

GENERAL REPORT

ON THE

TOPOGRAPHICAL AND REVENUE SURVEY OPERATIONS

OF THE

BENGAL PRESIDENCY,

FOR

SEASON 1863-64.

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BY

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SURVEYOR GENERAL OF INDIA.

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 No. 166,—Dated Calcutta, 6th April, 1865.
 

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## GENERAL REMARKS.

1. **INTRODUCTORY.**—For the previous season of 1862-63 two separate Operation Reports were submitted to the Military and Foreign Departments, respectively, for the Topographical and Revenue Branches of the Department, which then came under Military and Civil jurisdiction; but, in accordance with the new arrangement of bringing the whole of the surveys under the Home Department, as proposed in Lieutenant Colonel Dickens' Special Report on the reorganization of the Department, and directed to be carried out by the Financial Resolution marginally cited, the history of the season's proceedings in both branches under my superintendence has been combined into the following Report for the past professional year of 1863-64, or from the 1st October 1863 to the 30th September 1864.

Topographical Report No. 33, dated 26th April 1864, to Military Dept.  
Revenue Report No. 17, dated 13th June 1864.

No. 3996, dated the 22nd December 1864.

2. Very full details having been so recently given regarding the working of all the surveys, it is only necessary now briefly to allude to the results of the past season, bringing the same up to the period when I am about to leave my post for a time. After an uninterrupted course of 18 years' arduous service in charge of my present Offices at the Presidency, as well as supervision over so many Executive Surveys scattered all over this wide Presidency, I find it absolutely necessary, under the advice of my Medical Attendant, to seek a respite from work for a time, and to proceed to Europe on Medical Certificate, for which the necessary leave for 20 months has been accorded to me under the new Rules.

3. The Topographical Parties, as described in last Report, have been fully employed during the season under review, and by the combined efforts of the seven regular Establishments, which have worked systematically on the principles regulating this Department, a general area of 14,485 square miles of final survey have been completed, on the scale of 1 inch to the mile, at a total cost of Rs. 2,57,998½, for all charges, permanent and contingent. This is exclusive of the Pegu

Survey, which is based on different principles and scale, and the area of which is uncertain; it has therefore been separately recorded, as detailed in the following Statement, showing the extent of work and cost of each survey :—

Designation of Survey.	PROGRESS.		Total Expenditure for the season 1863-64.		REMARKS.
	Triangulation.	Topographical details completed.	Rs.	A. P.	
	Square miles.	Square miles.			
No. 1 Topographical Party, Gwalior and Central India Survey...	4,500	2,628	60,689	10	0
No. 7 Topographical Party, Rajpootana Survey ... ..					
No. 2 Topographical Party, Hyderabad Survey ... ..	2,550	2,682	36,896	11	0
No. 3 Topographical Party, Ganjam and Orissa Survey ... ..	7,000	3,454	53,990	0	0
No. 4 Topographical Party, Chota Nagpore Division Survey ...	1,500	3,896	43,097	6	0
No. 5 Topographical Party, Rewah Territory Survey ... ..	2,824	1,825	45,657	15	0
No. 6 Topographical Party, Cossyah and Garrow Hills Survey ...	600	None.	17,666	15	0
	18,974	14,485	2,57,998	9	0
No. 8 Topographical Party, Pegu Survey ... ..	.....	5,019	34,509	3	0
Total ...	18,974	19,504	2,92,507	12	0

From which an average rate of nearly Rs. 17-13 or 35s. 4d. per square mile, is obtained on fine survey alone.

4. The out-turn of the seven surveys is thus, 1,522 square miles in excess of that of the previous season, whilst the expenditure is only Rs. 23,768 above it; and if Pegu is brought into the calculation, there will be an area of 6,541 more than last year, or 19,504 square miles altogether, for a total expenditure of Rs. 2,92,507. The mean average cost of the above regular surveys is Rs. 17-13 per square mile on the final work alone, irrespective of the large area of triangulation in advance of the Topography, which amounts to no less than 18,974 square miles, or, inclusive of Pegu, the rate is reduced to Rs. 15 per square mile, equivalent to 30 shillings.

5. The advance in the annual rate of progress in this branch of the Department is worthy of notice, the progression is as shown in the margin; and as the several new Establishments become fully efficient and trained to the work, larger areas may be expected. The style of country, however, in which most of the Parties are now employed, or gradually advancing into, is hostile, both to rapid progress as well as the health of the Surveyors. In short, the most favored parts of India have now been pretty nearly surveyed, whilst the wild, jungly, and sparsely populated tracts and Native States remain to be disposed of.

Progressive increase of area.

Season.	Final Survey : Square Miles.	Triangulation : Square Miles.
1860-61 ... ..	8,204	14,569
1861-62 ... ..	8,204	14,569
1862-63 ... ..	12,965	20,048
1863-64 ... ..	19,504	18,974

6. The general, or  $\frac{1}{4}$ -inch, as well as the 1-inch Maps of the Ganjam, the Chota Nagpoor, and the Hyderabad Division Surveys, it gives me much pleasure to state, are improving most materially; those for the season under review are very well executed; the Sheets or Sections are all uniform and of a most convenient size both for preparation, early rendering, and subsequent publication, points of the greatest importance. The endeavours of the Executive Surveyors in following the instructions laid down for their guidance in this respect, have been conspicuous and demand my acknowledgments.

7. The whole of the 1-inch Maps of the Ganjam and Chota Nagpoor Surveys have been reduced to the  $\frac{1}{2}$ -inch scale by Photography, and the prints issued to various local authorities. These sheets are most useful, and sufficiently prove the value of the Photographic Branch, which, during the last year or two, has enabled me to put these records of the Topographical Surveys to a practical use, which had never before been done. A large Map of the Hyderabad Survey has likewise been photographed and supplied to Officials engaged in the re-distribution of the East and West Berar Districts.

8. The extent of work performed and submitted to this Office for examination and compilation by this branch of the survey, is very large. Since the last Report further additions have been made by the Government of India to the Topographical Surveys as per margin, which involve much extra correspondence and labor. Whilst, however, the exigencies of the Public Service have again necessitated these extra surveys to be placed under the control of this Office—as all surveys undoubtedly should be, the administrative and ministerial staff has in no ways been made to accord with the duties to be performed, and the difficulties brought to notice in last Topographical Report, paras. 23 and 24, are continued and materially increased.

Bengal Doars and Bhootan, by  
Captain Godwin Austen.  
Siam and Tenasserim Boundary, by  
Lieutenant Bagge.

The decision of Government on Colonel Dickens' enquiry, as contained in the Financial Resolution thereon, affords no relief whatever to the Supervising Office, and the subject has therefore been again submitted for the consideration of Government in letter as per margin.

No. 3996, dated the 22nd December 1864.

No. 158, dated 21st March 1865.

9. The Revenue Surveys have been in equal or greater force than the Topographical. The present Report embraces an account of the proceedings of ten Parties, which have been actively employed in the Upper and Central Provinces as shown in the following Statement. In addition to which, nine other Parties connected with the Lower Provinces have been reported on separately to the Bengal Government, and will be found annexed :—

No. of Division.	Division.	Districts.	Superintending Officers.	Area in square miles.	Total cost.		REMARKS.
					Rs.	Rs.	
1	Jubbulpoor Division, Central Provinces ...	Hoshungabad ...	Lieut. J. Sconce ... " J. H. W. Osborne ... Capt. R. E. Oakes ...	1,414	45,666	32 5	371 square miles, Topographical Work.
2	Nagpoor Division, Central Provinces	Bhundara ... Raepoor ...	Lieut. J. W. Taylor...	1,135	42,990	37 14	
3	Saugor Division, Central Provinces	Saugor ...	Lieut. J. Sconce ... " J. H. W. Osborne ...	1,341	45,565	33 15	
4	Baiswarrah, Oudh	Sooltanpoor ... Seetapoor ...	Capt. F. C. Anderson	1,517	50,109	33 0	
5	Lucknow "	Hurdui ... Durrinbad ...	Lieut. Col. D. C. Vaurenen...	1,498	52,514	35 0	
6	Fyzabad "	Fyzabad ...	Lieut. F. Coddington	982	38,768	39 7	
7	Rohilcund, N. W. P.	Moradabad ...	H. B. Talbot, Esq. ...	379	12,365	32 6	
8	N. W. Frontier ...	Shahpoor ... Peshawur ...	Maj. H. C. Johnstone	2,536	67,880	22 13	
9	Right Bank Indus, Sindh ...	Kohistan ... Kurrachee ... Schwan ... Jherruck ...	Capt. J. Macdonald...	6,836	58,963	8 10	3,571 square miles, Topographical Work.
10	Left Bank Indus, Sindh ...	Thur Parker ... Hyderabad ... Halla ...	W. Lane, Esq. ...	2,731	33,766	12 6	
10	Total Upper Provinces ...			20,369	4,38,486	21 8	
9	Total Lower Provinces ...			9,915	3,43,925	31 1	A. Of 6 regular Parties only and exclusive of 3 Waste Land Surveys.
	Grand Total ...			30,284	7,82,411	25 13	

10. Then ten surveys, as above noted, have produced an area of 20,369 at a cost of Rs. 4,38,486, which yields a general average of Rs. 21-8-0 per square mile, the rate varying from Rs. 12 in Sindh, where a good proportion is topographical only, on the reduced scale, to Rs. 33 and 39 for purely Revenue Village Survey on the 4-inch scale. In the Lower Provinces, where the nature of the survey is chiefly of the latter description, an area of 9,915 square miles has been effected at a cost of Rs. 3,43,925, and mean rate of Rs. 31 per square mile. The grand total accomplished by the nineteen Parties for the season amounts to 30,284 at an expenditure of Rs. 7,82,411, which gives a general rate of Rs. 25-13 per square mile for the work performed.

Season.	Square Miles.	Cost.		Rate.	
		Rs.	Rs.	A.	P.
1863-64 .. .. .	30,284	7,82,411	25	13	0
1862-63 .. .. .	23,936	6,11,354	25	8	0
Difference .. .. .	6,348	1,71,057	0	5	0

11. The extent of work now performed is in excess of that returned last season by 6,348 square miles, whilst the mean average rate is nearly the same, or 5 annas only in excess. The areas and expen-

diture under each jurisdiction are as follows :—

No. of Parties.	Jurisdiction.	Area Surveyed.	Total Cost.	Rate.
			Rs.	Rs. A. P.
3	Central Provinces ... ..	3,890	1,34,221	34 8 0
3	Oudh ... ..	3,997	1,41,391	35 6 0
1	North-Western Provinces ... ..	379	12,265	32 6 0
1	Punjab ... ..	2,536	57,880	22 13 0
2	Sindh ... ..	9,567	92,729	9 11 0
9	Lower Provinces ... ..	9,915	3,43,925	31 1 0
19	<b>Total</b> ... ..	<b>30,284</b>	<b>7,82,411</b>	<b>25 13 0</b>

12. These results as to quantity are as satisfactory as any of the preceding years, whilst the character of the operations steadily improve and evince the great care, zeal, and energy with which the several

Executive Officers and their subordinate staff perform their laborious duties.

Districts completed.

Saugor .. .. .	Central Provinces.
Sooltanpoor .. .. .	Oudh.
Durrabad .. .. .	Sindh.
Kurrachee .. .. .	
Right Bank Indus .. .. .	Do.
Halla .. .. .	
Left Bank Indus .. .. .	

Districts in hand, near completion.

Bhundara .. .. .	Central Provinces.
Dumoh .. .. .	
Hoshungabad .. .. .	
Pyzabad .. .. .	Oudh.
Seetapoor .. .. .	
Hurdul .. .. .	

	Square miles.
10 Topographical Surveys .. .. .	19,504
19 Revenue Surveys .. .. .	30,284
<b>29 Total</b> .. .. .	<b>49,788</b>
For season 1862-63 .. .. .	33,839
Excess performed in 1863-64 .. .. .	15,949

13. The several districts completed since last Report, and those now in hand near completion, are detailed in the margin. Table H in the Appendix brings the list of completed districts for the Upper Provinces with final areas, total cost, &c., up to date. The details connected with the surveys in the Lower Provinces will be found recorded in the separate Report to the Bengal Government annexed.

14. The combined areas executed by the two branches of the survey under my control, for the single season under review, amount to very nearly 50,000 square miles. In last Revenue Report, para. 10, the area effected for two seasons was 67,679; and taking half of this as the proportion for one season, we have an excess of no less than 15,949 square miles. Thus, it will be observed,

we have not only a very large number of Survey Parties employed, but the work produced is enormous, increasing every year according to the growing efficiency of the Establishments and the particular facilities afforded by change of country operated upon.

15. Of the Revenue Surveys alone, the following Statement shows the aggregate area, cost, and rate for eighteen seasons, from the period in which I first superintended these operations in 1846-47, and from the date when the Department commenced to expand to its present strength:—

	Square Miles.	Cost.	Rate.
Last reported, 17 Seasons ... ..	2,82,860	Rs. 65,15,711	Rs. A. P. 23 1 0
Now reported for 1863-64 ... ..	30,284	7,82,411	25 13 0
<b>Total for 18 Seasons ...</b>	<b>3,13,144</b>	<b>72,98,122</b>	<b>23 5 0</b>

16. The above mean average rate of Rs. 23-5 per square mile for work of this description, which produces Maps on such a scale as 4 inches to the mile, both of a Revenue and Topographical character, is extremely moderate.

Maps and Records lodged.

