terra incognita" to Europeans, and is yet perhaps so little known that a record of the observations of the party who have just surveyed it, of the history, general aspect and resources of the country and customs of its inhabitants, may not be out of place. It comprises parts of four native States, Pedda, Chinna, and Parla Kimidy and Goonipur belonging to the Rajah of Jeypur.

The portions belonging to the three first named are managed by hereditary petty chiefs, called Prissoys and Paters, whose families have, according to their own account, held them from time immemorial. They keep their own Paiks and pay an annual tribute to their respective Rajahs, which they collect the best way they can. Goonipur is managed by an agent of the Rajah of Jeypur called a Negoman, whose tenure of office is temporary. The Saoras Proper, or those who know little of any other than the Saora language, extend but a small distance beyond the boundaries of Goonipur and Parla Kimidy, the rest generally using the Oorya language as their medium of conversation with strangers.

It was among the Saoras Proper that the emeute which was the cause of the military occupation of the country by the British Government, and the consequent establishment of Police stations through it, commenced.

Up to that time they had only had to deal with Paiks, and generally came off masters, and among other accounts of fierce fights that were related to me, there was one that happened not very long ago, in which two hundred Paiks, after exhausting all their ammunition, were massacred to a man. Their unvarying success against these enemies made them ready for an encounter with others, when an opportunity presented itself thus. The Bissoy of Guma and his younger brother represented as a man of spirit, were being escorted as prisoners to Berhampore for some offence against the State, or for imprisonment on some judicial decision, when their fears were excited that they would not again gain their freedom. The younger brother watched for an opportunity of escape, found it and made a rapid and very long march to Putosingi, helped on the road by sympathizers among the Saoras.

He there preached resistance to an encroaching Government, and was joined by all the Omanyas or disaffected Saoras. Isolated acts of assault and murder had before been perpetrated on the servants of the British

Government, for instance, the murder of an officer of Police at the top of a ghât near Jerang by the brother of the present Bissoy of that place, and the assault on the camp and attendants of Captain Stewart, a Superintendent of Police, inspecting the country, with a view of establishing Police stations at Tarbeli, a village between Noagar and Putosingi, the repulse from the country of all members of survey parties attempting to enter or erect signals in it, but the massacre of a force of 50 Policemen at Putosingi, sent after the attack on Captain Stewart, was the first overt act by which they showed their readiness for a struggle and determination not to be put down by small means.

They were soon subdued, and the younger brother above alluded to, who had encouraged them to resistance, was taken and hanged, while the elder brother was reinstated and is the Bissoy of Guma at present. In remembrance of his escape he is building a temple in his village which I visited, and saw a great stock of materials in course of preparation. He has brought up skilled workmen from the neighbouring cities of the plains, so that the structure promises to be a fair one, and will then be the only evidence of the existence of any religion through the country; there being as yet no temple even of the rudest construction throughout the whole Saora tracts. In the border land towards Goonipur, I have come across something which appears to be connected with religion, but as

the same thing is common also to the Jeypur plateau, and was only seen in this one part among the Saoras, its presence may be supposed to be due to the close proximity of some Brahmins in and about Goonipur, and it may be a ceremony performed by men having some teaching in the tenets of the Hindoo religion. A small space of ground is enclosed by four upright sticks, across which four horizontal sticks are placed enclosing about a square foot of ground generally right in the middle of the path. The enclosure is sprinkled with some preparation of color like chunam water, and in this half a pumpkin stuck over with small pegs of bamboo is placed. I did not learn the object of this, but I have seen the guide step out of the way on approaching them.

In trying to lay down the boundaries I was led to infer that the authority of the Rajahs and their subordinates had been long in abeyance, for their ideas on the subject were misty, and a great deal of prevarication occurred. Old men from among the Saoras were brought by the contending parties to strengthen their claims, and the tenor of their information was that they had learned by tradition that certain villages had at some former period, long ago, belonged to such or such a Rajah, but that in their life-time the authority of any one had not been certain. The surplus energy of the Saoras used to be worked off by raids into the plains; and roads which passed along the foot of their hills were patrolled by armed parties of Police and Rajah's Paiks. The custom has to be kept up to a certain extent now, and a number of desperate characters said to be from the jails of the surrounding country, have taken a lesson from the Saoras, found a refuge in their country, and prey upon them in turns. The country affords ready means of resistance, and is the least easy of access I have yet met with.

The difficulties are steep and rugged ghâts with unmanageable boulders on the way, and the cases are rare where a passage from one village to another, only a mile or two distant, does not require the crossing of a ghât. In other places terraces raised to facilitate wet cultivation of all heights between one and twenty feet across the line of road, and require the agility of a nimble man to get down on foot. Two good ponies were quite unable to do my work in consequence of so frequently losing their shoes, and finding insurmountable objects on the way.

A feature of the country which deprives the hills of the arid appearance they would have in the open parts on account of their rocky nature, is the immense number of the species of the genus palm, namely the "Salep" and "Date" palms. The first is indigenous to the hills and seldom grows anywhere else except with great care. I have not seen it anywhere in such numbers as on the Saora hills, and its abundance encourages the propensity for drinking inherent

Numerous "Salep" palms from which an intoxicating beverage is obtained.

in the Saoras. Its blossom has the appearance of a mass of hair hanging on a stem about 3 inches thick, which bends under the weight. When it is cut off, the juice exudes from the stem into a pot placed to catch it, and they are careful that none shall be lost. Their attachment to the beverage is very great, and the first and last request made to me in the country was to remove restrictions on its use. They show some taste in preparing it for use, preferring it hot.

The villages are very numerous, and the object apparently aimed at in choosing their sites, is inaccessibility. They are generally built regularly (in two or three parallel rows) and kept clean. The material used

Villages built in inaccessible sites. in their construction is stone (everywhere plentiful on the hills,) mud cement and the coarse grass generally found in low ground, but not scarce up there. In default of grass, the leaf of the Salep tree is used for thatch, as also to cover the wigwags, where they keep their grain in the fields, to erect pandals for the protection from the weather of the followers of travellers among them, and as food for elephants. Although the date palm is so plentiful, it is not used at all. Orange trees are occasionally to be found near the villages, and in spite of want of care and bad position, the fruit is good, though small. The villages are often fenced with stone walls, and cover less space than seems requisite for the number of houses furnished for my village book.

The country is pretty equally divided into jungly and cultivated ground, that portion inhabited by the most unruly men being the best cultivated.

Cultivation. Hills are often terraced to the top, and springs are so numerous that most streams on the high lands have a perennial supply of water, almost from their source, which renders cultivation easy. Efforts in this line are confined to rice, and a large kind of bean called kondol. The women take the greater share of labor in the cultivation of rice, the men leaving all to them, except just the preparation of the ground, but taking on themselves the chief care of the other staple kondol. The process of preparing the ground for rice is to bring and retain on the terraces as much water as will saturate them well, and then parade bullocks and buffaloes over it, till it becomes a puddle knee deep, ploughs being seldom used, and this they substitute. From a bed previously thickly sown, the young grass, about 3 or 4 inches high, is taken by handfuls bound up and thrown at intervals over the ground, till the women have leisure to transplant it in the usual way. The preparation of the kondol fields is a mere scratching of the ground, the crop depending on a good choice of ground as to aspect and height as well as fertility more than anything else. This crop is said to be better sown on ground where iron is present.

The people seem to be better off in respect to food than hill tribes usually are, for I noticed

People well off. that they had their full meal of rice or kondol every day, and not the "pej" or khonji such people generally eat. It is probably the result of their efforts to overcome the natural difficulties of the ground by terracing, which must have originally entailed a great amount of labor in crection, and must now require much trouble to keep up and renew where necessary.

The only manufacture I noticed was that of pottery. They buy their clothes from the markets,

Manufacture and trade. which are plentiful in the low country on all sides. Ordinary white cloths are worn by most people, but the Gomangis or heads of villages must have colored ones. Most wild tribes confine their choice to a red cloth, but the Saora prefers a mixture of all the primitive colours, and has strips of red, blue, yellow and white in his turban.

Ornaments are a desideratum with both sexes. Every male of whatever age must have a

Dress and ornaments. plume on his head, and they take trouble in making it up. They have a long spool or cotton reel about 6 inches, covered with a mixture of red thread and a little tinsel generally, and having stripped from quills as many plumes as they can, they insert them into this and let them dangle gracefully on all sides. This contrivance is then fastened on the top of the head, by having the hair neatly twisted round it. The feathers of the white fowl are generally preferred by quiet people, those of the jay and pea-fowl by dandies, and any other varieties by those not particular as to personal appearance, and when accompanied by get-up for a gala day, the arrangement gives them a rather dashing appearance. Beads and rings are much used as ornaments with both sexes. The woman loads every finger with as many rings of copper, brass or any metal according to her means, as she can retain on them, and her neck with beads. The relations between man and wife seem to be on a more equal footing, and they show more mutual concern than is common to other natives of India. At the markets in the low country, I have seen the man assiduous in satisfying his wife in the matter of ornaments, and sharing everything with her, and the women have always shown concern for their husbands' return, when I have had occasion during the progress of a day's work to make a requisition on a village for men to supply the place of any one missing.

The Saora shows favorably in comparison with his wife, the latter being darker and of an

Personal appearance. inferior cast of feature. The men are generally well made, short, wiry, and active, and are expert in the use of the battle-axe and bow and arrow, their peculiar weapons, and have an air of independence about them. They are a merry set, very cheerful, and talkative. They lighten their labor by jokes, which they always try to twist into rhyme, and a good hit always produces a peal of laughter, just as is the case among the Khonds.