	PROVINCES.		Total.
	Upper.	Lower.	
Index Map of Season's operations, scale 4 miles = 1 inch ... ..	14	9	23
Charts of Triangulation, scale ditto ... ..	5	2	7
Main Circuit (or Pergunnah) Maps, scale 1 mile = 1 inch ... ..	65	44	109
Village Plan Sheets on scale of 4 inches = 1 mile (containing 14,837 Villages) ... ..	694	578	1,272
Large scale, City and Cantonment Plans ... ..	8	9	17
Main Circuit Traverse Computations, Vols. ... ..	11	6	17
Village Circuit ditto and Statistical Registers ... .. Vols. ... ..	24	17	41
Computation of Triangles ... ..	1	2	3

17. The geographical materials and results of the Revenue Surveys produced during the season aggregate the number and description noted in the margin. Of the 1-inch Pergunnah Maps there are 29, and of the village Plan Sheets 428, in excess of the quantity lodged in the previous Season.

18. The nature and extent of the principal part of the mapping work performed for the General as well as the Revenue Branch of the Office, may be stated as follows. It is not practicable to show all that has been done in this respect, there being many details of a desultory or trifling character, which, although occupying much time and attention, are not worthy of specification here.

### General Compilations.

	Miles.	In.	
India, (Special Skeleton,) illustrating Political Divisions for Secretary of State ... ..	32	= 1	Completed.
North-East Frontier, Bengal, including Assam and Bhootan, in 6 Sections ... ..	8	= 1	Compiled.
Central Provinces, Southern portions ... ..	8	= 1	Compiled to extent of materials supplied.
Ditto ditto ... ..	16	= 1	Compiled and ready for publication.
Punjab Map, in 8 Sections ... ..	8	= 1	Further additions made since last Report. This important and valuable Map has been ready for lithography some time, and will be taken up as soon as means will permit the Lithographic Press to do so.
General Map of the Punjab, North-Western Provinces, and a portion of Central India, in 2 Sections ... ..	16	= 1	Upper Section compiled; Lower Section under revision.
Bengal Dooar Map ... ..	4	= 1	Re-compiling as far as new materials will allow.
Hyderabad Topographical Survey ... ..	4	= 1	Compiled up to work of Season 1862-63.
Chota Nagpore Division Topographical Survey ... ..	4	= 1	Ditto ditto ditto.



## General Compilations,—(Continued.)

	Miles.	In.	
Ganjam and Orissa Topographical Survey	4	= 1	Compiled up to work of Season 1862-63.
Gwalior and Central India, Hyderabad, Chota Nagpore, and Ganjam and Orissa	4	= 1	Duplicate copies made, and also copies of Charts for Seasons 1862-63 and 1863-64 for Office record, and originals sent to England.
Bengal and Behar ... ..	16	= 1	Under revision, owing to fresh materials having been received, nearly ready for lithography.
Old Map of Kishnagur, Jessore, Boosnah, and Mahumdshi, with part of Dacca and Rajshi (Bengal) ...	8	= 1	Reduction from Rennel's Survey.

## REVENUE BRANCH.

## Compilations.

Scale 4 miles=1 inch.

CENTRAL PROVINCES ...	{	District Saugor ... ..	Final Map completed and ready for press.
		Do. Nursinghpoor ... ..	Final Map partly compiled.
		Do. Bhundara ... ..	Do. compiled to the extent of materials lodged in this Office.
ODDH ...	{	<i>South-Western Section,</i>	
		Containing Districts Oonao, Roy Bareilly, and Lucknow ... ..	Preliminary Map near completion, and will be ready for photography very soon.
		<i>South-Eastern Section,</i>	
PUNJAB ...	{	Containing Districts Purtabgurh, Sooltanpoor, Durriabad (portion of), and Fyzabad.	Final Map completed to the extent of materials lodged in this Office.
		Delhi and Hissar Division, lapsed Jagheers.	Final Map completed.
		District Nowshera, Hyderabad Collectorate.	Final Map compiled.
LOWER PROVINCES ...	{	District Hazareebaugh ... ..	Final Map completed. The publication has been delayed owing to certain revisions.
		Do. Maunbhoom ... ..	Final Maps completed to the extent of materials received from the Revenue Surveyors.
		Do. Tipperah and Ballooah ... ..	
		Do. Chittagong Hills and Hill Tipperahs.	
<i>Scale 2 miles=1 inch...</i>			
PUNJAB ...	{	District Delhi and Hissar, lapsed Jagheers, showing village boundaries.	Near completion.
CENTRAL PROVINCES ...	{	District Saugor, showing village boundaries.	Partly compiled.

19. The principal part of the work connected with the Photographic Branch for the past year is detailed in the following Statement, giving an aggregate of 406 Negatives taken and 3,067 Prints of Sections of Maps of the Topographical and Revenue Surveys, either re-produced on the original 1-inch scale or reduced to  $\frac{1}{2}$ -inch. A Map of Bhootan was similarly produced, and proved most valuable and opportune to the Military Expedition. The useful aid thus afforded to the Depart-

Photographic Branch.

ment and to my over-taxed Office, as well as to local Officers and others seeking geographical information of unknown parts of the country, by the prompt issue of all these Maps and Plans, cannot be too much appreciated.

Description.	Original Sheets.	Subject.	No. of Plates.	No. of Prints.	Original Scale.	Photographic Scale.	
TOPOGRAPHICAL.	3	Gwalior Survey ... ..	38	339	1 Mile = 1 Inch.	1 Mile = 1 Inch.	
	2	Degree Sheets (Gwalior) ... ..	8	80	4 " = 1 "	4 " = 1 "	
	25	Ganjam Survey ... ..	35	345	1 " = 1 "	2 " = 1 "	
	5	Sumbulpoor Tributary Mehals ... ..	8	80	1 " = 1 "	2 " = 1 "	
	1	Portions of Gwalior Survey ... ..	8	160	1 " = 1 "	1 " = 1 "	
	1	Map of Peshawar ... ..	3	6	1 " = 1 "	2 " = 1 "	
	5	Cashmere ... ..	10	20	1 " = 1 "	2 " = 1 "	
	1	Kurrachee Hills ... ..	1	2	1 " = 1 "	1 " = 1 "	
	1	Western Bhootan (Austen's) ... ..	9	298	4 " = 1 "	4 " = 1 "	
	..	Ditto ditto ditto ... ..	2	6	4 " = 1 "	8 " = 1 "	
	1	Bhootan (Office Compilation) ... ..	11	330	1 " = 1 "	1 " = 1 "	
	5	Jheelum and Rawul Pindee ... ..	20	60	1 " = 1 "	1 " = 1 "	
	10	Chota Nagpore Survey ... ..	20	200	1 " = 1 "	2 " = 1 "	
	REVENUE.	1	Jeypore, Bustar, &c. ... ..	6	90	1 " = 1 "	1 " = 1 "
		1	Hyderabad ... ..	11	110	4 " = 1 "	4 " = 1 "
8		Moradabad Survey ... ..	8	16	20 chns. = 1 "	1 " = 1 "	
96		Nursinghpore " ... ..	96	212	20 " = 1 "	1 " = 1 "	
1		Hoshungabad " ... ..	1	2	20 " = 1 "	1 " = 1 "	
2		Ditto ditto ... ..	13	39	1 Mile = 1 "	1 " = 1 "	
2		District Saugor ... ..	3	6	1 " = 1 "	To full $\frac{1}{2}$ and $\frac{1}{4}$ .	
2		City and Cantonment, Lucknow ... ..	2	8	8 " = 1 "	1 Mile = 1 Inch.	
1		Route, Major General (Showers's) ... ..	1	4	16 " = 1 "	Slightly reduced.	
9		Topographical Items for Village Plans ... ..	9	45	1 " = 1 "	To full and $\frac{1}{4}$ .	
4		Forts in Bhootan (Austen's) ... ..	8	144	150 Yds. = 1 "	150 Yds. = 1 Inch.	
1		Part of Saugor ... ..	1	4	1 Mile = 1 "	2 Miles = 1 "	
1		Dellamcotta Fort ... ..	1	5	Re-produced from an Engraving.		
2		Aldershott (Ordnance) ... ..	10	90	6 Miles = 1 Inch.	6 Miles = 1 Inch.	
GENERAL.		1	Barracks at ... ..	9	54	Re-produced.	
	1	Index to ... ..	4	24	Ditto.		
	3	Petley's Hill Sketches ... ..	3	60	Ditto.		
	..	Ditto ditto ditto ... ..	3	60	Reduced to $\frac{1}{4}$ .		
	1	Plan of Attack, Dellamcotta ... ..	2	60	Re-produced.		
	4	Conventional Signs ... ..	8	70	Re-produced and reduced to $\frac{1}{4}$ .		
	2	Lendy's Items ... ..	4	8	Ditto ditto ditto.		
	1	Lieutenant Stewart's Plan ... ..	2	2	Reduced to $\frac{1}{4}$ for trial.		
	1	Pergunnah Map ... ..	9	9	Re-produced.		
	1	Compass Card ... ..	1	1	Ditto for Mathl. Instt. Dept.		
	1	Plan of Buxa Dewa ... ..	1	1	Ditto for Qr. Mr. Genl.'s Dept.		
	1	Survey of Dellamcotta Fort ... ..	3	3	Re-produced and reduced to $\frac{1}{2}$ .		
	1	Map of Cyclone ... ..	4	4	Re-produced.		
	1	Sheet Saugor Survey ... ..	2	2	Re-produced and reduced to $\frac{1}{2}$ .		
	CARBON.	7	Subjects for Exhibition ... ..	7	7	Re-produced.	
1		Conventional Signs ... ..	1	1	Ditto.		
	218		406	3,067			

20. The operations in Carbon Printing, or Photo-Lithography, have been carried on as far as practicable, and some good specimens have been obtained.

**Photo-Lithography.**

Some Plans of Forts in Bhootan admirably drawn by Captain Goodwin Austen, on special duty with the Doar Field Force, have been successfully printed, and copies issued with great advantage to the Public Service. For a series of Carbon Prints exhibited at the Photographic Society's Exhibition, the Lieutenant Governor's prize of Rs. 100 was awarded to the Serjeants in charge of this branch of my Office, whose steady conduct and attention to business is deserving of commendation.

21. To afford some idea of the nature and extent of the work turned out by the Lithographic Press, the following Statement is furnished of the number of Maps transferred to the stone and the impressions struck off. A very large amount of business has been done, and the style of the publications is very good. The necessary supervision over this important branch of my Department entails much time and labor, and the demands from all quarters for lithographic work is quite overwhelming. The geographical materials of the Survey Department alone awaiting publication were shown in Colonel Dickens' Report to be sufficient to occupy the present strength of Establishment about 16 years, and the progress of the Executive Surveys, as above shown, increases the difficulty annually. A few extra Native Draftsmen to the extent of Rs. 168 per mensem have been recently added on Colonel Dickens' recommendation, but the bulk of his proposals for increasing the efficiency of this branch and putting it on a proper working footing is still unsanctioned.

Description of Maps Lithographed.	No. of Copies of entire Maps.	No. of Stones for each Map.	No. of impressions or Printing.	Maps transferred and not yet printed.
<b>GENERAL MAPS.</b>				
Small Map of India (tinted) ... ..	570	7	3,990	
Skeleton Index to Districts and Divisions of India ... ..	70	1	70	
"  "  "  showing Financial Circles, 1864... ..	30	1	30	
Index to the Indian Atlas ... ..	100	2	200	
Map of North-Eastern Frontier of Bengal, including Bhootan and Assam, 8 miles=1 inch, in 6 Sections ... ..	.....	6	820	6
Map of North-Western Provinces, 16 miles=1 inch ... ..	....	.....	.....	1
<b>DISTRICT MAPS, 8 MILES=1 INCH.</b>				
District Hazareebaugh ... ..	400	1	400	
"  Dinagepoor and Bograh .. ..	100	7	700	
<b>DISTRICT MAPS, 4 MILES=1 INCH.</b>				
District Jubbulpoor ... ..	250	4	1,000	
"  Dehra Ishmael Khan and Bunnoo in 4 Sections, double printing ... ..	500	8	4,000	
"  Jhansee and Lulutpoor, &c., in Bundelcund in 4 Sections ... ..	250	4	1,000	
"  Akyab in 2 Sections, 3 printings ... ..	.....	6	.....	1
"  Backergunge 2 .. ..	.....	2	.....	1
"  Jacobabad and Shikarpoor, &c., in 2 Sections ... ..	.....	8	.....	1
<b>DISTRICT MAPS, 2 MILES=1 INCH.</b>				
Districts Nagpoor and Wurdah in 4 Sections, double printing ... ..	.....	8	.....	1
<b>PERGUNNAH MAPS, 1 INCH=1 MILE.</b>				
7 Main Circuit Maps of District Dinagepoor, viz., Nos. 7, 11, 14, 15, 16, 17, and 18 ... ..	1,400	7	1,600	
5 Maps ditto ditto ditto, 1, 3, and 4, 9, 10, and 12 ... ..	1,000	5	.....	5
3 Main Circuit Maps of District Jubbulpoor, viz., Nos. 16 and part of 17, 17 A, and 19, 20, and 21 ... ..	700	3	1,000	
3 Ditto ditto ditto, Nos. 8, 9, 10, and 11, 17 and 22 ... ..	600	3	.....	3
<b>PERGUNNAH MAPS, 1 INCH=1 MILE.</b>				
4 Main Circuit Maps of District Backergunge, viz., Nos. 1, 2, 3, and 4, and 7 and 8 ... ..	800	5	1,400	
3 Ditto ditto ditto of District Maunbhoom, viz., Nos. 1 and 3, 2 and 4 ... ..	600	3	600	
1 Ditto ditto ditto of District Bhundarah in 2 Sections ... ..	200	2	400	
1 Ditto ditto ditto of "  Lulutpoor, Nos. 12 and 13 ... ..	200	1	.....	1
<b>MISCELLANEOUS MAPS.</b>				
Plan of Simlah (tinted) ... ..	120	4	480	
Plan of Cantonment of Hazareebaugh, with view, in 2 Sections ... ..	100	3	300	
Cashmere Route Map, two printings ... ..	600	2	1,200	
Map of Sub-Himalayah, &c., for Geological Survey ... ..	850	1	850	
Map of British Burmah, Sheet No. 2 ... ..	500	1	500	
Rennel's Map of the Provinces of Kishnagur, Jessore, Roosannah, &c., with part of Dacca and Rajshahye ... ..	340	1	340	
Map of Tuhseels Mohumdee and Alligunj and District Mohumdee Waste Lands ... ..	120	1	120	
Telegraph Map of India ... ..	150	1	150	
Plan of Civil Station of Barisaul ... ..	200	1	200	
Atlas of District Sealkote, 16 Maps, Title Page, and 1 Diagram for Punjab Government ... ..	4,430	49	13,810	
75 Maps, Plans, and Sketches executed for Government Special Reports, &c. ... ..	29,353	1	29,353	
<b>Total Maps</b> ... ..			<b>64,513</b>	
160 Departmental Forms, Circulars, &c., of various sorts and sizes .. ..	.....	.....	.....	1,54,280
Total number of impressions ... ..			.....	.....

22. The several Executive Surveys, both Topographical and Revenue, as cited in the

		Tour of Inspection.	
Topographical...	Rewah	... ..	At Chunar.
	Gwalior	... ..	„ Landour.
	Rajpootana	... ..	„ Delhra Dhoon.
Revenue	2nd Division, Lower Provinces	...	At Barrackpoor.
	4th „	„	„ Dinapoor.
	2nd „ Oudh Provinces	„	„ Landour.
	3rd „	„	„ „
	Rohilcund	„	„ „
	1st Division, Central Provinces	„	„ Jubbulpoor.
2nd „	„	„ Nagpoor.	
3rd „	„	„ Dumoh.	

margin, were visited and inspected by myself in the autumn of the past year. Great facilities were afforded me by finding the several Establishments in recess quarters with all their work just finished preparatory to taking the field again, and I travelled rapidly by rail and dawk to attain this object. Several Parties

never before inspected were reached, and the value and necessity of personal communication was fully proved. The result of my enquiries, which are detailed in the body of the Report, afforded me great gratification. The general state of efficiency in which I found these surveys, the relations of the Officers with their Assistants as well as with the local Authorities, and the discipline of the subordinates, (with exception of the Nagpoor Party only,) were highly commendable, and convinced me of the value of the services of all the Officers of the Department whom I met, and whose merits I have so often had reason to bring to the favorable notice of the Government.

23. During the year I have had the benefit of the valuable and cordial assistance of Lieutenant Colonel Gastrell, Boundary Commissioner of Bengal, in all matters connected with the Revenue Surveys, and with the details of duties of the several branches of my Offices at Head Quarters. In my absence on tour of inspection, this Officer again held charge of the same, and co-operated with me in the most satisfactory and efficient manner, for which I am under great obligations to him.

24. The usual annual despatch to the India Office of original manuscript Charts of Geographical materials sent to England. Triangulation and Maps, as well as lithographed impressions of those Maps published at this Office, has been well provided for and detailed in the List A separately submitted. Considerable additions have thus been made to several Sheets of the Indian Atlas still unpublished.

25. Very recently three Sheets or Maps, in 10 Sections, of the Jhelum and Rawul Pindee District Maps of the Revenue Survey of Dacca, Furreedpoor, Dinapoor, and Bograh. The Lithographed Maps received back from England. Topographical Survey, on the scale of 1 inch to the mile, have been received from England, together with the ¼-inch several engraved Sheets of the Atlas of India, as per margin, have likewise been received. These valuable Maps are most welcome, and it will be a great object to receive the others of the Jhelum Rawul Pindee Districts which were sent home in 1861, especially the general or ¼-inch Map, which has been so long looked for. The serious delay in publishing any of our Maps in England, is a great bar to materials being sent there for that purpose.

26. The following is the state of the accounts connected with the sale of Map money, in continuation of para. 24 of the last Revenue Report:—

	Rs.	A.	P.
By Dr.			
Balance in hand, or in deposit in Bank of Bengal, of amount realized by sale of Maps and from Manuscript Map fees up to 10th June 1864, as per account submitted in para. 24 of General Report to Government on Revenue Surveys, Bengal Presidency, 1861-62 and 1862-63	2,173	8	6
Amount realized by sale of Maps and collection of Map fees, from 11th June 1864 to 31st March 1865 inclusive, irrespective of Booksellers' account not rendered	634	12	0
Total	2,808	4	6
By Cr.			
Deduct amount paid into General Treasury, (Bank of Bengal,) to credit of Government of India on 5th April 1865	1,500	0	0
Balance remaining unadjusted	1,308	4	6

The sums realized during the year are chiefly outstanding items; the system of receiving cash at this Office having been stopped, owing to the serious influx of business involved and the great difficulty of collecting small sums from all parts of India. The account sales effected by the Booksellers for the same period have not yet been received, the financial or commercial year not having closed. The actual assets, therefore, cannot be shown in this Report, but will duly appear in the next.

27. Annexed is an Index Map showing the present state of the Topographical and Revenue Survey Operations in the Bengal Presidency, which gives at a glance the localities of the areas treated by both systems of survey respectively, and what remains to be done by each branch of the Department.

EXECUTIVE SURVEYS.

No. 1 TOPOGRAPHICAL PARTY.

Gwalior and Central India Survey,

AND

No. 7 TOPOGRAPHICAL PARTY, RAJPOOTANA SURVEY.

*Season 1863-64.*

28. Owing to the appointment of Lieutenant Colonel D. G. Robinson to officiate as Superintendent, Great Trigonometrical Survey, during the absence of Major Walker, as stated in para. 59 of last printed Report, the Government of India were pleased, on my recommendation, to nominate Captain A. B. Melville, Topographical Assistant, Cashmere Survey, to the temporary charge of the Gwalior and Central India Survey. But as Captain Melville was at the time on his return from Cashmere, Lieutenant Colonel Robinson completed all arrangements to start the Establishment from recess quarters at Dehra Doon, and on the 22nd October, Lieutenant G. Strahan, Military Assistant, marched *en route* to Dholepoor, from which place it had been arranged that the several detail Parties would be directed to the respective sections of ground for survey.

29. On the 10th November, Captain Melville, having arrived from Cashmere, received charge of the Party and all Office records, &c., from Lieutenant Colonel Robinson at Dehra Doon, and was at the same time furnished with complete details regarding the arrangements which had been made for the Season's survey and full instructions for his own guidance. In the interim, the triangulated points having been projected on the plane Tables, the detail Parties were detached to their respective portions of work, on the Officiating Surveyor reaching Dholepoor on the 23rd November 1863.

30. For the reasons given in page 36, paras. 160 to 162 of my last Report, the new Party, or No. 7 Rajpootana Survey, worked in conjunction with the Gwalior Survey during the season under review. The strength of the two Establishments was as marginally shown.

No. 1 TOPOGRAPHICAL PARTY.

*Gwalior and Central India Survey.*

- Captain A. B. Melville, Officiating Executive Surveyor in charge.
- Lieutenant G. Strahan, R. E., Assistant Surveyor.
- Mr. H. Horst, Civil Assistant.
- „ J. F. Baness, „
- „ H. J. Bolst, Senior Sub-Assistant.
- „ G. Chill, 2nd Class „
- „ W. Chapman, 3rd Class Sub-Assistant.
- Messrs. Ogle and Scamlan, 3rd Class Sub-Assistants.

No. 2 TOPOGRAPHICAL PARTY.

*Doing duty with Gwalior Survey for the Field Season.*

- Abdool Samad Khan, Native Surveyor.
- Juala Pershad.
- Kalka Pershad.

No. 7 TOPOGRAPHICAL PARTY.

*Rajpootana Survey.*

- Lieutenant C. Strahan, R. E., Assistant Surveyor.
- Mr. R. Todd, 3rd Class Sub-Assistant.
- „ A. Connor, „

31. The allotment of work and Plan of operations for the season was Programme for the Season. as follows:—Captain Melville to take up the triangulation south and west of the parallel of Kerowlec, or latitude 26° 30', and to connect the principal Series, emanating from the Great Arc with the Ragoon Meridional Series. Lieutenant G. Strahan to instruct Lieutenant C. Strahan, Assistant Surveyor, recently appointed, and then to triangulate northwards and westwards from latitude 26° 30' between the Great Arc and Ragoon Series in Jeypoor and Ulwar, and assist in the principal triangulation.

32. Messrs. Horst, Baness, and Bolst were directed to instruct the junior members of Party in plane tabling and inspect their work from time to time, together with that of the Native Surveyors, and to take up ground for their own detail work, so as to be near at hand to render assistance to the Sub-Assistants in cases of difficulty, the entire ground for detail survey being confined to the west of longitude 78° and south of the parallel of 26° 30' west and south-west of the city of Gwalior in both banks of the Chumbul River, and in connection with the area topographically delineated in former seasons.

33. All the area intended for triangulation during the season was successfully completed, the total out-turn being about 4,500. The southern portion of the tract triangulated was forest-clad and difficult, and the northern, though open, was flat and unsuited to rapid progress from the want of suitable elevations commanding a good view. The number of triangles completed and points fixed and the average error of triangulation are as marginally detailed. Observations were taken at 87 stations and 361 points fixed. These results are highly satisfactory. The Extracts from Captain Melville's professional Report in the Appendix are interesting, and show the manner in which the triangulation was conducted, and describe the country traversed.

Principal Triangles	...	22	average error per mile	...	0.312
Secondary "	...	120	" "	...	0.984
2nd Class "	...	33	" "	...	2.532
Minor Secondary Triangles	623		" "	...	8.58
Heights	...	30			

34. During the month of February, Lieutenant Colonel Robinson, while on his tour of inspection, arranged, at my request, to meet Captain Melville to render any assistance in his power, and to see whether his programme of work was being satisfactorily carried out. These Officers visited several of the detail Parties, and then proceeded in company to explore the very difficult ground on the Koonoo River, to which reference was specially made in my last Report, paras. 36 and 37, as it was necessary that some means should now be devised to carry the triangulation through it to prepare the ground for next Season's details.

35. On a casual reconnoissance of this ground during the last Season, it was believed that the forest tracts were totally uninhabited and waste; but on entering it near the source of the Parung River, some villages and scattered cultivation were found; and advancing southwards towards Shahabad, the country became more open and undulating, with jungle of Central India Sal and occasionally Teak Saplings. Several large Bunjara roads were also found traversing the southern side of the forest, along which a considerable amount of traffic in country produce is carried on, the staple articles being salt from the Sambar Lake in Jeypoor, and iron, which abounds in this part of the country. Further south, or near the source of the Koonoo River, in about latitude 24° 45', ranges of hills were seen running apparently east and west; and as on this side Lieutenant Colonel Robinson and Captain Melville were of opinion that no very serious difficulties existed, they arranged to cut across with the triangulation about the parallel of Shahabad in lat. 25° 15', and this was partially done by Captain Melville after Lieutenant Colonel Robinson left; it was further decided that no attempt should be made to carry any triangulation through the northern portion of this forest covered plateau, as the expense attending any such measure would be enormous, without any adequate advantage being gained, while every object of the survey would be served equally well by the more simple and inexpensive system of route or traverse surveying, and this will be combined to the fullest extent practicable with the minor triangulation.

36. On the 26th March, Lieutenant G. Strahan closed his triangulation on the parallel of 27° 15'. As the health of this Officer had materially suffered, I was anxious for him to escape the worst part of the hot weather in the field. I therefore directed him to proceed to recess quarters, where he was well employed. Captain Melville gave up triangulating on the 15th April.

37. The detail Parties completed an area of 2,628 square miles (vide margin) in very difficult and raviny ground, embracing a small tract at the south-west corner of the Native State of Dholepoor, part

Final Survey.

of Kerowlee, and a good portion on the north-western limits of Gwalior State, from the

Lieutenant C. Strahan	... ..	218	Square Miles.
Mr. H. Horst	... ..	335	"
" J. Baness	... ..	350	"
" H. Bolst	... ..	180	"
" G. Chill	... ..	300	"
" W. Chapman	... ..	270	"
" M. Ogle	... ..	105	"
" C. Scanlan	... ..	210	"
" R. Todd	... ..	85	"
" W. Connor	... ..	218	"
Joala Pershad	... ..	275	"
Abdool Samad	... ..	82	"
Total		2,628	Square Miles.

Chumbul southwards, between 77° 30' and 80° of longitude. This out-turn is small for the strength of the Establishment, but due allowances must be made for the fact that out of the twelve hands engaged in plane tabling, six were perfectly new and unacquainted with the work required, and had to receive instruction in delineating very difficult ground, and that a large portion of the time of the Senior Assistants was occupied in this essential duty. Native

Surveyor Abdool Samad Khan fell seriously ill after completing only 82 square miles of survey, and was totally unfit for duty for the better portion of the Field Season. Extracts are given from Captain Melville's Report describing the country finally surveyed.