I tried to get some information from the Inspector of Police at Odsara about their marriages and funerals and give his account. When a youth has made his choice, his first step towards getting his wife is to make a present to the friends and parents of the object of his choice, generally in the shape of their favorite liquor, the "Salep" juice. While this is operating, he watches for his opportunity of proposing terms, and if they are acceptable, an agreement is soon come to. He has

to pay for her by a certain number of buffaloes or oxen, or quantity of country produce, and that done and some more drinking parties held, he takes away his wife without more ado. Their dead are disposed of by burial or cremation. My informant held their morality cheap, and represented that cases of elopement were not unfrequent, but that in such case the first husband got some remuneration, for he was allowed, and helped by the primitive laws of the country, to get from the co-respondent an equivalent for what he originally paid for his wife.

**Truthfulness of the Saoras.**

Their taste for music is satisfied

**Musical instruments.**

construction are very primitive, and it is a rude imitation of the ordinary sitara. A calabash or bitter pumpkin has a slice cut out of one side, is cleared out and dried. The string is attached to a moveable peg inserted through the tapering end of the pumpkin passed across the hollow and fastened at the lower end. The Saora is able to get out of it a pleasant jingling sound, with which he is well satisfied.

Game is scarce, in fact hardly ever found. My head constable killed a hyena, a few peafowl and hares, near Putosing, and Mr. Claudius shot a kutra or jungle sheep. Mr. May reports bears on the north-eastern

**Scarcity of game.**

and eastern ghâts, and I on one occasion at night-fall disturbed three of these animals. Soon after doing so, I met a Saora woman going in the direction where I had come upon them. I stopped and asked my guide if she was not afraid, and got the curious answer, that there was a truce between the Saoras and bears, and they would not harm each other. Probably the scarcity of the animal was the cause of this fearlessness or carelessness, whichever it may be. Many cases of leprosy were met with towards the eastern portion by Messrs. May and Claudius, and the latter reports a case of this or some kindred complaint, showing wonderful vital power on the part of the sufferer. On passing a hill near Jerang, he heard a voice in conversation with his guide, but could not make out how it was produced. He could see something, but it had not a human appearance. On going closer to inspect he found a living skeleton. The lower extremities were skin and bone, but above there was just material enough to feed a large open ulcer, which was eating its way towards the head, the only part intact. His hair was long and matted, and his nails more than a finger's length. He was said to have been in one position for the last seven years, namely, on the ground, with a log of wood for a pillow, into which had been cut a hollow for the head and neck. So long ago he was driven from all villages he attempted to enter, but his compatriots made this hut for him, and made it as comfortable as their ideas prompted them to do. He is fed by the women of the neighbouring villages, who come every day for the purpose. The roads leaving the Saora hills to the eastward converge at Soorangi on Berhampur road, to the southward at Purla Kundy and at Goonipur to the westward. The latter town, which is the headquarters of the Nagoman of Goonipur, is divided into two parts by an old bed of the river "Bangadara," averaging a quarter of a mile in width. This joins the present bed, which makes the western circuit of the whole town about a mile lower down. The western portion of the town is for distinction called Kagguda, and a Subordinate Magistrate and Police force are stationed in it.

*Extract from the Narrative Report of Major G. C. DEPREE, in charge No. 4 Topographical Survey, Chota Nagpur Division.*

Notes by Mr. G. A. McGill, Surveyor, 2nd Grade, on the Talook of Sohagpore in the Native State of Rewah.

The district of Sohagpur appertains to the Rajah of Rewa. It lies between Latitudes  $23^{\circ}38'$  and  $22^{\circ}40'$

**Sohagpur of Rewah.**

Longitudes  $82^{\circ}15'$  and  $80^{\circ}44'$ , and comprises an area of 2,900 square miles.

It might for description be very conveniently divided into two parts, viz., upper or mountainous, and lower or plain country.

Upper Sohagpur consists of a very mountainous piece of country, ranging from 3,800 to 3,000 feet above sea level. It abounds in extensive plateaus, well wooded and most beautifully watered by perennial streams. The two

**Upper Sohagpur.**

best plateaus are at the sources of the Nerbudda and Johila rivers; both these rivers take their rise from the village of Ummerkuntuck and flow almost parallel in a Westerly course for 80 miles; after which, the Johila diverges to the North and abruptly casts itself down a fearful gorge, makes its way into the plains of Sohagpur close to the large village of Palo. The Nerbudda keeps steadily on its Western course, seldom diverging except to avoid a range of hills. It for 40 miles forms the Southern boundary of Sohagpur. The river Soane also takes its rise not very far from the village of Ummerkuntuck, but its waters all go to refresh the low country of Pindra and Sohagpur.

The fact of so many rivers having their sources at and about Ummerkuntuck, had made it most

**Sacred village of Ummerkuntuck.**

sacred in the eyes of the natives and pilgrims, who resort to it from very great distances. There are some old temples, the most part of which are of an ordinary kind. I was told that the Rewah Rajah made a pilgrimage to it some years ago, and that he endowed the temples with a certain sum of money. The pilgrimage was undertaken at the advice of a "Gosai," who assured the Rajah, that if he washed himself in the sacred spring of water at the source of the Nerbudda, he would be cleansed of his leprosy. I am not aware if His Highness benefitted by this pilgrimage; the priests at the temples, however, still enjoy the endowment.

The temperature on the pāts differs by several degrees from that of the adjoining plains, and to

Temperature and other remarks with reference to the pāts.

a traveller passing through the country the change is remarkable. There are several roads that lead to the top of the plateau, but, without an exception, they are all bad; they are, however, used by pack bullocks. During the months of December, January, and February, the plateau is draped in a mantle of hoar frost up to  $\frac{1}{2}$  past 7 o'clock, and in sheltered places, I have seen it lying thick as late as 9 o'clock in the morning. The cold during the night is intense, and woollen clothes are most acceptable during the day. In the months of March and April, the nights keep delightfully cool, and even in the day an ordinary hill tent is not at all disagreeable to live in.

There are two distinct tribes who inhabit these hills, the "Gonds" and the "Baigas." The Gonds inhabit the open plateaus and valleys; their villages consist of small fragile huts, and, as a rule, are dirty in the extreme. Both men and women dress most scantily, and their children are allowed to roll about in filth along with the pigs and poultry, which they rear in large numbers. They are passionately fond of drink, and, when under its influence, are very irritable. The Gonds, like many of the other primitive races of India, are fond of decking themselves up with beads and jewellery. I have frequently come upon both sexes of them, all but nude, yet their arms, necks, and ears were profusely decorated,

I was never able correctly to find out what was the religion of these people; they are certainly not Hindoos, as they have no gods in common with them.

Religion and practices.

Demon worship is largely practised by them, and I once had an opportunity of seeing this strange worship. It is a regular holiday in the village; nothing like out-door work is done. Very early in the morning the village assumes a lively appearance, drums are beaten, guns discharged, and every one dresses himself out in his best. A procession is formed, headed by a standard bearer, who carries aloft a white flag attached to a long bamboo. After him, come two persons carrying, or rather suspended by its rear legs to a cross pole, a pig, which screams most pitifully at receiving such ignominious treatment. Behind this, follow the whole village, men, women, and children; intermixed with them are the musicians hammering away at tom-toms and playing on an instrument shaped much like a clarinet having four holes for the change of notes and reeds for blowing through. The procession moves on to a small hut, at some distance from the village; the hut consists of a thatched or tiled roof supported on poles; a small mound in the centre of it forms an altar, on which are placed three small stones and an iron trident. The hut reached, the standard is planted in the ground in front of the little temple. Now begins a regular series of dissipation; drinking and dancing seems the chief part of the ceremony, so that, by the afternoon, the ground presents a sad picture. Men and women are seen helplessly lying drunk, and others discover or bring to mind old quarrels, and abuse each other most heartily. Later in the evening, the pig is killed by driving a stake through its neck. I now witnessed a most revolting sight: men and women all made a rush to the dead pig and carried off some of the blood, which they greedily sucked up! Later still, the head was severed from the carcass and placed close to the stones on the altar; the carcass was then cut up and shared out among the villagers.

The Baigas consider themselves a better class than the Gonds: the two tribes live quite apart and never intermarry. The Baiga selects the site of his village in some sequestered spot, deep in the depths of the jungle, and generally on the slope of a hill; his only care is to see that a

Baigas.

good spring of water is at a convenient distance. The spot selected, a large piece of ground is cleared, and huts built on it; the village is built in the form of a square leaving a clear quadrangle in the centre, which is kept scrupulously clean. Now begins the difficult work of opening up the ground for cultivating purposes; the slopes of the hills are selected, it matters not how heavy the timber may be that grows on it; these hardy mountaineers steadily set to clearing it, which they do both quickly and systematically. The fallen trees are cut up into bits, and spread out to dry, and as the jungle clearing begins in the cold months, very large patches are cleared and made ready by the months of April and May. The dry wood is now set on fire, and the ashes form the manure for the seed, which is sown broad-cast immediately after the first few falls of rain. The first season's crop is universally a good one, but the ground very soon loses all sustenance, so that the Baiga has to make fresh clearings every third year. On this account, a Baiga village never remains in the same place for three consecutive years. The Baiga is very fond of sport and makes a tolerably good shot with his bow and arrow at about 25 yards; their arrows never go true at longer distances. As a race, the Baiga is to be preferred to the Gond; they are extremely good natured, and willing to assist to their utmost, once you succeed in attaching yourself to them; but this is no easy matter, as they are extremely timid and desert their village on your approach.

The extensive open valleys that one meets with on the pāts, especially those of the Nerbudda

Produce of the country.

and Johila, are well cultivated; the soil all over these valleys is rich and of a black color. Wheat, Bengal gram, jowarri, and kodo are plentifully cultivated; rice is grown, but sparsely.