38. The total cost of the survey for both Parties (No. 1 and No. 7) for this Season amounts to Rs. 60,689-10, yielding an average rate for final survey of Rs. 23-1 per square mile. This rate is undoubtedly very high, but it includes the training of one Military Assistant and four Sub-Assistants, and further, it must be considered that the Gwalior Survey has, within the last three years, furnished trained agency, both Executive and Subordinate, for no less than three new Topographical Surveys. Serving, as it does, a training school for the Department at large, and having in consequence to bear the salaries of the more expensive class of Superintendent as well as Assistants, it can be expected to compete with other Parties in mileage rates at present. I, however, anticipate that the cost and rate will be reduced as soon as the demand for trained agency to recruit other Parties ceases: it is impossible to say when this may be the case; but as the new Establishments gain experience, it naturally follows that each survey will be able to train hands for its own requirements. During the Season under review, the high rate of Rs. 23-1 is exceptional, and a portion of the entire cost, *viz.*, Rs. 60,689-10, is due to No. 7 Party, Rajpootana Topographical Survey, the triangulation for which has been fairly started in connection with that of the Gwalior Survey. The detail or final survey of the State of Dholepoor and nearly half of Kerowlee in the Rajpootana Agency which legitimately belongs to the field of survey apportioned to No. 7 Party, has also been completed. This will contribute to fill up Sheets Nos. 50 and 51 of the Indian Atlas.

39. By the 23rd April all the detached Parties assembled at Agra, and Messrs. Ogle and Scanlan, 3rd Class Sub-Assistants, posted to No. 2 Topographical Party, Hyderabad Survey, who were doing duty with the Gwalior Survey, were directed to proceed to Ellichpoor and join the Hyderabad Survey; the remainder then proceeded to Dehra Doon for recess, on arrival at which place, Office was opened

Vertical Angle Sheets	... ..	..	40	pages.
Horizontal do.	.. ..	..	248	"
Triangles computed	... ..	..	803	"
Latitudes, longitudes, and azimuths	.. ..	..	115	"
Heights	.. ..	..	30	"

*Maps and Charts.*

- 3 General Maps on the 1—inch scale, measuring 30 minutes of latitude by 30 minutes of longitude, completed as far as materials exist.
- 1 Degree Sheet, 4 miles = 1 inch, completed as far as materials permitted.
- 2 Office Charts, 4 miles = 1 inch.
- 1 Skeleton do., 8 miles = 1 inch.

on the 16th May, and the computations, projecting and drawing of the fair Maps, &c., commenced. The records as per margin were completed. A duplicate fair copy of Triennial Report, in one large volume for Season for 1860 to 1863, was

also completed and has been lodged for record in this Office.

40. During the recess a survey, on a large scale, of the Cantonments, Civil Station and Town of Dehra was made, and some of the Assistants and Native Surveyors trained to work on a large scale. This will be particularly useful, whilst at the same time it affords excellent practice. The fair Map will be produced during the ensuing recess.

41. Adverting to what was stated in the 47th and 48th paras. of last Report, I again had an opportunity of inspecting this Party, during the course of my general tour, in the autumn of the past year. On the 28th and 29th September last I visited Captain Melville's Office at Dehra, and carefully examined the field and fair Maps, computations, and other records, and found them in a highly satisfactory state, all well brought up to date. The General Maps I found admirably maintained, in accordance with the usual excellent style of this Party; and from the energy displayed by the Officiating Surveyor, as well as from the efficient state of the Office, it was evident that the duties had been well carried on during the absence of Lieut. Colonel Robinson. The disposition of the Establishment (which had just received several new hands) for the new Season's work was judiciously made, and every thing connected with the internal economy of the Party left a very favorable impression on my mind.

42. Captain Melville is an Officer of great energy, and has conducted the duties much to my satisfaction; he has had the benefit of Lieut. Colonel Robinson's advice and assistance during the recess, and the programme, as laid down by that Officer, has been followed. From the able manner in which Captain Melville has conducted these operations, and from his skill as a Topographical Draftsman and delineator of ground, it is most desirable to retain him in this branch of the Department. I have therefore submitted my recommendation\* that on being relieved, (which he is likely to be shortly on the return to India of Lieut. Colonel Walker, Superintendent of the Great Trigonometrical Survey, for whom Lieut. Colonel Robinson is now officiating,) he may be allowed to do duty in my Head Quarter's Office, where his services can be turned to good practical account, until he may again be required for active employment in the field.

\* No. 127, dated 12th January 1865.

43. Lieutenant Charles Strahan, Assistant Surveyor, has given every satisfaction; he is a young Engineer of the highest promise, and cannot fail, under such auspices, to turn out a valuable Departmental Officer.

44. Captain Melville reports that he experienced the greatest civility in Scindiah's Dominions, Ulwar and Bhurtpoor, and his relations with the Durbars of these States was most satisfactory; but in Jeypoor and Kerowlee some spirit of hostility was evinced to the progress of the survey, owing to disputes between the petty landholders regarding boundaries. Some of the Assistants were subjected to constant trifling annoyances, and complaints were made against the Surveyors, all of which, on investigation, proved groundless. In one instance only was actually incivility and violence resorted to by the people of the country, when a Native Surveyor was assaulted, his horse wounded, and his syce killed. The utmost tact and forbearance, I am glad to say, characterises all the proceedings connected with the survey of these Native States, and I anticipate no political difficulties in the prosecution of the work.

45. Messrs. Horst and Baness, Civil 2nd Assistants, performed all the duties, both in the field and recess, entrusted to them, in a very creditable and satisfactory manner; they have both been very successful in training the junior members of the Party; their professional attainments are superior, and their zeal and good example exercises a happy influence over their subordinates.

Civil Assistants and Sub-Assistants.

46. Messrs. Chill and Chapman completed their allotted portions of work satisfactorily.

47. For the ensuing Season of 1864-65 the Survey Party will prosecute its plan of operations as follows:—Triangulation to be extended northwards through Ulwar, and south from the Chumbal into portions of Bondee Kotah and western part of Gwalior. The plane tabling or detail work will be carried on in connection with that of the former Season in portions of Gwalior, Jeypoor, and Kerowlee.

Future operations.

48. This Establishment has been completed to maximum strength by the appointment

New Sub-Assistants appointed.

Messrs. Geo. McCarthy and G. K. Allnutt, G. G. O. No. 756, dated 15th September 1864.

of the Junior Sub-Assistants as per margin. The full complement of Native Surveyors have also been entertained, so that we may reasonably hope for a good out-turn of work in future Seasons.



No. 2 TOPOGRAPHICAL PARTY.

HYDERABAD SURVEY.

*Season 1863-64.*

49. To carry out the Season's programme the Party was divided into three detachments.

James Mulheran, Esq., Executive Surveyor in charge.  
Mr. A. Chamarett, Civil Assistant.  
" J. B. Smith, Senior Sub-Assistant.  
Mr. R. D. Farrell, 2nd Class Sub-Assistant.  
Mr. A. Chennell, 3rd Class Sub-Assistant.  
Mr. B. Maine, Probationary 3rd Class Sub-Assistant, appointed by Military Department letter No. 6, dated 2nd November 1863.

*Native Surveyors.*

Ram Chunder Pandarao, Baparno, and Mypatrao.

The first, under the Executive Surveyor, proceeded from recess quarters at Ellichpoor, on the 22nd October, towards Mahore, to triangulate a small tract which had been left unfinished by the old Hyderabad Survey, as described in para. 76 of my printed Report for the Season of 1862-63; the second, under Mr. Civil 2nd Assistant Chamarett, was directed to take up the triangulation in extension of that of the past Season through the Upper Godavery Districts; and the third Party, under Mr. Senior Sub-Assistant Smith, assisted by the Sub-Assistants and Native Surveyors, was instructed to take up the detail work in connection with that of the former Season south of Jangaon in the Talooks of Chinoor and Madapur.

50. Messrs. Mulheran and Chamarett completed the observations at 37 principal and secondary stations, and fixed 100 points over an area of 2,550 square miles in difficult forest-clad tracts. Mr. Chamarett, however, I regret to say, failed in extending the triangulation down to Budrachillum and Rakapilly Talooks, situated near the junction of the Severy and Godavery Rivers, about the parallel of 17°30' as directed by myself. This might, I conceive, have been easily accomplished if the Executive Officer in charge had made proper arrangements to secure the necessary assistance, and had been near at hand to see his orders carried out, but he was unfortunately too far detached from his Party to be of any use, a circumstance I have taken care to prevent in future.

51. The total triangulated area now in advance of Topographical details is reported to be 4,731 square miles. The average difference between the Hyderabad Topographical Survey and the Triangulation executed by Captain, now Sir George, Everest in 1819, on four common sides is 13 inches per mile; this difference, though large, must not be considered as actually representing the error of the Hyderabad Survey Triangulation, for the old triangulation has to be re-computed on the more accurate elements obtained by the re-measurement of its initial side or origin. Of the secondary triangulation the average error is 5.6 inches per mile.

52. The Extracts given in the Appendix from the Report of the Surveyor, as well as of his Civil Assistant in charge of the triangulation, describe vividly the nature of the country visited and the difficulties overcome. By moving rapidly through the country and carefully selecting dry spots, with good water for encamping grounds, the Party suffered but little from fever.

Topographical details completed.

	<i>Plain tabling completed.</i>	Square Miles.
Mr. Smith	...	444
" Farrell	...	337 (Sick until 22nd December 1863.)
" Chennell	...	232
" Maine	...	45 (Joined in January 1864.)
Ram Chunder Rao	...	335
Panda Rao	...	562
Baparno	...	346
Mypatrao	...	291
Total	...	2,682

53. The detail Parties under Mr. J. B. Smith's direction broke ground by the end of November. The total area of details completed amounts to 2,682 square miles. This out-turn, though not large, is fair, considering the nature of the country, the repeated attacks of jungle fever, from which several of the detail Surveyors suffered and were for a time incapacitated from work, and from the effects of which, I regret to add, they have not yet recovered.

Return to recess and recess duties.

In duplicate. { Final computations of 3 principal triangles.  
Ditto of 178 secondary ditto.  
Ditto of 21 heights of Stations.  
6 deductions of principal latitudes, longitudes,  
and azimuths.  
200 deductions of secondary latitudes, longi-  
tudes, and azimuths.  
2 Duplicate Angle Books.  
Register of villages, latitudes, longitudes, and  
statistics.  
General alphabetical lists of latitudes, longi-  
tudes, and heights.

*Maps and Charts.*

3 Maps, fair Sheets, Nos. 17, 18, 19; scale 1  
mile=1 inch.  
1 Reduction of the above; scale 4 miles=1 inch.  
3 Charts of triangulation for Seasons 1861-62 and  
1863-64; scale 4 miles=1 inch.  
1 Index Pergunnah boundary Sketch; scale 4  
miles=1 inch.

*For record in Surveyor's Office.*

12 Copies of Plane Table field Sections; scale  
1 mile=1 inch.  
1 Copy of Village Register, &c.

55. The entire cost of the survey for the Season (1863-64) amounts to Rs. 36,896-10, and the average rate per square mile and the average cost of final survey per square mile is Rs. 13-12, or about 26s. 8d. per mile, including cost of triangulation in advance of details. This is reasonable, considering the heavy expenses incurred in such a country in clearing jungle and cutting pathways for the conveyance of Theodolites and baggage, &c.

56. During the recess, Messrs. Ogle and Scanlan, who had been appointed to this Party by Government General Order No. 587, dated 18th September 1863, and temporarily attached to No. 1 Topographical Party, Gwalior Survey, to be instructed, during the Field Season, in Topographical delineation, joined the head quarters of the Hyderabad Survey at Ellichpoor on the 22nd June, and took part in recess duties. Mypatrao, Native Surveyor, resigned his appointment on the 1st June 1864, owing to his health having entirely failed him. Mr. J. B. Smith obtained leave on private affairs from the 12th April to 12th August. Native Surveyors Ram Chunder and Baparao, having been reported qualified and in all respects deserving, received promotion to a higher grade by an increase of Rs. 10 to the salary of each. Native Surveyor Janardanrao, who had been transferred to No. 5 Rewah Party, was re-posted to the Hyderabad Survey, and joined Mr. Mulheran's Head Quarters on the 1st November.

57. Mr. A. Chamarett, Civil Assistant attached to this Party, having for many years past taken an active part in all professional duties, and by zeal and attention to duty as well as from his Departmental standing, proved himself deserving of advancement to the higher grade of Senior Civil Assistant; his name will be submitted in the usual course. Mr. J. B. Smith, Senior Sub-Assistant, a very able and energetic Assistant, will be recommended at the same time for advancement to the next higher grade.

58. During the current Season, the small blank in Mahore will be completed, together with the bordering Talooks of Seroncha and Noogoor, in the Upper Godavery District, and part of the Ramgeer Circar in the dominions of the Nizam, aggregating in all about 4,000 square miles. This will complete all the Hyderabad or Assigned Districts Territory west of the Godavery. There will then be left an area of about 2,600 square miles of the Godavery Talooks east of that river, the skeleton triangulation of which is now under execution to complete the whole of the work at present assigned to this Party. The triangulation is now being extended by the Executive Officer over a part of the Nizam's dominions in Ramgeer along the western bank of the Godavery, and through the southern Talooks of the Upper Godavery District, viz., Albaka, Cherla, Bhudrachellum, and Rakapilly, covering an area of about 1,400 square miles.

59. The survey of the Hyderabad or Nizam's Territories, together with all the assigned Districts of East and West Berar, as well as the adjoining Talooks appertaining to the Central Provinces on the Godavery River, having thus been nearly brought to a conclusion, it becomes necessary to decide on the future field of employment for this Establishment. As soon as these Godavery Talooks belonging to the Central Provinces can be got out of hand, there is a very extensive area belonging to the same jurisdiction, consisting of the Sathpoora range of hills,

Vide his letter to Foreign Department No. 4037, dated 23rd August 1864.

which demands to be dealt with by a regular Topographical Party. The Chief Commissioner of the Central Provinces has intimated his wishes to me on this point during my recent visit to Nagpoor. I had full opportunities of discussing this question with Mr. Temple; and in conformity with the views expressed by the Viceroy and Governor General in Council in the reply to my last Operation Report, the object has been to distinguish most carefully between those parts of the country requiring a revenue detail survey on a large scale, or merely a topographical delineation on a smaller scale.

60. The Sathpoora and Maha Deva Hills traverse the Districts of Baitool, Nimar, Chindwara, Seonee, Mandla, Bhundara, &c., the whole of this varying in height from 2,000 to 4,000 feet, must be laid down on a trigonometrical basis. The regular Revenue Surveys are now skirting these hills both on the north in the Nerbudda Districts above the Ghâts and on the south in Nagpoor, Bhundara, &c., below the Ghâts, leaving a very extensive area between the two to be thus provided for. The minor triangulation will have to be continued from the northern extremity of the Hyderabad operations, in the Gawilgurh Sircar, and carried westwards through the above two named districts. The great arc and other principal Meridional Series of the Great Trigonometrical Survey will cross this area in longitude 78°, 80°, and 82°, and thus form good basis for emanating and closing the Topographical Survey. It is therefore proposed to employ No. 2 Party on this duty, in due connection with its present work, and to take up all the ground which does not require revenue detail measurements from west to east, until a proper junction is formed with the operations of No. 3 Party under Lieutenant Colonel Saxton, which have already skirted the eastern limits of Belaspoor and Raepoor in the Chutteesgurh Division of the Central Provinces. The disposition of these operations will be better understood from an inspection of the Sketch Map annexed to this Report.

### No. 3 TOPOGRAPHICAL PARTY.

#### GANJAM AND ORISSA SURVEY.

*Season 1863-64.*

61. On the 10th December 1863, the Party under Lieutenant Colonel Saxton's orders marched from recess quarters at Cuttack towards the Tributary States of Jeypoor, Noagurh, Kalahandi, and Karial, west and south-west of Sumbulpoor, and reaching their ground by the 1st January following. The following was the plan of operations decided upon for the Field Season :—

- Lieutenant Colonel G. H. Saxton, Executive Surveyor.
- Lieutenant C. E. Armstrong, B. A., Military Assistant.
- Mr. D. Atkinson, Senior Sub-Assistant.
- " R. W. Chew, 1st Class Sub-Assistant.
- " J. Harper, " " "
- " F. Adams, 2nd Class " "
- " J. A. May, " " "
- " R. P. Raynor, 3rd Class " "
- " T. E. M. Claudius, 3rd Class Sub-Assistant.

*Native Surveyors.*

Abdool Ruhman, P. Neelacuntum, and Hindiautoollah.

62. Lieutenant Colonel Saxton with Mr. Claudius, as Observatory Assistant, to proceed to triangulate the country within the parallelogram formed by the lines of latitude 21° to 22° 15', and longitude 82° 15' to 83°, embracing portions of Phuljer, Sarangar, Sumbulpoor, and Belaspoor. Lieutenant Armstrong and Mr. Atkinson to continue the triangulation executed in former Seasons, extending south and west from the meridian of about 20° 15' and working well in Konkeir, Jeypoor, and Bustar, and afterwards to assist in the detail operations, and the detail Parties to occupy the tract laying between the parallels of 82° to 82° 45', and meridians of 20° to 21° 10'.

63. This programme was fully carried out; the 1st detachment under Lieutenant Colonel Saxton covered an area of 4,500 square miles with 136 points, observations being taken at no less than 68 stations, while Lieutenant Armstrong and Mr. Atkinson completed 2,500 square miles of triangulation, fixing 68 points by observations from 26 stations. The second detachment might have completed a much larger area had not Mr. Atkinson's health, which was in a bad state from former attacks of jungle fever, completely failed, and he was unfit for further duty from the 3rd March. Lieutenant Armstrong was totally inexperienced, and had for the first time attempted triangulation; but besides this work he completed 108 square miles of topography in a very creditable manner. The total area covered by triangulation is very large, 7,000 square miles, but the points fixed are few for the area, and barely sufficient as a basis for good topographical work; this deficiency is easily remediable, and the Executive Officer has been addressed on the subject. Lieutenant Colonel Saxton, in his professional Report, gives a very interesting account of the country which has come under his own observation, and Extracts from it are given in the Appendix.

64. The detail or Topographical Parties completed an area of 3,454 (vide margin) square miles in a manner superior to that of former Seasons, and the Executive Surveyor having inspected the plane tables in the field, in accordance with my instructions, reports very favorably of the general accuracy of the Topography executed.

	Square miles.
Lieutenant C. E. Armstrong ...	108
Mr. Chew ... ..	550
„ Harper .. ..	465
„ Adams ... ..	547
„ May ... ..	279
„ Raynor ... ..	387
„ Claudius ... ..	127
Abdool Ruhman ... ..	566
Neelacuntum ... ..	216
Hidiatoollah ... ..	209
Total Square miles	3,454

Return to recess.

65. The several detached Parties returned to recess quarters after an arduous Season's work in a very difficult country between 18th April and 27th May, when the usual duties were commenced on and the following completed :—

Angle books (horizontal and vertical) in duplicate.	
Computation of principal triangles	ditto.
Ditto of secondary ditto	ditto.
Ditto of latitudes, longitudes, and azimuths of principal and secondary stations, in duplicate.	
Ditto of heights	ditto.
Registers of Synopsis Sheets	ditto.

All the above have been lodged in this Office, and one complete set will be forwarded to England in the course of the year. Maps completed and rendered to this Office :—

{	Original Sheets	... 15	(Exclusive of 2 retained in the Surveyor's Office.)
	Fair Sheets	... .. 7*	
	Ditto tracings	... .. 7	

Scale 4 miles = 1 inch, Chart of the Season's triangulation.\*

\* The Maps and Charts will be forwarded to England shortly. Ditto General Map; reduction of the 1-inch Sheets of Topography completed during the Field Season.\*

Index Map to illustrate Report; scale 16 miles = 1 inch.

66. No actual check or verification can at present be applied to this portion of the triangulation executed by this Survey, as no principal Series of the Great Trigonometrical Survey has extended southwards on this side below the parallel of about 23° 30'. A Series on the meridian of 84° east longitudinal is now under operation, which will pass directly through the districts specified, and connect with the Coast Series in the vicinity of Vizagapatam. The average difference of common sides for the principal or Ganjam net work of triangles is about 2 inches per mile, and for secondaries about 9 inches per mile. These results, as far as any opinion may at present

Remarks on triangulation and Maps.

be expressed, irrespective of check on Great Trigonometrical Survey values, are satisfactory. The fair mapping on both 1-inch and  $\frac{1}{4}$ -inch scales is a very great improvement on that of all former Seasons and highly creditable to all engaged on these records.

67. The total cost of the survey for the Season amounts to Rs. 53,990, from which an average rate on final survey of Rs. 15-6 per square mile is obtained; this is very moderate for the difficult nature of the country, and speaks well for the management of the Executive Officer.

68. Lieutenant C. E. Armstrong, Assistant Executive Surveyor, having been gazetted to another situation, resigned his appointment in this Department\* and was struck off on the 1st August 1864. The labor of instruction of this young Officer for a period of about two years has thus been entirely lost, the effect of which has been to enhance the cost of the survey.

69. Lieutenant A. E. Downing, of the late 51st N. I., a passed student of the Roorkee College, has been appointed to fill the above vacancy by the orders as per margin, and for the present Season attached to No. 1 Gwalior Survey for the purpose of obtaining good training.

70. The several Assistants have performed all their duties, both in the field and recess with much credit to themselves and entirely to the satisfaction of their superior. I have had much pleasure in submitting the names, as per margin, to Government, with my recommendation for advancement to higher grades. Messrs. Adams, May, and Harper are equally commended, and their services will be duly brought to notice for promotion at a suitable interval from the date of their last increase.

71. Nearly all the members of this Party have suffered severely from jungle fever during the Season under review, and also during or years, and are all much enfeebled in health. The country is very hostile to European constitutions, and the Field Season for actual working is limited to four months in the year. Mr. Leonard, Apothecary, attached to this survey, continues to give every satisfaction and is very highly spoken of by Lieutenant Colonel Saxton; besides his professional duties, he voluntarily assists in Office and affords useful aid.

72. During the current Season, the triangulation will be extended south of the parallel of  $20^{\circ}$  into Bustar and its dependencies and parts of Konkeir and Jeypoor, and, if possible, a junction will be formed with the primary operations of the Great Trigonometrical Survey along the sea coast. The detail Parties will be employed in completing the topography between the parallels of  $21^{\circ} 10'$  to  $22^{\circ} 15'$ , and meridians of  $82^{\circ} 15'$  to  $83^{\circ}$ , including portions of Belaspoor, Raigar, Phuljer, Sumbulpoor, and Sarungar.

73. Cuttack being now far distant from the field of operations of this survey, Lieutenant Colonel Saxton proposed to change recess quarters to Waltair near Vizagapatam, as this station is favorably situated with reference to the future operations of the Party, and its position on the sea coast renders it a desirable locality for recruiting the health of the Civil and Native Establishments, after the performance of their arduous duties in the field over such bad ground. To the arrangement, which is a very suitable and proper one, I have expressed my concurrence.

74. Lieutenant Colonel Saxton's management was spoken of in detail in para. 97 of last Report only a year ago; he continues to merit the favorable opinion I therein recorded for his successful labors.

No. 4 TOPOGRAPHICAL PARTY.

CHOTA NAGPORE DIVISION SURVEY.

Season 1863-64.

75. This Party, of the strength shown in the margin, started from recess quarters at Dorundah on the 23rd November. The plan of operations for the Season has already been fully described in the 122nd para. of my Report on the past Season's operations, but is briefly repeated here for easy reference.

Captain G. C. Depree, Executive Officer in charge.  
 Mr. F. B. Girdlestone, Assistant Surveyor.  
 " G. A. McGill, Senior Sub-Assistant.  
 " J. Vanderputt, 1st Class Sub-Assistant.  
 " A. J. Wilson, 2nd Class Sub-Assistant.  
 Mr. G. A. Wyatt, }  
 " J. A. Craven, } 3rd Class Sub-Assistants.  
 " T. W. Babanau, }  
 Mr. J. H. Wilson, }  
 Baboo Modusudun Dutt, } Draftsmen.  
 Chinia D'Cruz, }

76. The triangulation on which the survey\* is \* Programme for the Season. based having, during former Season, been sufficiently extended beyond the limits of the detail work, it was decided that

the entire strength of the Party should be brought to bear on the detail operations, and the Executive Officer be employed in affording instruction to his newly appointed Assistant and the junior hands of the survey in plane tabling, delineating ground, and examining the Plane Table Surveys of all the members of the Party as opportunity offered—a duty on which I place much importance; while one Sub-Assistant should be deputed, for a portion of the Season only, to extending some secondary triangles and fixing minor points, where needed, west of the meridian of Chota Nagpore.

77. The tract occupied by the detail Surveyors may be described as the northern half of

Description of country and area surveyed.	Square miles.
Mr. Girdlestone .. ...	382
And part of Hazareebaugh ... ..	30
Mr. McGill ... ..	275
" Vanderputt ... ..	549
" Wilson .. ...	391
" Wyatt ... ..	529
" Babanau .. ...	549
" Craven .. ...	504
" Wilson, Junr. .. ...	139
Baboo M. S. Dutt ... ..	548
Total ...	3,896

Singbhoom, a small portion of the Gangpoor State, and the portion of Chota Nagpore District situated about 10 miles east of the meridian of the city of the same name, or Ranchee, embracing about 3,866 square miles; but 30 square miles in excess of this, within the Hazareebaugh District, was also surveyed to allow of a good junction with the survey of that district. The amount of work completed by each Surveyor is given in the margin.

78. The following Extracts from Captain Depree's professional Report describe the nature of the country finally surveyed and the Estates or Pergunnahs completed:—

" Para. 18.—Of the tracts of country surveyed during the Season, that of the Rajah of Dulbhoom proved to be covered with forest, with the exception of the western flank, where the Pergunnahs of Holdipukar and Kalkapur have much well cultivated land. There are also some fair villages on the banks of the Subaurekha River. Dulbhoom has now been completely surveyed. The tributary estate of the Seraikela Rajah has been completed during the late Season; it is generally open and well cultivated. Singbhoom Proper, or the Kolehan, late the estate of the Rajah of Poehat, now the property of the British Government, is not quite surveyed, but I think it probably will be in the ensuing Season. I then propose to submit a Report on the whole district; it contains much forest and many hills, as well as large tracts of populous country.

" Para. 19.—Of the portion of the Chota Nagpore Estate or the Lohardugga District, the Pergunnah of Borunda, Sillee, and Bundu have been completed, and nearly all the largs Pergunnahs of Tamar, Khokra, Juspur, &c., have also been more or less surveyed and will be completed next Season.

" Para. 20.—That portion of the estate of the Rajah of Patkom which lies on the right bank of the Subanrekha River has also been entirely surveyed; it is a part of the Maunbhoom District, but by your orders, No. 22 B, dated 9th January 1865, it was undertaken by the Topographical Party."

79. Besides the detail work completed as above shown, which fills up Atlas Sheet Nos. 113 and 114, Captain Depree surveyed the road from the southern limit of the Hazareebaugh District to Chota Nagpore, which I was anxious to obtain for the sake of the Hazareebaugh District Map, and on the return of the Party to recess, a large scale survey (8 inches = 1 mile) was completed of the Civil and Military Stations of Ranchee and Dorunda. This last duty occupied the Party for a month, and afforded excellent practice.

80. The secondary triangulation which it was necessary to complete in connection with this Season's survey, was entrusted to Mr. Senior Sub-Assistant McGill. This duty was performed in a very satisfactory manner by the Senior Sub-Assistant in less than three months, when he also took part in plane tabling.