The Gonds, however, are a most improvident race, and never think of storing up the produce of their fields. Immediately the crops are cut, their great object seems to be to sell it at any price, and as might be expected, you have either a feast or famine in the country according to the time of the season you enter it. The following are the prices at which grain was selling shortly after the reaping of the "rubbi" crops:—

Wheat	...	...	64 seers.	Wheat flour	...	...	48 acers.
Bengal gram	...	...	100 "	Gram doll	...	...	32 "
Oorid or Kalai	...	...	32 "	Oorid do.	...	...	20 "
Fine rice	...	...	20 "	Masur do.	...	...	32 "
Coarse rice	...	...	32 "				

During the months of April and May, the country swarms with banians and banjams: these people enter the country with hundreds of pack bullocks and drain it of all its grain.

Iron, I believe, is the only metal found in these hills, and it is very extensively manufactured.

**Manufactures.** The process is very simple, a small blast furnace is built, circular in shape, and about four feet high, and hollow in the centre. Into an opening on the top charcoal mixed with broken bits of ore is thrown in and lighted. A strong current of air is forced into the furnace from below by means of two ingenious pair of bellows worked by the feet. I was told that six lbs. of iron can be manufactured in a day by each furnace. A coarse kind of cloth is made from the cotton grown in the country, but the natives generally wear cloth of English manufacture. A strong liquor is distilled from the flower of the *Moua*; it is quite clear in color like gin, but has a most unpleasant odour.

Lower Sohagpur, or that portion which lies at the foot of the hills, is almost perfectly flat; it

**Lower Sohagpur.** is watered by the Soane and several of its tributaries. It is almost throughout open and well cultivated, and only occasionally that belts of jungle are met with. The inhabitants of these plains are mostly Hindoos and Mahomedans: the former are a fine looking race, resembling closely the people of Oudh. I have never known natives so ready in rendering assistance to a camp as these people are. The ryots don't seem at all to like being placed under the Rewah Rajah; they make some bitter complaints against the tchseeldars and sepoy sent by the Rajah for collecting the revenues of the country. If what these people assert is to be relied on, it would appear that they are regularly in the habit of levying black-mail on the poor ryots.

All over these plains are scattered old ruins, temples and tanks, perhaps hundreds of years old.

**Old ruins and temples.** There are some fine old temples and the ruins of an old palace at Singpur: lying about these temples are large slabs of stone most beautifully sculptured. In the old palace also some fine sculptured columns are to be seen. At Sohagpur there is a dismantled stone fort and several temples, and a very large number of tanks. This fort was dismantled during the mutiny, as the zemindar of Sohagpur showed himself disloyal to the British Government. The little fort is built of stone cemented with lime, and is in the shape of a square, and has a double wall and trench round it. There are altogether five wells of good water in it, so that the garrison need never have suffered thirst were they placed under siege. There is some magnificent sculpture to be seen in this fort; its broken gateway must indeed have been a marvel of Indian workmanship. Inside the quadrangle, on its western face, is a large piece of sculpture with an inscription below it. The characters of the inscription are quite unlike any I have seen, and the present zemindar told me that no one has been able to read it.

Sohagpur is a regular champaign country and well adapted for the growth of all manner of

**General remarks.** grain. Rice is extensively grown, although the practice of terracing the fields similar to that done in other parts of India is not generally adopted. It is therefore very difficult to put a limit to the rice-fields. Jawari, bajri, oorud, and mustard are also extensively cultivated, and closer to the hills Bengal gram and wheat grow well. Some sugar-cane fields are to be seen close to the town of Sohagpur, but I do not think it is manufactured into sugar.

The country is of sandstone formation, and outcrops of coal are to be seen about Jaintpur and along the bed of the Soane River. Altogether there is not much jungle, yet the country abounds in sport: sambur, spotted deer, and wild pigs are common and frequently to be met with on the line of march, and tigers and cheetahs are also found and can be got at by beating up the jungle. To the thistle-whipper the country affords immense scope for practising his art. Snipe, widgeon, duck, and black teal are plentiful in the tanks, while in the low brushwood and fields numbers of partridge and peafowl take shelter. In closing my remarks on the sport of the country, it will be as well to mention that the tiger found in these parts is very much smaller to those seen in other parts of India. It is seldom above ten feet in length from snout to tip of tail, but he is just as savage. They are the dread of the villagers, as they boldly walk into a village, not unfrequently at dusk, and carry away cattle and pigs. As a rule, they do not attack men unless molested, but once these creatures get the taste of human flesh, they seem to prefer it to any other. A man-eating-tiger generally selects a hill-pass as his lair, and carries off his victim as opportunity offers: owing to this, some very good passes across the hills have been totally shut up.

*Extract from the Narrative Report of Captain R. V. RIDDELL, in charge of No. 5 Topographical Survey, Bhopal and Malwa.*

On the 18th November triangulation work in Bhopal was commenced by a visit to "Tins" H. S.

**Bhopal.** situated between the stations of Lakoli and Narmao of the Calcutta longitudinal series, and on these three stations the whole of the triangulation east of the meridian of 78° east longitude was based. Mr. Wilson observed with an eight-inch theodolite for horizontal angles at 33 stations, from all of which he took vertical angles, and from his observations the position of 136 points inclusive of observed stations, in an area of 836.6 square miles, have been determined, and the heights of 72 points.

To Mr. Chennell I allotted the strip of country between the meridians 78°30' East Longitude, having fixed for him the position of four principal stations, and of three or four secondary stations.



Mr. Chennell observed with a ten-inch theodolite at 51 stations for horizontal angles, at 41 of which he took vertical angles, and from his observations the position of 216 points, inclusive of observing stations, have been determined, and the heights of 169 points in an area of 1694.3 square miles.

My plan of operations was to extend a few first class triangles from the sides Lakoli to Tins and Tins to Narmao, of the Calcutta longitudinal series, across the ground east of the Great Arc meridional series as far South as the Nerbudda. To observe the angles for these triangles myself, and to connect my observations at each principal station with at least one secondary station, so as to render it unnecessary for Mr. Wilson or Mr. Chennell to observe for more than secondary work. I therefore selected seven principal stations, connecting my triangulation with the Great Arc meridional series at three points, and then proceeded to select secondary stations in the strip of country between 77°30' and 78° East Longitude.

Nearly between these meridians the Great Arc meridional series runs, and consequently I found only two first class triangles necessary in this space. I spent the whole of December selecting secondary stations, and had by the end of that month selected sufficient to extend over all but a small portion in the south-western portion; most of the necessary poles were erected during this reconnaissance, and I commenced observing at Ander H. S. on the 2nd of January.

I then carried on observations for secondary triangles west of 78° until the end of March, when, on account of the haziness of the atmosphere, reconnaissance for future work would have been, if not impossible, at least unprofitable, and all the ground we had prepared for triangulation had been triangulated. I observed with a 14-inch theodolite complete vertical circle for principal angles at 14 stations, secondary angles at 26 stations; took vertical angles for principal stations at 14 stations, and vertical angles for secondary stations at 24 stations. From these observations the position of 205 points, including observing stations and the heights of 194 points, have been determined in an area of 1735.9 square miles.

Thus an area of 4,267 square miles was reconnoitred and triangulated between the 18th November and 1st April following. The total number of points fixed in this area are 556, giving an average of 1 point in every 7.7 miles very nearly, and an average of 1 height in every 9.8 miles.

The country over which this triangulation has been carried is that immediately north of the Nerbudda, embracing as it were the back-bone of the Vindia Range. The north limit seems to be just where the open country on the north side breaks up into ridges, steps and valleys to the south; so completely does the character of the country change, as may easily be imagined, when in from 20 to 30 miles the drainage falls from 1,000 to 1,400 feet. It is a wild and picturesque country. The highest point met with yet is Kheda H. S. near the eastern boundary of Bhopal, about 30 miles from the Nerbudda, and reaches nearly 2,400 feet above the sea. From this hill, for about 40 miles to the west, the main water-shed line runs nearly east and west, then suddenly turns at right angles to the south for about 30 miles, until within 10 miles of the Nerbudda, where somewhere in the neighbourhood of Ganoorgarh the Betwa rises and runs northward. From Bhimbet eastwards a spur of the hills runs away for about 30 miles, falling abruptly for about 1,000 feet on the south side of the Nerbudda valley, and more gently towards the north to the Barne. This ridge presents a most rugged appearance, the peaks and summits of the ridges cropping up like the teeth of a saw, all about the same level, and 1,000 feet above the level of the Nerbudda Valley. Another main feature may be picked out as a spur running southwards from the main line of water-shed terminating near Bari between the Barne and the Tenduni. East of the Tenduni is another ridge of hills, on the highest point of which the station of Dudia is situated. South of this ridge, extending to the Nerbudda, is a nearly level plain varying in width from 10 to 20 miles, without a hillock to break the view. This plain is richly cultivated, so much so that space seems to be grudged for any road wider than a footpath. This eastern portion of Bhopal is said to be the most hilly and jungly of that part of the country, and from what I could see I believe this to be the case.

## BUNDELKUND.

*Remarks by* LIEUTENANT J. R. WILMER, *Assistant Superintendent, Bundelkund Survey, on the country brought under detail survey in Bundelkund.*

As regards the general features of this portion of Bundelkund States, the plains in the northern part are very much the same as those of last season. The southern part of the country is very hilly. A separate ridge runs east and west a few miles to the north of the Vindia Range. This ridge rises very abruptly on the north side, but has a gentle slope on the south. The total fall from the summit of ridge being about the same on both sides. The southern slope of this ridge is remarkable in many parts for the absence, or nearly so, of vegetation. It consists generally of sandstone rock with a few stunted trees and thorny bushes. A considerable quantity of iron is found on this ridge, and is extracted from the ore by the natives roughly, and sent in round pigs, weighing 10 to 12 seers, to their respective territories, where the iron is worked until fit for use. To the South of this ridge runs the Vindia Range, which rises in two steps one above the other on the east, and these gradually approach each other, the upper one getting gradually lower until they merge into one and then become much broken up towards the west. The hilly parts are covered with jungle, in some places very thickly. The drainage is generally from west to east, although to the extreme west it is north.