81. The area triangulated was about 1,500 square miles, and over this was laid out 11 2nd Class secondary triangles and 106 minor secondary triangles, the average error of the former being 0.71 feet per mile, and of the latter 1.2 feet per mile. The angular measurements were made with a 6-inch Theodolite. On connecting with the side Nakti to Patal of the Calcutta Longitudinal Series, Great Trigonometrical Survey, the discrepancy in linear measure was found to be in a distance of 12.3 miles = -13.7 feet, and the differences in latitude and longitude

	Latitude.	Longitude.	
Nakti Hill Station by G. T. S. ...	23° 34' 24.67	85° 0' 14.84	This triangulation will further be checked by the 1st Class secondary triangulation, which will be executed during the present Field Season.
Ditto by Chota Nagpore Topographical Survey	0 0 24.68	0 0 14.78	
Difference ...	+ 0.01	- 0.06	
Patal Hill Station by G. T. S. ...	23° 40' 26.01	85° 9' 52.83	
Ditto by Chota Nagpore Topographical Survey	0 0 26.11	0 0 52.79	
Difference ...	+ 0.10	- 0.04	

\* Recess duties.

Horizontal and Vertical Angle Books copied...	...	...	77 pages.
Triangles computed ...	...	...	151 "
Computations of Latitudes and Longitudes ...	...	...	91 "
Ditto of Heights ...	...	...	7 "
Synopsis of Latitudes and Longitudes ...	...	...	8 "
General Alphabetical List of Latitudes and Longitudes ...	...	...	4 "

	Maps.	
Scale 1 inch = 1 mile	{ Field Sheets 15' X 15' ..	20 Sheets.
	{ Fair copy of the above in Sections of 15' of Latitudes by 30' of Longitudes ...	10 "
	Degree Sheets 1 to 4, scale 4 miles = 1 inch ...	4 "

sections of the fair Maps have been retained by the Surveyor, as they are only partially completed.

\*82. On the 10th June the usual recess duties commenced, and were carried on without interruption till towards the close of November. The computations and Maps, as detailed in the margin, were completed. The above Maps have been completed and forwarded to this Office, and three

83. Besides the above, a complete set of Maps, including all the ground surveyed during the Season, has been furnished on the 1-inch scale, on tracing cloth, to the Commissiour.

†84. The total expenditure for the Season amounts to Rs. 43,097-6-2, which for the 3,896 square miles of final survey yields an average cost of Rs. 11-0-10 per square mile; and 5,712 square miles of triangulated country still remains prepared for details. Such results speak for themselves; the out-turn of details is large and the average cost moderate, while the country surveyed is in parts most difficult of access, forest-clad, and unhealthy.

85. Each Surveyor was in turn visited in the field by the Executive Surveyor, the accuracy of the work tested, and instruction given when necessary; the Extracts from Captain Depree's professional Report will show all that was done to ensure accuracy in the details and the satisfactory results which have been gained. The duty of inspecting the Plane Table Surveyors while in the field is of the utmost importance, and the necessity for visiting each detail Surveyor as often as possible during the working Season, has been pressed on all Executive Officers.

86. The recess duties, owing to the large amount of Plane Tabling executed, were heavy but have been completed in a very satisfactory manner. The fair 1-inch and  $\frac{1}{4}$ -inch Maps are exceedingly good specimens of topographical drawing, and having been prepared only in Indian ink and without any high colouring, are now much better suited for reproduction or reduction by photography, and shortly will be still more perfect in that respect.

87. It is with much pleasure that I again testify to Captain Depree's ability, zeal, and energy. This Officer has taken an active part in all the duties, Field and Office, and his Maps have been materially improved, in the furtherance of which, as well as in the efficiency of his Party, he evinces the utmost enthusiasm. Of his Chief Assistant Captain Depree reports as follows :—

“Mr. F. B. Girdlestone has realised the anticipations I held in my last Report. He is very energetic, willing, industrious, and zealous, and is rapidly acquiring a knowledge of all duties of an Executive Surveyor; besides learning the practical computations in the recess, he has systematically studied, with my aid, the theory of the same. It has already been stated that he surveyed in detail two-thirds of the full quota of a trained Surveyor, and in an unexceptional style.”

Mr. Girdlestone is an acquisition to the Department, whom it will be an object to retain.

88. Of the Sub-Assistants Captain Depree makes honorable mention of those cited in the margin. Each of these Assistants have given perfect satisfaction. Mr. Vanderputt is an excellent Draftsman, and has made himself very useful in training young hands as Topographical Surveyors. Baboo Modusudun Dutt, Draftsman and Plane Tabler, continues to merit the good opinion of his superior, and has done good service in a difficult and unhealthy tract of hilly country this Season.

*Sub-Assistants.*  
Mr. McGill.  
„ Vanderputt.  
„ Wilson.  
„ Craven.

89. Mr. Craven, 3rd Class Sub-Assistant, a very promising Surveyor, well acquainted with his professional duties and very energetic, I have been compelled to transfer\* to the new Cossyah and Garrow Hills Survey, No. 6 Topographical Party, with the view of strengthening it in trained hands, and the demand for work there being very urgent.

\* Department Order No. 17, dated 25th August 1864.

### No. 5 TOPOGRAPHICAL PARTY.

#### REWAH TERRITORY SURVEY.

*Season 1863-64.*

90. The triangulation forming the ground-work for the Rewah Topographical Survey having been sufficiently advanced during the past Season to admit of the detail operations being commenced, the Party, as marginally shown, left recess quarters at Chunar on the 12th October, entering the Rewah Territory and beginning work towards the close of the month. Lieutenant Riddell, Assistant Surveyor, and Mr. E. S. P. Atkinson, Sub-Assistant Surveyor, from No. 1 Topographical Party, joined about this time and took part in the Season's work.

Lieutenant W. G. Murray, Executive Officer in charge.  
Lieutenant R. V. Riddell, R. E., Military Assistant, late doing duty with No. 1 Party.  
Mr. R. A. Bell, Civil 2nd Assistant.  
„ C. H. T. Neale, do.  
„ J. B. Landeman, 3rd Class Sub-Assistant.  
„ E. S. P. Atkinson, 3rd do. do., transferred from No. 1 Topographical Party.  
Mr. C. F. Hamer, 3rd Class Sub-Assistant.  
Ali Ahmed, Native Surveyor.

† 91. The programme for the Season was to extend the triangulation south of the Soane River, and connect with and revise portions of the old triangulation of the Calcutta Longitudinal Series; this duty was undertaken by the Executive Officer, and Lieutenant Riddell, with the remainder of the Party, was directed to take up the topographical details of the Rewah plateau from the Khymore range to the high scarp or northern boundary of Rewah.

† Programme for the Season.



92. On the 23rd October Lieutenant Murray broke ground; he then revised a portion of the old triangulation, cleared several rays, and passed south of the Soane River with the approximate triangulation, selection of stations, &c., and, while employed on this duty, was suddenly prostrated with jungle fever, rendered unfit for active duty, and compelled to seek medical aid at Nagode, which station he was not again able to leave till the 27th January. By attempting this part of the country so early in the Season much sickness prevailed; usually a train of 20 doolees carrying sick men accompanied the Camp. In the meanwhile instructions were issued to Lieutenant Riddell to complete his section of detail work to the summit of the high scarp of Rewah and then to take up the triangulation; this was done by the 13th of February, and this duty he performed in a most able and satisfactory manner. Mr. Bell, Senior Civil Assistant attached to the Party, also executed a small amount of triangulation, observing at 14 secondary stations. Lieutenant Murray employed the remainder of the Field Season in visiting the detail Surveyors and inspecting and checking their work; he reports that all the ground surveyed is well and accurately delineated, and, with the exception of Janardan Rao, Native Surveyor, is perfectly satisfied with the exertions of all the members of his Party.

1st Class Triangles	...	29	observed on 4 zeros.
2nd do.	...	195	do. on 2 do.
3rd do.	...	148	do. do.
Minor Triangles	...	1,100	do. on 1 or 2 do.
Heights	...	90	points.

\* Plane Tabling or details completed.

Mr. Atkinson,	1st December	commenced work.
„ Landeman,	19th November	do.
„ Hamer,	20th do.	do.

		Square miles.
† Lieutenant Riddell	...	220
Mr. Bell	..	352
„ Neale	..	439
„ Atkinson	..	262
„ Landeman	..	250
„ Hamer	...	262
Native Surveyor Janardan Rao	..	10
Total	..	1,825

93. The total area triangulated and covered with secondary points was 2,823 square miles, and the total out-turn is as detailed in the margin.

\* 94. The detail Parties, with the exceptions noted in the margin, commenced work at the end of October and beginning of November, and worked without interruption till the middle of April, when the jungly tracts became too unhealthy to allow of the Party being kept out longer with safety. The area of final survey completed is 1,825 square miles,† embracing about one-half of the Rewah country north of the Khymore range, viz., the portion in the plains adjoining the districts of Allahabad and Bandah, the great scarp forming the northern edge of the Rewah basin, and a

portion of the high lands or plateau on which the city of Rewah is situated.

95. This country presents such a diversity of feature that it is difficult of description.

Description of country surveyed. The scarp and broken ground on its summit is well wooded, the jungle consisting of bamboos and forest trees in dense masses, with high and, in some parts, almost impenetrable undergrowth of brushwood. The plateau is high undulating land, well populated and thickly covered with topes of mangoe trees, the chief means of irrigation being by tanks and artificial reservoirs, formed by bunds across streams. North of the Tonse or Tamas River the country is in some parts perfectly level and open, but towards the north-west heavy Dhak and Mhowa jungle exists.

Return to recess quarters, and recess duties.

Computations and Angle Books.
Fair Copies of Angle Books.
29 Principal Triangles.
21 Ditto Latitudes and Longitudes.
192 Secondary Triangles.
52 Ditto Latitudes and Longitudes.
52 Ditto Heights.
1,100 Minor Triangles.
Heights of Minor Stations.
Alphabetical lists of Villages.

Maps and Charts completed.

9 Sheets of original plane Tables, scale 1 mile = 1 inch.
4 Sheets Fair Maps in Sections of 15' of Latitude by 30' of Longitude.
2 Ditto ditto partly finished.
2 Charts on the scale of 2 miles = 1 inch.
1 Ditto ditto 4 miles = 1 inch.

96. By the middle of April and first week in May the entire Party returned into recess quarters at Chunar, when the work, as per margin, was completed. It was found necessary to revise the entire computations of the past Season, owing to the initial elements having been adopted from points of the Calcutta Longitudinal Series, Great Trigonometrical Survey, and which it was advisable to reject, as this triangulation was executed many years ago with an inferior instrument and is not considered final. All the computations of the Rewah Survey now depend on elements derived from the Gurwani Meridional Series. This revision entailed much extra labor on the Party.

97. As soon as the field duties terminated and the Party were marching back to recess quarters, Lieutenant Murray was directed to come down to my Presidency Office for the purpose of examining the state of other Topographical Survey records, and to improve himself generally in all details connected with his work, into which he was likely to gain a good insight here. Three weeks were thus most advantageously spent, and the Surveyor returned in a single day by rail to his station, taking with him whatever was likely to be useful for the prosecution of his work. During the recess Lieutenant Murray obtained two months' privilege leave to the hills on urgent private affairs, during which time his duties were well cared for by Lieutenant Riddell.

98. Mr. D. Antrobus, on return from sick leave to Europe, was transferred from the Chota Nagpore Division Survey, No. 4 Topographical Party, to the Rewah Survey. Mr. A. D. Howard  
\* Vide G. O. G. G. No. 471, dated 9th June 1864. was appointed a 3rd Class Sub-Assistant\* and attached to this Party in June, and at the same time Moonshee Nubee Bux, a Native Draftsman of great promise in my Drawing Office, volunteered for survey duty, and was transferred to the Establishment of the Rewah Survey. Prem Raj and Abdool Ruheem, Native Surveyors attached to the Rewah Survey, and doing duty in my Drawing Office, with a view to being instructed in topographical drawing, were also at this time directed to join Lieutenant Murray's Head Quarters at Chunar.

99. The entire cost of survey for the Season is Rs. 45,657-15-0, and from this is  
Cost and rate of survey, and opinion obtained a rate on the area finally completed (1,825 square miles) of Rs. 22-7, but for this cost we have also 2,823 square miles of triangulation in advance. The total out-turn of work in the field and recess is good and highly creditable to the entire Establishment, but the rate of survey, *viz.*, Rs. 22-7, is undoubtedly high. This, however, will be considerably reduced during ensuing Seasons, and as the young hands gain experience, for nearly all of them had to be instructed in plane tabling and drawing, and much valuable time of the experienced Surveyors was taken up in this duty alone.

100. On the 21st September last, during my tour, I had the satisfaction of inspecting  
Opinion on the Season's Map. Lieutenant Murray's Office at Chunar and going through the whole of his computations, Maps, &c., both of which I found well brought up, and the latter executed in a very satisfactory style. These being the first general Maps executed by this Party, I was much pleased with the manner in which they were got up, reflecting credit on Mr. Bell and the other Assistants, who took a part in their preparation. The amount of computations completed during the recess is also satisfactory.

101. The equipment and general state of this Party appeared to me in excellent order. The Camp equipage, instruments, and Native Establishment having been all in a state of preparation for taking the field, met my eye and entire approval. The order and regularity of Lieutenant Murray's Office also was in all respects most satisfactory, evincing much care and method on his part, and I have great pleasure in recording the favorable opinion I entertain of his successful administration of the duties entrusted to him, and of the energy displayed in every thing connected with the same.

102. The Season's records have not yet reached this Office, having been detained owing to certain corrections to be applied to the calculation of the heights and for comparison of the line of boundary between Allahabad, Bandah, and the Moharajah's territory, regarding which a special reference had been made from this Office to the Board of Revenue, North-West Provinces.

103. The Assistant Executive Surveyor, Lieutenant R. V. Riddell, n. e., a most able and energetic young Officer, possessing superior professional attainments, merits special mention. He took a leading  
Military Assistant. part in both the field and recess duties, and performed all the work entrusted to him in a very satisfactory manner. Owing to the continued employment of Captain H. Godwin Austen on

special duty with the Bhootan Field Force, I recommended to Government that Lieutenant Riddell should be appointed to officiate for him as Executive Officer in charge of No. 6 Topographical Party, Cossyah and Garrow Hills Survey, and he was accordingly nominated to this appointment by Government Orders marginally quoted.

104. Messrs. Bell and Neale, 2nd Civil Assistants, are also deserving of special mention. Besides conducting their own duties, both in the field and recess, in a highly satisfactory manner, they have been employed in training the junior Sub-Assistants and instructing them in their duties, whilst their good example and zeal has had good effect on all their juniors; they are both excellent Assistants, and very hard working.

105. In my last Report, para. 144, I stated that it was desirable to concert some plan for the employment of this Establishment during the early months of the Field Season in some healthier tract than the heavy jungles at the foot of the Khymore range and south of the Soane River, and subsequently, on a representation made by Lieutenant Murray, I solicited permission, in the correspondence as per margin, to extend the field of this survey westwards into the Bundela and other small Native States adjoining Rewah, and sanction was accorded to this arrangement, so that the future employment of the Party will be extended over a wider field, advantage being taken of the most healthy months during the Field Season to enter the jungly tracts; the advantages of this arrangement will be very great, for not only will the health of the Establishment be preserved, but the Field Season will be extended by a month at least, and we shall have progressing simultaneously the surveys of Rewah and eastern portion of Bundelcund, which will fill up Sheet No. 89 of the Indian Atlas.

## No. 6 TOPOGRAPHICAL SURVEY.

### COSSYAH AND GARROW HILLS SURVEY.

*Season 1863-64.*

106. A complete narrative of the formation and equipment of this new Party having been given in my last printed Report on the Topographical Surveys in the Bengal Presidency for Season 1862-63, paras. 149 to 158, it now remains to describe its working during the Season under review (1863-64), the first of its employment in a most difficult and mountainous country.

107. This small Party, only half of its proper strength, left the Presidency on the 3rd January, arrived at Chatak, near the foot of the hills in the Sylhet District, by the 28th of the same month, and after procuring the necessary carriage reached Cherra Poonjee on the 7th February, at which place there was a short detention for making the necessary preparations for a hill campaign as well as owing to bad weather; ground was broken on the 22nd February.

108. All the necessary arrangements for the working of the Topographical Survey devolved on the Senior Civil Assistant in the absence of Captain Godwin Austen, whose services were required with the Bhootan Mission. As stated in para. 156 of last Report, it was contemplated that Mr. J. O. Nicolson, Officiating Surveyor in charge of the Waste Lands Party, deputed to Gowhatty, might exercise general supervision over the Topographical Survey in the Cossyah Hills; but after accompanying the Establishment from the Presidency, he was obliged to proceed on to his new field of employment in Kamroop, and beyond general advice his

superintendence over these operations has been merely nominal. Mr. N. A. Belletty, Civil Assistant, therefore, conducted the triangulation, assisted by 3rd Class Sub-Assistants Messrs. Low and Hussey, who were both young and inexperienced.

109. Towards the end of the recess, Mr. Nicolson went round by water from Gowhatty to Cherra Poonjee to visit the Party, and to draw up the Narrative Report of the proceedings which he has furnished, and from which Extracts will be found in the Appendix.

110. It has been explained in former Reports that triangulation is the basis on which all our topographical operations are conducted; it is therefore necessary that on initiating surveys of this class, the first Season should be devoted to laying out a suitable number of points by series or net work of triangulation over the tract to be surveyed in detail, and this should be kept so far in advance of the topography, Season by Season, as to prevent any unnecessary delay to the detail Parties afterwards, which closely follow upon the triangulation.

111. The Great Trigonometrical Survey operations having been some years previously conducted across the Cossyah Hills, and some of the principal stations being situated close to Cherra Poonjee, the hill station of Rangsandbo was selected as a suitable initial point, and the sides emanating from it were selected as basis for the triangulation required. It had previously been arranged, owing to the state of the Garrow Hills and the extreme difficulty of organising suitable means of transport, to confine the working of this Party at first chiefly to the Cossyah and Jynteah Hills, east of the meridian of  $91^{\circ}$  and in the immediate vicinity of Cherra Poonjee.

112. Mr. Belletty having previously for many years been attached to the Great Trigonometrical Survey, was fully competent for such work, and he accordingly commenced to break down the large triangles of the Great Trigonometrical Survey, and fixed his minor triangulation over an area of about 600 square miles, which is all that could be effected up to the setting in of the rainy season, which in this locality is of extraordinary severity, the fall of rain averaging as much as 400 inches per annum.

113. The total out-turn of triangulation, *viz.*, 600 square miles, is exceedingly small for a full Party; but with only the very limited strength available, and in the absence of the Officer appointed to conduct the operations, it is as much as could be expected for a first start under many difficulties. Even this was completed under the most trying circumstances in a country where the physical obstacles to be overcome are very great, and at a time of the year most unfavorable for observations, owing to heavy fogs and mist.

114. This Party has been organized and started under the greatest difficulties, and has been the source of considerable anxiety to me. The paucity of trained Executive and Subordinate Agency in this branch of the Department, which, during the last three years, has been more than doubled, is severely felt, and the removal of Captain Austen to the Bhootan Mission, and afterwards to special duty with the Bhootan Field Force, at a time when his services were invaluable to this Department, caused serious embarrassment. The Season under review, therefore, must be considered as altogether experimental only and partial in its operations, both as regards the time of working and the efficiency of the agency employed.

115. The cost of the Establishment for the entire Season amounts to Rs. 17,666-14-0. On this outlay no fair approximation of the cost and rate can be arrived at. The first equipment and starting of a new Establishment is always more expensive than the subsequent Seasons, and until a fair amount of work can be achieved, both skeleton triangulation as well as topographical details, it will not be proper to estimate the actual cost on the area returned.

116. Owing to the exceedingly high rates for provisions and consequent high charges for labor in the Cossyah and Jynteah Hills, the difficulties of transit and the special extra allowance to the Executive Officer and Assistants on this survey, for which I have applied to Government\* on account of the local circumstances above detailed, it must be expected that the average cost per square mile of the survey will exceed that of all others.

\* Vide letter to Home Department, No. 133, dated 25th January 1865, and enclosures.

117. The Party returned to recess quarters at Cherra Poonjee so late as the 8th July, and completed the records as per margin.

Recess duties.

Computations.

1st Class Secondary Triangles ...	...	119	
2nd " " ...	...	137	
Latitudes, Longitudes, and Azimuths ...	...	25	}
Angle Book, horizontal ...	...	386	
" " vertical ...	...	150	}
1 Chart of Triangulation, scale 4 miles 1 = inch.			}

\* *Vide* letter to Secretary to Government, Military Department, No. 98, dated 3rd October 1864.

Mr. Hussey, 3rd Class Sub-Assistant, immediately on his return to Cherra Poonjee, obtained medical leave\* owing to an attack of paralysis brought on by constant exposure to wet and damp, and was transferred to No. 7 Rajpootana Topographical Survey, his medical attendant having de-

clared that the climate of the Cossyah Hills was altogether unsuited to his constitution.

118. The Party has now been strengthened by the addition of the Sub-Assistants marginally named, and Mr. H. M. Atkinson,

Mr. Craven, 2nd Class Sub-Assistant, transferred from No. 4 Topographical Party by Department Order No. 17, dated 25th August 1864.

Mr. Landeman, 3rd Class Sub-Assistant, transferred from No. 5 Topographical Party by Department Order No. 17, dated 25th August 1864.

Sub-Assistant, 1st Class, having returned from medical leave to Europe, joined on the 18th December 1864. As these Sub-Assistants become thoroughly trained and experienced, it is hoped

that work will progress more favourably during the current Season.

119. On the return of Captain Godwin Austen from the Bhootan Mission, he obtained leave from the Foreign Department to proceed to Dehra Dhoon to write his Report and draw up his Map, and he was allowed up to the 7th October 1864 for this purpose; he consequently never joined his Party. On the commencement of the present Field Season he was again directed by the Military Department to accompany the Dooar Field Force as a Surveyor to sketch the country and lay down the new frontier boundary. In consequence, therefore, of the protracted absence of this Officer from the Cossyah Hill Party, it became imperatively necessary to provide

† *Vide* letter to Secretary to Government, Military Department, No. 2L, dated 29th September 1864.

another competent Surveyor to take charge of the operations. I accordingly recommended to Govern-

Assistant Surveyor, No. 5 Topographical Party, who had received a good training with both

ment† that Lieutenant R. V. Riddell, R. E., the Gwalior and Rewah Parties, should be appointed to officiate for Captain Austen, and this arrangement having been sanctioned,‡ Lieutenant

‡ By G. O. G. G. No. 808, dated Simla, 4th October 1861.

Riddell was directed to proceed down to the Presidency and thence onwards to join the Cossyah and Garrow Hills Survey at Cherra Poonjee, where he arrived and took over charge of his Office on the 23rd November 1864, and after making all necessary arrangements for the Season's operations, started with the entire Party from recess quarter on the 14th December 1864. I have every hope of this Officer doing full justice to the work on which he is now engaged.

120. The programme for the Season is as follows:—Lieutenant Riddell and Mr. Belletty

Programme for the current Season.

to be engaged in extending the triangulation completed last year north and eastwards; one Sub-Assistant to take up the large scale survey of the Government lands at the new stations or locations of Yeodo and Shillong, pressingly demanded by the Bengal Government; the remaining Assistants and Native Surveyors to undertake detail work east of Cherra Poonjee over the ground triangulated during the past Season. After another Season or two, it is hoped that full progress may be attained, as the Establishment becomes quite effective up to full strength and more experienced in dealing with ground of this intricate character. A Military Assistant is required, and will be recommended as soon as the position of Captain Godwin Austen is fixed.

G. O. G. G. No. 1514, dated the 17th February 1865.

121. Mr. Belletty, Civil Assistant, has been promoted to Senior Civil Assistant on Rs. 400 per mensem by the orders as per margin.

## No. 7 TOPOGRAPHICAL PARTY.

## RAJPOOTANA SURVEY.

*Season 1863-64.*

122. During the Season under review, No. 7 Topographical Party, as explained in the preceding paras. 3 and 11 of this Report, worked

Lieut. George Strahan, Military Assistant Executive Surveyor.

Mr. H. Horst, Civil Assistant.

„ J. Hussey, 3rd Class Sub-Assistant, re-transferred from No. 6 Topographical Survey, on sick leave.

Mr. R. Todd, 3rd Class Sub-Assistant, appointed by G. G. O. No. 673, dated 16th November 1863.

Mr. C. Tapsell, ditto ditto, by G. G. O. No. 685, dated 23rd August 1864.

Mr. F. Kitchen, ditto ditto, by G. G. O. No. 804, dated 4th October 1864.

Mr. C. Kirk, ditto ditto, by G. G. O. No. 859, dated 2nd November 1864.

Mr. W. Statesbury, ditto ditto, by G. G. O. No. 859, dated 2nd November 1864.

Native Surveyors Hurlall Singh, Sreenivas, and Kalka Pershad.

in combination with the Gwalior Survey, No. 1 Topographical Party, and its operations have in consequence been already reviewed with that of the Gwalior Survey. Further remarks, therefore, on its past working are unnecessary here. It now forms for the Season of 1864-65 a distinct Establishment under the immediate management of Lieutenant George Strahan, R. E., with a subordinate staff as marginally shown, and its future operations will be regulated according to circumstances with the general supervision of the Superintendent of the Gwalior Survey. The Estimate passed in the Budget amounts to Rs. 48,881.

123. The triangulation will be carried on in continuation of the Gwalior Triangulation emanating from the Great Arc Series, Great Trigonometrical Survey, and connecting upon the

## Programme for the season.

Rahoon Series, Great Trigonometrical Survey, northwards and westwards through Ulwar and Jeypoor in the Rajpootana Agency. The detail Surveyors will receive instruction and training from the senior hands of the Gwalior Survey, and be employed afterwards in their vicinity with the view to receiving any necessary assistance, and to secure good supervision of their work during this their first Season.

124. Lieutenant George Strahan is an Officer of great ability and excellent business habits. He has received his training in a good

## Opinion of Military Assistant Executive Officer.

School, and is now efficiently conducting the operations entrusted to this new Party, which will very soon be able to compete with any other Establishment. When inspecting the work executed by Lieutenant Strahan during the past Season, I was fully satisfied with all that had been done by this excellent Officer; he was principally employed in the computations, and likewise completed one of the general Maps (No. 3) as far as the materials existed; this Officer excels as a Draftsman, and is in every way most deserving.

125. Mr. O'Connor, 3rd Class Sub-Assistant, recently appointed to this Party, resigned his appointment, on the 1st June 1864, under the terms of his agreement, by refunding to Government half the salary he had drawn. Great endeavours have been made to procure promising candidates to fill up the numerous vacancies in the Department, and I am happy to say the present Season furnishes a very good staff of subordinates.