There are two rivers of consequence, the Cane and the Dussan. A portion of the former runs to the extreme east of this season's work, and the latter to the extreme west, and indeed much of one western boundary between British and Native States is the river itself.

The Cane River cuts through the Vindia Range, and is impassable except at a few places. In the rainy season it is impassable everywhere except in boats. By the heights I was able to take, it appears to have a drop of 5 feet in  $4\frac{1}{2}$  miles. The bed of the river is very rocky, large smooth water-worn boulders forming its bed. The banks are in some places 30 feet high, in others 12 and 15. It is only passable at five places within the 24 miles that it comes in this season's work.

There are two ferries and one ford north of the village of Lahar. There is a ford to the north-west of the village of Gangour and east of the hill station of that name. There is also a ferry and ford at the village of Takra. These fords are only fords in the dry season.

The Dassan flows generally in a northerly direction, and is impassable during the rains except in boats. In the dry weather it is passable at about 14 places within the distance of 44 miles; this being the length surveyed this season. The bed is composed of shingle and in some places boulders of rocks. Where the Katni Naddi falls into this river and also at its widest parts, it is thickly studded with small islands covered with thick jungle. At its broadest parts it is 600 yards, and upwards across. Its banks are in some places 15 feet high. The following are the principal fords and ferries of the Dassan that have been surveyed this season, commencing from the south towards the north:—

Fords and Ferries of the Dassan.	Ford two miles east of Nimtoria (very bad).
	„ at village of Bamori-bara.
	„ two miles further down the river.
	Ferry one mile and a quarter due south-west of Sikeria.
	Ford north of Katora village.

The road goes from Katora to Baragaon, and crosses over a disputed island about five miles long and one broad, covered with jungle and formed by two branches of the Dassan.

Ford. Two and a half miles further north, small ferry at Korela; one boat, and a very small one.

Ford at Lorki village.

- „ one mile beyond (bad).
- „ due north of Bhagwa two miles distant.
- „ one mile further down the river.
- „ "Tipri Ghât," west of Kardati village.
- „ north of Kardati village.
- „ "Ghorai Ghât," north-west of Deoran.
- „ and Ferry north of Barkhara village "Am Ghât."
- „ west of Bharoti (bad).
- „ west of Peperia (bad).
- „ west of Kurra.
- „ and Ferry one mile north of Janakpur (good).
- „ „ at Pachar village.

The northern part of this season's work is a flat, open, well-watered country interspersed with hills about two and three hundred feet high. The peculiarity of these hills is, that they generally run in straight and nearly parallel ridges somewhat in the direction of north-east and south-west. These hills are very rocky, composed of quartz and granite generally, and are about half a mile in width at the base, and only some few feet wide at the summit. The flat portion of the country is well watered by wells.

Water being found almost everywhere, and not very far beneath the surface, the usual cereals are grown abundantly.

Cities.	Chutterpore and Bijawar are the only two cities of importance. Large scale plans of both have been done.
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Chutterpore.	Chutterpore is kept very clean; its principal streets are broad and always in good order. The population amounts to about 11,000 persons.
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Bijawar is considerably smaller, its population being about 7,600, and is situated at the foot of the ridge north of the Vindia Range. It is not so well kept as Chutterpore, and only gives one the appearance of an overgrown village, instead of a city containing the palace of its Rajah.

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*Extract from the Narrative Report of CAPTAIN W. F. BADGLEY, in charge of No. 6 Topographical Survey, Khasia and Garo Hills.*

The country triangulated in the Garo Hills is between the high range called by the people of the plains Rajnil, and by the Garo Dura or Tura (separating the dependent and independent Garos) and the plains. As the Deputy Commissioner could not accompany the party, the original plan of carrying the work across the independent country was given up, as it was not thought safe to venture among the savages with a small guard only.

The country triangulated is traversed by low ranges of hills covered with heavy grass jungle, the forests that once covered them having been felled by the Garos to give place to their rice and cotton crops.

There are paths leading from almost every village to the plains, and there are two made roads, both from Tura—one to Mankachar on the Bráhmáputra, and the other, of which eight or ten miles have been finished, towards the plains of Mymensingh.

A considerable trade in timber is carried on by the Meches from the Góalpara District, who float their wood down the streams in the rains. It is sold in the first instance to traders at the foot of the hills, and is by them distributed to Mymensingh, Dacca and Serájgang, to be used principally in boat building. The Garos produce cotton largely for their own use, and to sell either raw or made up into thick clothes (*chudders*).

*Extract from the Narrative Report of CAPTAIN GEORGE STRAHAN, in charge of No. 7 Topographical Survey, Rajpútana.*

The country through which the principal series alluded above passes is not difficult for triangulation, though there is little doubt that it will give considerable trouble to the plane-tablers, especially in the Arabulla Range, where the ground is most intricate, the rocky peaks covered with jungle rise in many places more than 3,000 feet above the sea, and the tract covered by these mountains is almost uninhabited. In such ground the progress of the detail surveyors must necessarily be slow. The range is about 12 miles broad, and on the eastern side is formed entirely of a number of small hillocks without any apparent regularity, rising higher and higher till the centre of the chains is reached, where they are replaced by long parallel ridges rising far above the mean level of the range. The slope on the western side is far steeper and more abrupt than on the eastern, and the vertical observations show that the plain on the former side is considerably the lower. Cactus and dhow jungle abound on these hills; the custard-apple is also met with, but of forest trees there are few or none. They are almost destitute of springs, and as a natural consequence there are very few wild animals to be found: these at least in that part of the range lying between Ajmere and Desuri. After crossing these hills the plains of Marwar are met with, which are very flat, sandy and barren. A rocky hill or two of inconsiderable height alone breaks the monotony of the scene. The country is almost entirely destitute of good water; the wells are all more or less salt, and the only drinking water obtainable is the remains of the rainfall of former years, stored in muddy tanks, and very unwholesome. Since the famine of 1867-68, the population here has been very much diminished, numbers of villages are entirely deserted, and large tracts of lands thrown out of cultivation. I visited Jodhpur, the capital of Marwar, this season, and met with great civility from the authorities there. The Political Agent was unfortunately absent. I, however, had an interview with the Maharajah and explained to him the object of our survey operations in his district. He appeared to appreciate the value of our maps and promised us every assistance. Of the country triangulated Mr. Horst reports as follows:—

“The whole of my triangulation, with the exception of a few stations in British Mhairwarra, was carried on in the Marwar District, where I met with very little opposition. At Chandela the Thakoor objected to my erecting a platform for a station of the principal series, but on the matter being represented to Major Impey, the Political Agent, I gained my point. I experienced but little trouble in obtaining supplies, although but little rain had fallen during the season, and the harvest had consequently been a poor one, yet there was no scarcity, as the mahajans had opened their stores of grains. The rates were, however, high compared with those prevailing in Ajmere and Udeypur: wheat sold at 8 seers, barley 14, maki 16, and bajra 13 seers for the rupee.

“Water was generally very scarce, and the little that was obtainable was brackish. The inhabitants drink tank water as long as it lasts, and then use the well water. In consequence of very little rain having fallen this year, the supply in the tanks was soon exhausted, and the well supply had also diminished.

“For fully six weeks after leaving Deoli there was a great deal of sickness in my camp, principally fever, the average number of men laid up being 25 per cent. of my whole establishment. I attribute this chiefly to the great variations of temperature by day and night, and the innutritious diet, maki or Indian corn, on which the men for the most part lived.

“The authority of the Jodhpur Rajah is hardly recognized by the influential Thakoors, of whom there are twelve. They do just as they please, and refuse to pay any tribute unless compelled by the Political Agent, whose orders are always obeyed. They are civil and obliging to Europeans, but the Rajah's officials are not tolerated. The Bali Pargana, presided over by the Rajah's eldest son, is overrun by robbers of the Bhil and Mina caste, who are being constantly hunted down, and when caught are executed. I was told that some thousands of heads are hanging from trees in the jungle at the base of the Arabulla Range south of Desuri, but this report is doubtless greatly exaggerated. On two occasions I met small parties of robbers, who ran away as soon as they saw me, but natives, when travelling singly, or in small parties, are frequently robbed and killed. They levy black mail on the banjarns when going through the passes of the range or skirting it.

“The high road from Ajmere and Nasirabad *via* Beawar to Eripúra passes through the ground triangulated this season. It is an unmetalled road, but for the convenience of European travellers,

bungalows are built at every twelve or fifteen miles, for which no rent is charged, and choukis for the protection of travellers are established a few miles apart.

"The country is exceedingly poor and thinly populated, hundreds of thousands of people having emigrated during the famine, but they are gradually returning. The only export is cotton, and the only import grain, which is brought chiefly from Bhowani near Hisar, as the supply falls far short of the consumption. I found no archaeological remains near Palli: there is a temple of recent construction situated on a conical isolated hill, leading up to which are 500 steps, some of masonry and others cut out of the solid rock, and at Narlai near Desuri there is a stone elephant, life size, hewn out of a single rock, and standing on the hill overlooking the village, connected with which the natives have a superstition. They believe that an evil spirit had stolen the elephant whilst alive, and was carrying it away, but when morning dawned, he deposited it on the hill, when it turned into stone. On the top of this hill, which consists of immense masses of granite piled one on the other, there is a spring of pure water which has never been known to dry."

Since the submission of my last report the field work of Mount Aboo has been completed, and the remaining fair maps drawn and published. The following remarks on that sanatorium are taken from Mr. Stotesbury's report:—

The sanatorium of Mount Aboo is situated on a block of granite hills, the highest in Rajpūtana. Gurusikkar, the highest peak on the plateau, is 5,653 feet above the sea, and about 4,000 above the level of the surrounding plain. There are a few other prominent peaks nearly as high lying to the north of Gurusikkar and beyond the village of Usrot. The hill may be generally described as an isolated mass surmounted by a plateau, which is enclosed by rocky ridges so as to form a sort of hollow on the top of the mountain, the drainage of which, with one or two trifling exceptions, flows to the eastward. The largest drainage line on the plateau is the commencement of the River Bandas, which in its course through the plain flows about six miles to the northward of the military station of Deesa. The drainage on the north side flows into the Luni River. The features of this mountain are very bold and the slopes precipitous, especially on the western side. They are strewn with gigantic blocks of granite, apparently so slightly balanced as to be in danger of rolling down; these are in many cases so weather-worn as to present mere pinnacles of rock of the most fanciful shapes. The brow of the mountain is an absolute precipice, in some parts of some 300 or 400 feet in height. On the north the mass becomes gradually lower, and finally ends in a sharp ridge of low hills running north-east towards the range of the Arabulla. On the east the slope is less regular and much cut up by deep valleys, and densely covered with bamboo jungle and karounda. All the slopes are more or less covered with bamboo jungle, especially on the lower flanks. The lake in the cantonment of Aboo known as Naki is artificially formed by a dam blocking up one of the few streams which escape from the plateau on the western side. It is about half a mile long and one quarter broad, with an average depth of 20 or 30 feet; in the centre, however, and again near the bund, the depth is nearly 100 feet; the eastern part is shallow and weedy. There are a few very small islands in it, on which grow willows and date-palms, and which add considerably to its picturesque appearance. A new road, six feet wide, has lately been completed round the lake, affording a pleasant walk. There are several legends current among the people at Aboo as to the formation of this lake. The one most generally believed is as follows:—In ancient times a sect having offended one of the deities by its overbearing presumption was changed into fowls. After a while the offenders repented and begged to be restored to their original state. The deity imposed on them a penance that they should scratch out for him with their nails a lake at Aboo. They did as they were told, and hence the name of Naki Talao, *i. e.*, the lake of nails. The bund is of solid masonry, about 50 feet high, prettily planted with trees on its summit, and is a favorite resort for picnic parties.

There are fourteen villages on the hills, *viz.*, Seoni near the Aboo Bazar, Masgaon, Hetanji, Arna Dundai, Torna, Salgaon, Dilwara, Gna, Uria, Achalgarh, Zabai, Usrot, and Sahar. This last is now in ruins and uninhabited. These villages are chiefly inhabited by Rajpūts known locally as Loks. There are also a few Bhils, Chamars, Gujars, and Ahirs. They cultivate only in the hollows and on the flat low lands, where the soil is free from granite blocks. The irrigation is performed from wells built on the overhanging banks of the nullahs, and the water is raised by Persian wheels.

The crops raised at Aboo are maki, the staple food of the poor, wheat, barley, mandwa, (*sorghum vulgare*), a large quantity of dal and til (*sesamum indicum*), a few potatoes are grown round about the station, and cucumbers in great plenty. The pasturage on the hill is rich, and chiefly of the well known doob grass (*nynodon dactylon*). Each village possesses large herds of cows and buffaloes, but goats and sheep are less plentiful than in the plains below.

As the Aboo hill is second only to Parasnath in the Jain worship, some good temples may naturally be expected to be met with. Those at Dilwara are by far the finest, though perhaps not the most richly endowed. These temples are built for the most part of blocks of granite, the inner walls are richly decorated with figures carved in black and white marble and brass castings. These Dilwara temples are supposed to have come down from heaven complete as they stand, and as the priests foster this belief, it is difficult to fix the date of their construction. Many assert that they were built about 300 years ago by a bania named Bunal Saseth. They are considered to be first class specimens of temple architecture. The marble employed in them was brought chiefly from Jodhpur, some of the coarse marble used for paving was quarried about eight miles east of Uria, and some at Dilwara to the west of Aboo. The temples are dedicated to Aboo raj, from whom the hill takes its name. There are two temples worthy of notice at Achalgarh, one being at the foot of the peak on which the village of that name is situated, and the other on its summit. The latter was built by one of the Ranas of

Udeypur, who had fled to Aboo for shelter. He is said to have built a fort also, the ruins of which are still to be traced enclosing the whole of the Achalgarh peak. The former of these two temples is considered very sacred, and is by far the richest at Aboo, being endowed with seven out of the fourteen villages on the hill, besides many others in different states of Rajpútana. This temple, which is the resort of thousands of pilgrims yearly, is built on the side of a large masonry tank called Mangana, which is now ruined and useless. The legend attached to it is, that Bhim, one of the giant Gods of Hindú mythology, was becoming too renowned and powerful at Aboo. The ruling deity at Benares seeing this showed his great toe at Achalgarh, to let Bhim know that although he was resident at Benares, yet his power extended as far as Aboo. He left therefore the figure of his great toe in black marble to remind Bhim constantly of his presence, and over this figure the temple is built. In a smaller temple near this spot is a fine brass image of a young bull well proportioned, and also a thick bar of iron weighing two maunds or more, which is said to be a "garee" belonging to Bhim—(a garee is a stick used in a certain game, and is thrown at a large block of wood with a view to driving it beyond a fixed mark). There are three stone figures of buffaloes standing at the edge of a tank near this temple, through the ribs of each of which a fine hole has been drilled. It is reported that these holes were caused by an arrow shot by Bhim, which pierced all three buffaloes as they were drinking, in commemoration of which event they all became turned into stone. Overlooking the cantonment is a small temple known as Adhar Debi. This also is believed to have come down complete from heaven: it derives its name of Adhar Debi from its situation on the face of a granite peak half way between heaven and earth. There is also another very sacred temple some way down the southern slope, at the foot of a frightful precipice known as "Dhote ghara." This temple is called Gaumukh, from a stream which here falls into a tank out of the mouth of a cow carved in white marble.

Another of the legends connected with the Aboo hill is, that in former times there existed at this spot a deep cavity, into which a cow belonging to some deity fell. He being unable to rescue her, ordered Adubura, one of the giant gods, to bring a part of the Himalaya Range to throw into the cavity to fill it up, lest some poor man's cow might meet a similar fate. This Adubura did, and hence arose the mountain. The cow was left under it, and the people say that it is supported on her horns; when one gets tired she shifts the weights on to the other, thus causing the earthquakes so frequently felt at Aboo. The rumbling sounds heard on these occasions are said to be the bellowing of the cow.

There are several good pukka roads in the cantonment; the best is that from the Residency to Sunset Point: four-wheeled carriages can be driven along this road, and there are always several of the visitors at Aboo who possess them. The ascent to the sanatorium is made from Anadra, a village at the foot of the hill at its south-western corner. The road is steep and narrow, but well kept, being, however, not well selected, having frequent zigzags; it is in contemplation to construct another on the eastern side, which will lead direct to Deesa.

A new road has lately been made from the cantonment to the village of Uria, as it has been proposed to build new barracks on this spot, which is certainly a more desirable site than that on which the present barracks stand, both in its more picturesque aspect and better climate.

The temperature on the plateau in summer is very pleasant, being about the same as that of the Sub-Himalaya. In winter the frosts are severe, and bitterly cold winds are often experienced. The hot winds which blow fiercely in the plains below are not felt at all on the hill; the thermometer in the shade seldom rises above 90°. The rainfall averages about 85 inches. During the monsoon the hill is wrapt in thick clouds, and is then considered to be very unhealthy; fever and ague prevailing to a very great extent. The visitors and invalid soldiers from Deesa and Erinpura go up about the end of February, and return in the middle of June to avoid the rainy season.

There are but few good houses, many visitors being content to live in straw huts for the short time they reside here. Timber for building purposes is very scarce. Teak is imported from Bombay. The felling of timber on the hill is strictly forbidden by the authorities, the prohibition extending even to firewood and bamboos.

Of the larger trees I recognize the following:—The karaunda (*Caressa carundas*), the fruit of which is gathered by the Bhils in large quantities and bartered in the plains for half its weight in grain; the mango (*Acacia anesiana*, *A. Arabica*, *A. Catechu*); the Tindo (*Diosphyros melanoxyton*); the khara, mowa, mulberry, simbul, and toon, dhak, kathal, pipal, bar, goolar, (*Ficus carica*); the date-palm, bael, tamarind and kamila.

Among the smaller shrubs and creepers, I recognized the cow-itch, which is here used by the natives to feed their horses on, and which seems to fatten them better than gram. Cows and buffaloes will not touch it. Among the nettles, I recognized *Urtica crenulata*, *U. Stimulans*, and *U. Urcus*, and many others; also one kind of wild rose, which I believe to be *Rosa arvensis*; many kinds of violace, a species of *Ampelidæ* near Achalgarh, Uria, and at the former place *Curcas purgans*. At Gaumukh, I also met with *Banhinia Vahlî* and *Artocarpus*, which, I think, must have been brought from elsewhere; a great deal of *Abrus precatorius* is also found. The other plants are *Momordica*, *Citrullus*, *Colocynthus*, and others of the same family; on the lakes and pools are found *Lenuaminor*, *Trapa bispinosa*, *Nelumbium speciosum*, *N. brasenia*, *Pistia stratiotes*, *Juncus* and *Sagittaria cardifolia*. Several varieties of *Bambusa* are plentiful; also *Datura stramonium*, *D. alba*, and others; *cardicus arvensis*, *Cannabis sativa*, *Ocimum sanctum*, *solanum Jacquirii*, *S. Lycopersicum*, and a little *Euphortia indica*. During the rains *Vanda Roxburghii* is to be seen in full flower all the mango trees. There are many other plants and trees besides these, which I was unable to recognize.

## APPENDIX B.

COMPILING, DRAWING AND GEOGRAPHICAL EXAMINING BRANCH, SURVEYOR  
GENERAL'S OFFICE.

STATEMENT showing the nature of the work performed and the progress made from 1st January  
to 31st December 1871.

M A P S.	SCALE.	REMARKS AND PROGRESS.
	Miles. Inch.	
INDIA.—Standard Map, in 6 Sheets ...	32 = 1	
Sheet 1, Punjab, North-Western Frontier, and part of North-Western Provinces.	.....	Finished.
Sheet 3, Central India, Rajpūtana, Sindh and Bombay Presidency.	.....	Portions of Sindh, Central Provinces, and Rewah added.
Sheet 4, Nepal, Bhootan, Bengal, Central Provinces.	.....	Portions of the Chota Nagpore Division and the Native States of Jeypur and Bustar added.
INDIA.—Reduced from the above Standard Map.	64 = 1	Outlines completed of the Coast. Principal rivers inserted. Names of the most important places written. In progress.
INDIA.—For a General Map of the World, Eastern Bengal Section, Latitude 20° to 25°, Longitude 90° to 94°.	10 = 1	Completed as far as materials are available. Awaiting survey results on the Eastern Frontier.
INDIA.—Punjab Section, Latitude 30° to 35°, Longitude 70° to 74°.	10 = 1	Outlines in progress of the Umritsur and Jullundur Divisions.
BENGAL.—Jurisdiction of the Lieutenant Governor.	16 = 1	All the most important sites and names inserted. Outlines completed. In progress.
ORISSA DIVISION.—For the Gazetteer ...	12 = 1	Finished. Map engraved and published.
CHOTA NAGPORE DIVISION.—Outline or Skeleton Map	8 = 1	Finished and photozincographed on full and half scales.
CHOTA NAGPORE DIVISION.—Office Compilation Map.	4 = 1	Survey results up to date inserted. Hill shading in progress.
OUDE.—Hand Map ...	16 = 1	Finished. Engraving in progress.
SINDH.—Province of—with the Beloochistan Frontier.	16 = 1	Outlines and writing finished. A few additions in progress.
BERAR—	8 = 1	Finished and published for the Educational Department.
BHOOTAN.—(Western half), with the Dalingkote Sub-Division of District Darjeeling and the Northern portion of the Dooars.	4 = 1	Hill shading completed, various additions made. Silver prints sent to the Geographer at the India Office for additions to Atlas Sheet 118.
PUNJAB.—(Skeleton Map), with its dependencies to illustrate reports, &c.	32 = 1	Finished. To meet the urgent demands of the Punjab Government, this map was lithographed. A second and improved Map is now engraving. Reduced and drawn. Lithographed.
CALCUTTA CITY.—Pocket Map ...	1½ = 1	
Map to illustrate Dr. Anderson's Report on the route from Bham to Western Yunnan.	4 = 1	Compiled and photozincographed on the reduced scale of 8 miles=1 inch.
SHEETS OF THE ATLAS OF INDIA.		
Sheet 2, Quarters, S. E., S. W., and N. E. ...	4 = 1	Province of Sindh, Hydrabad, and Karachi Collectorates; Quarters S. E. and N. E. completed. On quarter S. W. the Frontier and Coast of Beloochistan remain to be added.

STATEMENT showing the nature of the work performed and the progress made from 1st January to 31st December 1871,—continued.

MAPS.	SCALE.	REMARKS AND PROGRESS.
Sheet 3, Quarters, S. E., N. E., and N. W. ...	Scale 4 Miles to the inch.	Province of Sindh. Shabunder and part of Jhirruk Districts. Mouth of Indus. Three-quarter Sheet completed.
Sheet 9, Quarters, S. W. and N. W. ...		Province of Sindh. Part of District Rohree and the Khyrporc Native State. Quarter S. W. completed. N. W. in progress.
Sheet 11, Quarters, S. E., S. W., N. E., N. W.		Province of Sindh and part of Cutch. All four quarters finished.
Sheet 32, Quarters, N. E. and S. E. ...		Portions of Districts Sirsa and Hissar and of the Bhikaneer State in Rajpūtana. Both quarters finished, up to the Meridian of 76° to the west of which the Survey of Rajpūtana has not yet extended.
Sheet 33, Quarters, S. E. and N. E. ...		Portions of the Native States of Jeypur and Shekawatti in Rajpūtana. Both quarters completed up to the Meridian of 76°.
Sheet 34, Quarters, S., E. and N. E. ...		Part of District Ajmere and of the Native States of Jeypur, Kishengur, Tonk, Boondi, &c. Both quarters completed up to the Meridian of 76°.
Sheet 51, Quarters, S. W. and S. E. ...		Writing completed on quarter S. E. Hill shading finished on quarter S. W.
Sheet 53, Quarters, S. W. and S. E. ...		Small portions south of the Nerbudda River completed. Part of the District of Husungabad.
Sheet 72, Quarters, N. E., N. W., and S. E. ...		Central Provinces. Portion of the Districts of Chindwara, Seonec, Bhundara, and Nagpore.
Sheet 73, Old double Elephant size plate ...		Central Provinces and Berar, Nizam's Territory, &c. Portion of the District of Chanda added.
Sheet 86, Quarter, S. W. ...		Portions of Oudh and Nepal completed.
Sheet 93, Quarter, N. E. ...		Portions of Jeypur, Bustar, &c., in the Vizagapatam Agency and Central Provinces. Outlines completed; writing in progress.
Sheet 124, Quarter, S. W. ...		Portions of Districts Goalpara and Kamroop completed as far survey materials are available.
Sheet 125, Quarters, N. E. and N. W. ...	Hills shaded—North Cachar, Khasia, and Jynteah Hills.	
Sheet 131, Quarter, N. W. ...	North Cachar and Naga Hill District finished.	

*N. E.*—Except where it is specified in the column of remarks, the hill shading remains to be done on all the above drawings of the Atlas Sheets. The drawing for hills and broken ground will be given on the final proofs of engraved outlines.

Charts of Triangulation, Ganjam and Orissa Topographical Survey, sheets 1, 2, 3, 9, 10 and 11.	4 = 1	For office record and photozincography. Each sheet contains two degrees of Latitude by one degree of Longitude. All are nearly ready. To be examined.
Central Provinces Topographical Survey (No. 2 Party), degree sheets 2, 4, 5 and 6.	2 = 1	Exaggerated Drawings completed for photozincography to the reduced scale of 4 miles to the inch.

STATEMENT showing the nature of the work performed and the progress made from 1st January to 31st December 1871,—continued.

M A P S .	SCALE.	REMARKS AND PROGRESS.
STANDARD SHEETS OF THE TOPOGRAPHICAL SURVEY, PREPARED FOR PHOTOZINCGRAPHY.	Miles. Inch.	
Gwalior and Central India Survey, sheets 6A, 11A and 11B.	1 = 1	Completed. The series of 1-inch maps of this Survey are now all completed and published up to date as far as the Survey has progressed.
Chota Nagpore Division, sheets 35, 36, 42, 44 and 54.	1 = 1	Projected and re-drawn from the original field sheets.
Sheets 12, 25, 26, 33 and 34 ... ..	1 = 1	Ditto ditto in progress.
Central Provinces Survey, sheet 17 ... ..	1 = 1	Projected and redrawn, finished.
Orissa, Ganjam and Central Provinces Survey, sheets 2, 4, 5, 6, 7, 8, 9 and 18.	1 = 1	Projected, outlined, &c., from the original field sheets. Drawing in progress in various stages.
Rewah Survey, sheets 1, 2 and 4 ... ..	1 = 1	Projected and drawn from the original field sheets, finished.
Sheets 11, 12, 13 and 15 ... ..	1 = 1	Ditto ditto in progress.

*Miscellaneous Maps, Charts, Tracings and Extracts.*

Country round Delhi ... ..	2 = 1	Specially compiled and published for the use of the troops at the Camp of Exercise, 1871-72.
Eastern Frontier adjoining Munnipore and Burmah.	4 = 1	Various additions and corrections made to the compilation, and a new edition published for the use of the Military Expedition against the Lushai Tribes. Photozincographed on the scale of 6 miles = 1 inch.
Lushai Hills and portions of Cachar and Chittagong.	4 = 1	A new map prepared and photozincographed; corrections and additions from Major John Macdonald's reconnoissance.
Hooghly River ... ..	1 = 4	From Atchipoor to Diamond Harbour. Outline map prepared for the River Defence Committee.
The Irrawaddy River from Ava to Moongkhom	1 = 1	Fair trace for office record, and an extract of the northern section of the map for Dr. Anderson.
Map of the Naga Hills between the Dekha and Dbyung Rivers.	Various	Four tracings from different old maps made for the Deputy Commissioner, Naga Hills District.
Extracts from unpublished charts of the Great Trigonometrical and Topographical Surveys	4 = 1	22 Extracts, with numerical data in full, for various Government Departments.
Corrections and additions to Topographical Survey standard and exaggerated sheets.	{ 1 = 1 2 = 1 4 = 1 }	77 Sheets examined and corrected.
Pergunnahs, Keltree, Sawar and Bughera of District Ajmere.	1 = 1	Tracings for the Deputy Superintendent, Rajpootana Survey.
Charts and Synopsis Sheets of Trigonometrical data of the old Hyderabad Topographical Survey Triangulation.	4 = 1	For Major Elphinstone, Superintendent of Revenue and Settlement Survey, Hyderabad Assigned Districts.
Charts and data of Triangulation in Berar ...	4 = 1	Ditto ditto ditto.
British boundary between Nepal and North Behar.	2 = 1	Trace for J. G. Charles, Esq.
Sketch map of the boundary between Holkar's State and Khandesh.	2 = 1	Fair copy for photozincography, printed for the Foreign Department.
Pergunnahs Soonth and Sunaouth, with part of Dussmullung, District Balasore.	2 = 1	For the Collector of Balasore. Fair copies on paper drawn for photozincography.



STATEMENT showing the nature of the work performed and the progress made from 1st January to 31st December 1871,—concluded.

MAPS.	SCALE.	REMARKS AND PROGRESS.
Corrections and additions to lithograph and photozincographed maps, addition of Railways, &c., to engraved maps.	Miles. Inch. Various	4,190 Sheets; corrections and additions made of various kinds.
Lithographed and photozincographed maps and plans, colored ...	Ditto	16,750 Copies.
Atlas Sheets and engraved maps, colored ...	Ditto	2,381 Copies.
<i>Work performed by Extra Draftsmen on payment.</i>		
Killahs Ranapur and Kandapah of Cuttack Tributary Mehals.	1 = 1	Drawn for photozincography.
Killah Sarunda, Gurjat State in Chota Nagpore Division.	1 = 1	Ditto ditto.
Outline map of District Baraitoh (Oudh) ...	4 = 1	Drawn on transfer paper and lithographed for the Settlement Officer, Baraitoh.

SURVEYOR GENERAL'S OFFICE, }  
The 1st January 1872. }

J. O. N. JAMES,  
Assistant Surveyor General,  
In charge, Drawing and Geographical  
Compiling Branch.

## APPENDIX C. 207

*Statement of work completed and in progress in the Engraving and Plate-printing Branch of the Surveyor General's Office.*

The work completed and in progress is shown as follows :—

- Quarter plate, atlas sheet, 125 south-west, containing parts of Mymensingh and Sylhet, finished.
- Quarter plate, 51 south-east, containing parts of Gwalior and Jhalawar States, finished.
- Quarter plates, 87 north-west, and 87 south-west, containing parts of Oudh, finished.
- Quarter plate, 10 south-west, containing parts of Districts Halla, Oomerkot, Hyderabad, and Mahomed Khan's Tanda of Sindh, finished ; 10 south-east, parts of District Oomerkot of Sindh and Native State of Mullance, Rajpūtana, finished ; 10 north-east, parts of Native State of Khyrpoor and District Oomerkot, Sindh, finished.
- Quarter plate, 11 south-east, containing parts of District Oomerkot and Native State of Cutch, finished ; quarter plates, 131 south-west, part of District Cachar, finished ; quarter plate, 3 south-east, parts of Districts Jhirruk and Shah Bunder of Sindh, finished. Quarter plate, 3 north-west, part of District Jhirruk of Sindh. These eleven plates have been completed and printed.

## PLATES IN PROGRESS.

- Quarter plate, 125 north-east ; hill work in progress : this is a heavy sheet and will take some time before completion ; the same with 125 north-west.
- Quarter plate, 51 south-west ; outline engraved and writing in progress.
- Quarter plates, 124 south-east ; hill work in progress ; 124 south-west, outline in progress.
- Quarter plate, 87 north-east. This plate has been laid aside for two years, waiting for new materials.
- Atlas sheet 68, old double elephant size plate. The new work on this plate is well advanced, and the progress is good. It is a very heavy plate.
- Atlas sheet 88, old double elephant sheet. The new work on this sheet is likewise very heavy. This plate has been put down several times on account of more pressing work.
- Quarter plate, 10 north-west, writing completed, and plate nearly ready for publication.
- Quarter plate, 11 north-east, outline completed, writing in progress, well advanced ; 11 south-west ; tracing commenced.
- Quarter plate, 86 south-west, outline and writing completed ; water lining and hills in progress.
- Quarter plate, 131 north-west ; outline and writing completed ; waiting for new materials.
- Quarter plates, 32 south-east and 32 north-east ; outline done, writing in progress. Both these sheets are in want of fresh materials.
- Quarter plate, 33 north-east ; outline done, writing nearly so ; 33 south-east, outline in progress.
- Quarter plate, 2 north-east ; outline in progress.
- Quarter plate, 34 north-east ; outline and writing nearly finished ; new materials wanted.
- Double elephant size sheet 78 ; repairing old work in progress. Transfers have been given of the parts repaired.
- Double elephant size sheet 73 ; taking out large piece of old work ; dry proofs have been taken for new work.
- Double elephant size sheet 48, Railways, engraved and completed.
- Double elephant size sheet 30, Railways, completed.
- Quarter plates, 72 north-east, 72 south-east, 72 north-west, projected, and dry prints given for new work. A transfer has been given so as to make a quarter atlas sheet (72 south-west) on account of this portion of the sheet not requiring any alterations.

## EXTRA AND MISCELLANEOUS JOBS,

- Altering dates, &c., to imprimature plates.
- Engraving Circular Protractor for the Mathematical Instrument Department.
- Repairing Diagram for the Punjab Irrigation Department.
- Engraving Map of Orissa (Hills engraved after office hours, for which payment was received).
- A large four-sheet Map of India (64 miles=1 inch) projected ; put aside for the want of hands.
- Index Chart of India, Great Trigonometrical Survey Triangulation, corrected up to date, 1871.

Map of Punjab, outline finished, writing in progress ; this plate is well advanced.

Revisions to the Town of Calcutta done as far as given by drawings. The new surveys did not come in early enough to do anything with them this year.

The projections to the quarter plates 2 and 3 by Mr. John Walker had to be taken out and re-done.

Cleaning old Town of Calcutta of eight plates (Prinsep's Plan).

Index to the Indian Atlas Sheets engraved and published.

#### EXTRA WORK.

During extra hours, I have engraved, out of office, a series of eleven plates to illustrate the report on cholera for the Sanitary Commissioners, by Dr. D. D. Cunningham, from which a large number of impressions have been taken and order completed. I likewise illustrated W. W. Hunter, Esq., LL. D. Work on Orissa, and engraved the hills to the Map of Orissa. This last job was done after office hours. For these jobs I have received payment.

The following statement shows the number of the Indian Atlas Sheets, that are completed and in progress for the year 1871 :—

Quarter plates,	125	S. W.,	completed and printed.
"	51	S. E.	"
"	87	N. W.	"
"	87	S. W.	"
"	10	S. W.	"
"	10	S. E.	"
"	10	N. E.	"
"	11	S. E.	"
"	131	S. W.	"
"	3	S. E.	"
"	3	N. W.	"
D. E. size plate	48 } 30 }	Railways,	completed.
Quarter plates,	125	N. E.	in progress.
"	125	N. W.	"
"	51	S. W.	"
"	124	S. E.	"
"	124	S. W.	"
"	87	N. E.	This plate at a stand still.
"	68		in progress.
"	88		"
"	10	N. W.	"
"	11	N. E.	"
"	11	S. W.	"
"	86	S. W.	"
"	131	N. W.	"
"	32	S. E.	"
"	32	N. E.	"
"	33	S. E.	"
"	33	N. E.	"
"	2	N. E.	"
"	34	N. E.	"
D. E. plates	78		"
"	73		"
Quarter "	72	N. E.,	projected.
"	72	S. E.	"
"	72	N. W.	"
Impressions, proofs, and transfers taken from copper plates—			
Proofs of various kinds	...	...	607
Transfers	...	...	561
Impressions	...	...	20,732
Total Impressions	...	...	<u>21,900</u>

SURVEYOR GENERAL'S OFFICE ; }  
Calcutta, 1st January 1872. }

(Sd.) C. W. COARD,  
Superintendent, Engraving Branch.

## APPENDIX D.

*ABSTRACT of the Drawings executed in the Surveyor General's Office, Lithographic Branch, from 1st January to 31st December 1871.*

Scale, &c.	New Maps, &c., the Lithographic Drawings of which were completed during the present year.	Size.	Number of Sheets.
<b>GENERAL MAPS.</b>			
8 Miles=1 inch...	Punjab Compilation Map, Sheet No. 5 ... ..	Double Elephant.	1
4 " =1 "	Sindh Compilation Map, Sheet Nos. 1, 2, 3, 4, 5, 6, 8, 9, 10, 11	Imperial.	10
16 " =1 "	North-Western Provinces, Chalk Hills on stones ... ..	Do.	4
32 " =1 "	Eastern Bengal, Burmah and China, with parts of Siam, Chalk Hills on stone ... ..	Do.	4
4 " =1 "	District Bhundara with Chalk Hills ... ..	Double Elephant.	1
4 " =1 "	Do. Cacliar with do. do. ... ..	Super Royal.	1
4 " =1 "	Standard Specimen of Revenue Survey congregated Village Plan ... ..	Atlas.	1
4 " =1 "	District Sylhet, new boundaries, sub-division and thannah names inserted ... ..	Double Elephant.	1
16 " =1 "	Postal Map of North-Western Provinces ... ..	Atlas.	4
32 " =1 "	Bengal, Behar, and Orissa, Skeleton Map ... ..	Double Elephant.	1
	Index Maps, showing the published Sheets of the Topographical Surveys ... ..	Foolscep.	12
	Do. do. of Sindh ... ..	Do.	1
	Do. do. of Oudh ... ..	Do.	1
2 " =1 "	District Ferozepore ... ..	Atlas.	4
<b>REVENUE SURVEY MAPS.</b>			
1 " =1 "	District Ramree, M. C. Nos. 1 and 2 ... ..	Antiquarian.	2
<b>SHEET MAPS.</b>			
1 " =1 "	Sindh Revenue Survey, Sheets Nos. 21, 34, 35, 42, 49, 51, 54, 56, 63, 64, 65, 73, 74, 75, 78, 79, 82, 83, 86, 87, 90, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102 ... ..	Double Elephant.	32
1 " =1 "	Lohardugga Revenue Survey, Sheets Nos. 3, 4, 5, and 6 ... ..	Double Royal.	4
1 " =1 "	Chauda Revenue Survey, Sheet No. 6, 2nd edition, a portion added ... ..	Do. do.	1
1 " =1 "	District Purneah, Sheets Nos. 1 to 18... ..	Do. do.	18
<b>PLANS OF CANTONMENTS AND CIVIL STATIONS.</b>			
6 " =1 "	Cantonment and environs of Meerut ... ..	Atlas.	4
14 " =1 "	Calcutta Plan ... ..	Foolscep.	1
50 feet =1 "	Plan of part of the City of Delhi ... ..	Atlas.	4
<b>THANNAH MAPS.</b>			
4 inches=1 mile...	Thannah Naoparrnah, Sub-division Kooshteah, District Nuddeah	Imperial.	12
" "	Do. Bhalooka, Sub-division Kooshteah, District Nuddeah ...	Atlas.	4
" "	Do. Kooshteah, Sub-division Kooshteah, District Nuddeah...	Do.	1
" "	Do. Bhadooliab, Sub-division Kooshteah, District Nuddeah...	Do.	4
" "	Do. Coomercolly, Sub-division Coomercolly, District Pubna...	Imperial.	8
<b>BARRACK PLANS.</b>			
Of various scales...	Meerut Cavalry Lines ... ..	Atlas.	12
	Do. Bazaars ... ..	Double Elephant.	2
	Do. Hospitals, &c. ... ..	Do. do.	4
	Do. Infantry Lines ... ..	Atlas.	12
	Do. Artillery Lines ... ..	Do.	10
	Do. Cantonment Index ... ..	Super Royal.	2
	Mooltan Cantonment ... ..	Atlas.	4
	Jullundhur Cavalry Lines ... ..	Double Elephant.	2
	Carried over ...		189

ABSTRACT of the Drawings executed in the Surveyor General's Office, Lithographic Branch,  
from 1st January to 31st December 1871.—continued.

Scales, &c.	New Maps, &c., the Lithographic Drawings of which were completed during the present year.	Size.	Number of Sheets.
<b>BARRACK PLANS,—Contd.</b>			
	Brought forward ...	.....	189
Of various scales...	Jullundhur European Infantry Lines ...	Imperial.	12
	Do. Native do. do. ...	Atlas.	4
	Do. Key Plan ...	.....	1
	Sealkote Infantry Lines ...	Atlas.	8
	Do. Artillery do. ...	Imperial.	18
	Mean Meer Infantry Lines ...	Double Elephant.	6
	Do. Artillery Lines ...	Atlas.	16
	Jubbulpore Infantry Lines ...	Double Elephant.	3
	Do. Artillery Lines ...	Do. do.	5
	Ferozepore Infantry Lines ...	Do. do.	24
	Geological Maps ...	Various sizes.	3
	Medical Department Maps ...	Do.	9
	Railway Maps and Plans ...	Do.	7
	Sanitary Commissioner's Maps ...	Do.	3
	Foreign Department Maps and Plans ...	Do.	20
	Military Department Maps and Plans, including Quarter Master General's ...	Do.	26
	Public Works Department Maps and Plans ...	Do.	17
	Archæological Survey Maps and Plans ...	Do.	42
	Bengal Government Maps and Plans ...	Do.	13
	Miscellaneous Maps, Plans and Drawings ...	Do.	100
			526

Abstract of the Printing executed during the year, showing value or selling price of the same.

SUBJECTS.	Number of Sheets.	Number of Copies.	Number of Pubs.	Value or selling price.	
				Rs.	A. P.
District and General Maps on various scales ...	50	8,168	26,378	17,740	8 0
Index Maps ...	25	14,860	27,950	gratis.	
Revenue Survey Circuit Maps, 1 Mile=1 inch ...	3	474	786	1,179	0 0
Do. do. Sheet Maps, 1 Mile=1 inch ...	82	20,308	27,172	30,462	0 0
Thannah Maps, scale 4 inches=1 Mile ...	21	300	1,575	337	8 0
Plans of Cantonments and Civil Stations ...	16	984	4,453	1,976	0 0
Block Plans of Barracks, &c., for Secretary of State ...	140	1,845	12,880	3,662	0 0
Reprints of old Maps ...	67	3,379	10,358	6,979	0 0
Maps with coloured boundaries ...	...	144	144	27	0 0
Do. with tints ...	...	947	1,347	133	12 0
Miscellaneous Maps ...	136	61,302	83,771	9,612	15 0
Do. Plans, Sketches, &c. ...	147	62,685	66,643	5,814	7 0
Estimated cost of transfers of heading and foot-notes to the published Maps of this Department ...	...	...	...	600	0 0
	687	166,396	262,457	78,523	2 0
Memoranda, &c. ...	...	41,442	66,092	4,399	8 0
Forms for the use of the Department ...	...	85,060	147,786		
Do. Topographical and Revenue Survey Orders ...	...	3,554	4,436		
Cost of the above ...	...	130,056	218,314		
<i>Cost of Lithographic Branch.</i>					
Permanent Establishment ...	32,554	8	4		
Contingent Expenses ...	2,044	7	10		
Extra Contingencies ...	3,989	0	0		
Actual Cost of Papers* ...	6,365	0	0		
				45,853	0 2
* Lithographic Paper of all sorts, 126 reams ...					
Proof " of " 132 "	...	...	...	Rs. 6,365.	
Printing " of " 123 "	...	...	...		

W. G. MURRAY, Captain,  
Assistant Surveyor General, in charge, Lithographic Branch,  
Surveyor General's Office.

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APPENDIX E.

SURVEYOR GENERAL'S OFFICE,  
PHOTOGRAPHIC BRANCH;  
Calcutta, 1st January 1872.

FROM

CAPTAIN J. WATERHOUSE,

*Assistant Surveyor General, in charge Photographic Branch,*

*Surveyor General's Office,*

TO

COLONEL H. L. THUILLIER, B. A., C. S. I.,

*Surveyor General of India.*

SIR,

I have the honor to submit, for your information, the usual tabular statement showing the amount and progress of the work performed in the Photographic Branch of your office during the past twelve months, extending from 1st January to the 31st December 1871.

The amount of work may briefly be stated as follows: 1,035 original subjects have passed through the Office, of which 1,11,503 complete printed copies have been struck off, besides 2,565 silver prints.

2. There has been a considerable increase in the out-turn of work during the period now under review over that of the previous twelve months as noted below:—

	December 1860-70.	1871.	Difference.	Difference, Square Inches.
Originals ... ..	631	1,035	+ 404	.....
Negatives ... ..	2,078	1,816	- 262	+ 4,780
	4,84,430 Sq. In.	4,89,210 Sq. In.		
Silver prints ... ..	3,796	2,561	- 1,235	-4,51,029
	7,02,086 Sq. In.	2,51,057 Sq. In.		
Carbon prints ... ..	2,076	1,827	- 249	- 11,797
	4,69,922 Sq. In.	5,01,719 Sq. In.		
Transfer to zinc or stone ... ..	501	549	+ 48	.....
Number of pulls ... ..	88,322	96,725	+ 8,403	.....
Number of complete copies ... ..	54,952	1,11,503	+ 56,551	.....

3. As the system of work is now thoroughly established, there is no necessity for my reviewing the operations of each department as in former years. The ordinary processes have remained unchanged, the work has shown a steady improvement.

4. EXPERIMENTAL WORK.—The whole of my leisure during the year has been devoted to the perfection of a process of photocollotype printing analogous to the process known as Heliotype, and I am glad to report that I have obtained results which give me hopes of being able very shortly to introduce into the office a process by which all kind of maps and drawings may be copied, whether they are in pen and ink or brush shaded, the former being reproduced with all the sharpness and distinctness of fine copper plate engraving; the latter with the delicacy of gradation of an ordinary silver print. I am sorry that my absence with the Eclipse expedition during the latter part of the year has prevented me from being able to prepare a specimen to accompany this report, but I hope to supply the deficiency next year. A description of the process is appended.

5. NEW ANASTATIC PROCESS.—A process of anastatising drawings made with the ordinary blue or red chalk pencils on white paper suggested by Captain Murray has been tried with success, and though no practical use has yet been made of it, it might be utilised on many occasions when facsimiles of sketches or chalk drawings are required.

6. ECLIPSE EXPEDITION.—At the request of Colonel Tennant, R. E., I was deputed to assist in the Photographic operations connected with the expedition, to observe the total Solar Eclipse of the 12th December at Ootacamund, and succeeded in obtaining six good photographs of the corona besides other photographs of the instruments and locale.

EXPENSES OF WORKING.—The total cost of the office during the past twelve months has been Rs. 50,549-13-2, while the approximate value of the work is Rs. 68,692-4-0, showing a profit of Rs. 18,142-6-2, which is most satisfactory.

I have the honor to be,

SIR,

Your most obedient servant,

J. WATERHOUSE, *Captain,*

*Assistant Surveyor General, in charge Photographic Branch,*

*Surveyor General's Office*

A.

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 ABSTRACT of work performed in the Photozincographic Branch of the Surveyor General's Office from 1st January to 31st December 1871.

МАС. ПРОТОВАРЕНД.	No. of Sections or Sheets.	No. of Negative Plates.	ПЛИТЫ.		Transferred to Zinc or Stone.	No. of Pulls.	No. of Complete Copies.	REMARKS.
			Silver.	Carbon.				
Topographical Survey Maps ...	132	214	42	226	92	15,130	13,550	
Revenue Survey Maps ...	459	701	237	737	219	25,499	23,264	6,710 anastatised.
District Maps ...	9	46	94	28	11	2,970	1,705	
General Maps ...	62	192	423	166	43	5,140	2,560	160 anastatised.
City and Cantonment Plans ...	193	504	54	546	142	28,092	5,102	{ 110 anastatised. 880 zincographed.
Miscellaneous Maps, Plans, Subjects, &c. ...	180	159	1,715	126	41	17,844	65,322	7,446 anastatised.
Zincographic and Anastatic Transfer ...	...	...	...	...	123	...	...	
Proofs ...	...	...	...	...	...	2,050	...	
<b>TOTAL.</b> ...	1,085	1,816	2,565	1,829	671	96,725	1,11,503	Exclusive of silver prints.

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J. WATERHOUSE, Captain,  
 In charge, Photographic Branch,  
 Surveyor General's Office.