## No. 8 TOPOGRAPHICAL PARTY.

## PEGU SURVEY, BRITISH BURMAH.

126. A complete history of this survey from its origin to 1st May 1864, with full details on all professional points, was furnished for the information of Government in my Special Report on the Pegu Survey, forwarded with my letter No. 83 A, dated 2nd September 1864, to the Secretary to Government in the Military Department; and in my last printed Report on the Topographical Surveys in the Bengal Presidency for the Season of 1862-63, No. 33, dated 26th

Captain F. FitzRoy, R. A., Superintendent.  
Lieutenant A. H. Bagge, R. E., Assistant Superintendent.

Mr. W. S. Barnett, Sub-Assistant.  
„ S. Cooper ditto.

Native Surveyors Gour Chundra, Ramloosain, Shuay-leng, Esan Chundra, Kyanzan, Shuay-pho, Moungh-pho, Moungh-keng, Moungh-ngoo, Moungh-tot, Moungh-pho, Moungh, Moungh-gyewng, Tay-gyan, Shuay-han.

April 1864, a concise account of its origin, progress, cost, and probable time of completion was

given. With the object, however, of placing before Government the entire operations of the Executive Surveys under my control for the Season under review, it is simply necessary briefly to state here what the working, progress, and cost of the Pegu Survey has been for the Season of 1863-64.

127. The organization and system of survey of this Party is peculiar and different from all others under my control and direction, as explained in the Special Report above referred to. I therefore place the results on record as described in the Narrative Report made by the Superintendent, from which Extracts have been given in the Appendix. For reasons already

Foreign Department, No. 1225, dated 14th November 1864. placed before Government and acquiesced in by the resolution on the subject marginally cited, no attempt has been made to alter either its organization or "modus operandi," the chief object at present being to bring the survey, which has been so many years in progress without check or control, to a close within the current Season, which any interference with or alteration in the system hitherto pursued would certainly defeat.

128. The programme for the Season, as laid down by the Superintendent, was as follows :—

129. The Superintendent to inspect the detached Parties in the Prome District, and carry a triangulation from Meng-don to Lamoo across the Arracan Yoma Mountains. Assistant Executive Officer (Lieutenant Bagge) to complete several traverses, partly across the portions surveyed during prior Seasons, to instruct Mr. Sub-Assistant Cooper in traversing, &c., then to proceed to the Pegu Yoma Mountains and explore this mountain tract from the parallel of 17° 30' northwards, taking barometrical observations for heights and reporting on the country; should time admit after these duties, to carry a triangulation across the above named range from Tounglay eastwards, or assist the Superintendent on the triangulation of the Arracan Yoma Mountains.

130. Mr. W. S. Barnett, Sub-Assistant, to complete traverse in Tha-Yawa-dee and Prome Districts and along portions of the Arracan Coast.

131. Mr. A. Cooper to be instructed in traversing, then to undertake certain traverses in District Prome and part of Arracan.

132. The Native Surveyors, 13 in number, to undertake portions of details in the Districts of Prome, Tha-Yawa-dee, and part of Arracan.

133. This plan, as far as I am able to glean from the Superintendent's Report, was far from successful, except as relates to the traversing and details; for Captain FitzRoy, after very unnecessarily delaying at Rangoon till the middle of January without assigning sufficient reasons for the same, describes in his 12th, 13th, 19th, 20th, and 22nd paras. how each object was left unfinished and abandoned from causes of the most trivial nature. The particular part taken by the Superintendent appears to have been "in inspecting the detail Parties, in erecting 13 stations for a rough triangulation over 42 miles across the Arracan Mountains with a Prismatic Compass, and in selecting and clearing a base line which was measured with the chain only."

134. The Assistant Superintendent completed a traverse or route survey of 30 miles from Rangoon to the village of Pa-lay on the line of Telegraph to Da-na-bhyoo by the 23rd January. An attempt was then made to visit the Pegu Yoma Mountains, but this was abandoned owing to Lieutenant Bagge's health having failed; he then proceeded to Prome and conducted a small triangulation over 12 miles of country from Toung-lay to the summit of the Pegu Mountains. Eleven stations were observed at and some heights ascertained barometrically, after which Lieutenant Bagge proceeded to join the Superintendent, but owing to the difficult nature of the country did not succeed in doing so till the 9th May, or at the time when it was considered expedient to retire from the field owing to the setting in of the rains and sickly Season.

	Linear Miles.
Mr. W. S. Barnett, Route Survey ... ..	225
.. A. Cooper, ditto ... ..	96
Also, a time and compass sketch of the Lamoo River.	
Total ... ..	321

	Square Miles.
Topographical details by Native Surveyors, final and complete ... ..	5,316
Partially completed—	
In Arracan ... ..	2,393
In Proms District ... ..	455
	2,848

135. The detail Parties are reported to have completed the extent of work marginally noted. It is, however, impossible to follow the Superintendent with these figures, or to understand where his areas described as under survey are situated. The work reported to be thus done by the native subordinates is enormous.

136. The country over which the operations have extended is stated to be wild, unhealthy, and difficult; labor cannot be procured even at exorbitant rates, and the difficulties of communication seem to be very great. The Superintendent, his Assistant, and one of the Sub-Assistants suffered from repeated attacks of fever; the Native Establishment much less in health than usual, and the reason assigned for this is, that written medical instructions, with boxes of medicine, were supplied to each detached Party for the first time. This necessary precautionary measure is always followed in this Department.

137. The entire Party moved into recess quarters at Rangoon by the end of June, and was employed on computations and mapping until the middle of December.

138. From the Superintendent's professional Report, it cannot be discovered what the real amount of work completed during the recess was, but the following Extract is given to convey some general idea. No Maps or computations of any sort of the survey executed during the period under review have been furnished.

"Para. 40. \* \* \* \* \* The compilation of the field work of 1864 to the extent of 5,018 square miles upon the Office copy of the General Map is complete. The outline of the same upon the fair copy is very nearly so, comprising the upper half of Sheet No. 4."

"The fair copy in full detail of the field work of 1863, comprising the lower half of Sheet No. 4 of the General Map, is also finished, with some slight exceptions."

139. The total expenditure for the Season is Rs. 34,509-3-0, but on this amount no general rate or average cost per square mile can be struck, as the field work is of a desultory nature and of several kinds, in parts final and in others only half finished. Moreover, no records whatever have been submitted in any shape to this Office, and the number of square miles already returned largely exceed the real area of the province. Until the whole survey is completed and correct areas arrived at, it will not be possible to strike a fair average. The mean average cost, however, given in my Special Report (para. 48) at Rs. 15-15-9 is much nearer the truth than what the Superintendent reports in the 41st para. of his Report for the Season, viz., 6-13-0 as the rate per square mile.

140. Captain FitzRoy reports very favorably of Lieutenant Bagge's exertions in the field. This Officer is reported to have ably assisted the Superintendent in conducting the operations of the survey during the Season under review. Lieutenant Bagge, I am aware, is an Officer of great merit, energy, and determination, and he will be sure to give satisfaction in every thing he undertakes. The two Sub-Assistants, Messrs. Burnett and Cooper, as well as the several Native Surveyors, have also given satisfaction.

141. The services of Lieutenant Bagge have been suddenly withdrawn from the Pegu Survey, under the orders cited in the margin, for special survey employment with the Commissioners appointed to lay down the boundary between the Tenasserim Provinces and those of the King of Siam. The Assistant Surveyor was consequently struck off duty on the 17th December last, and, under detailed instructions from this Office, has been equipped and started on his new work, in which he is at present engaged, and which must prove a difficult task, requiring both time and skill, if it is to be done effectually.

Chief Commissioner to Foreign Department, No. 187, dated 19th December 1864.

Foreign Department to Surveyor General, No. 17, dated 9th January 1865, enclosing Extract of letter No. 500, dated 14th November 1864, to Chief Commissioner, British Burmah.



142. The following is the work reported by the Superintendent to remain for completion during the current Season:—  
Programme for Season 1864-65.

“In Prome District a small portion of arrears, Map No. 4, must be completed. But in the Toung-ngoo District the main portion of the Season's operations will fall; some work will also be conducted in the Tha-Yawa-dee and Rangoon Districts, as also in a part of Martaban.”

“The greater part comprises wild, uninhabited, and hilly tracts covered with dense jungle and extremely unhealthy.”

“Sub-Assistant W. S. Barnett to execute traverses with Theodolite and chain in the vicinity of Toung-ngoo, also to take mountain heights when necessary.”

“Sub-Assistant A. Cooper to execute traverses in the vicinity of Shuay-gyeng, also to take mountain heights where necessary.”

“Surveyor Moung-pho to complete arrears in Prome District.”

“Surveyors Shuay-pho, Moung-keng, Moung-ngoo to complete Survey in Tha-Yawa-dee District.”

“Surveyors Ramloosain, Gour Chundra, Moung-gyweg, Shuay-leng, Kyanzan to complete Toung-ngoo District.”

“Surveyor Moung-gay-gyan to complete what is requisite in Rangoon District, then to work up to Surveyor Kyanzan in Toung-ngoo District.”

“Surveyors Shuay-chan, Moung-kya, Moung-pho-Moung, Moung-tot to be employed in that part of the Martaban Division which is in close proximity to the Pegu Division, principally with a view to improving their skill as well as to form a reserve in case of any accidents or casualties amongst the other Surveyors.”

“Detailed instructions in writing, with rough Maps of the tracts to be surveyed, are furnished to each Surveyor.”

“By the traverse survey upwards of 474 miles will be accomplished; by the detail survey an area of 8691·9 square miles in the Pegu Division, and probably 2025·9 square miles in the Martaban Division, will be filled in, *i. e.*, the entire survey of Pegu will be completed, and such portions of the Martaban Division as fall within Map No. 3 of that Division also.”

143. It has unfortunately happened that the services of Lieutenant Bagge could very ill be spared just at this time. When the usual period arrived for the Pegu Establishment to take the field, Captain FitzRoy submitted, with letter of the 13th December, his application for leave to Europe on medical certificate for 10 or 12 months. This unexpected announcement caused serious embarrassment, because it was fully anticipated that the Superintendent would be able to carry out his promise of bringing the survey of Pegu to a termination by the close of the current year. With the loss of both Superintending Officer and his Military Assistant, however, it was not at all apparent how the above object could be realised, especially with an Establishment so weak in European subordinate agency. In his proposed programme the Superintendent observes as follows:—

“Various circumstances have of late occurred, more or less, tending to hamper the operations of this survey and to enhance the difficulty of completing the work within the period formerly specified.

“The Superintendent has, however, now but little anxiety on this head, provided that the services of an Officer are speedily procured, to whom charge of the Office could be made over during his own temporary absence on medical certificate.”

144. To this end a representation was made by myself, urgently recommending that the services of Captain Edgcomb, Royal Engineers, the former Superintendent of this Survey, should be applied for to the Madras Government with the view of his relieving Captain FitzRoy from the charge of the Pegu Survey, and thus endeavouring to bring it to a completion

Home Department, No. 2075, dated 6th March 1865.

within the time specified. By the orders, as per margin, Captain Edgcomb's services have been granted, and he has accordingly proceeded to Rangoon for the above purpose. It is obvious that no other Officer

could possibly prove so useful in bringing these lengthy proceedings to a termination. The knowledge of the previous history of this survey, as well as his experience of the language and country, must give Captain Edgcome great facilities for taking up the duty; it is therefore a matter of congratulation that an Officer of such known ability and energy has been secured for the work in question.

145. It has not been without considerable inconvenience that the Madras Government have been able to spare Captain Edgcome's services from the appointment of Principal of the Civil Engineering College at Madras, which he at present holds, and he is required to return to it again as soon as possible. It is therefore proposed that as soon as the whole of the field work shall have been completed, and the materials are in a fit and intelligible state to be taken away from Burmah, that the Superintendent shall take the General Map back to Madras with him and finish it there, as he will have particular facilities for doing so at the College. This I believe to be the best way of winding up the Pegu Survey, and it is to be hoped that Captain Edgcome's exertions may prove in every way successful. He will have the fullest support from this Office for the purpose.

146. Under the orders from the Foreign Department cited in the margin, Mr. Montgomerie, an Assistant Surveyor employed for some time at Moulmein under the Commissioner in making a survey of the town and other desultory survey work, was transferred to the Pegu Survey, together with the small Establishment as per margin. The salary of the Assistant is Rs. 400 per mensem, which was not provided for in our Departmental Budget for the current financial year, but the surplus under other heads is sufficient to cover it.

No. 285, dated the 30th September 1864, to Chief Commissioner, British Burmah.			
			Rs.
1 Assistant	...	...	70
2 Draftsmen, at Rs. 30 each	...	...	60
1 Tindal	...	...	14
9 Classies, at Rs. 10 each	...	...	90
1 Peon	...	...	10
		Total	244
Mr. Montgomerie	...	...	400
		Total	644

## REVENUE SURVEYS.

### 1ST DIVISION.

#### CENTRAL PROVINCES.

147. The survey of the District of Hoshungabad was again taken up by this Establishment in November 1863,

#### District Hoshungabad.

Captain J. Sconce, Royal Artillery, Officiating Revenue Surveyor, transferred to 3rd Division, Central Provinces, on the 13th November 1863, *vide* G. O. G. G. No. 1812, dated 31st December 1863.  
 Lieutenant J. H. W. Osborne, late 44th Native Infantry, Assistant Revenue Surveyor in charge, from 13th November 1863 to 10th of March 1864.  
 Captain R. E. Oakes, Staff Corps, Revenue Surveyor, rejoined from leave on the 11th of March 1864.

#### *Assistants.*

Lieutenant J. H. W. Osborne, late 44th Native Infantry, transferred to 3rd Division, Central Provinces, from 22nd August, *vide* G. O. G. G. No. 758, dated 25th July 1864.  
 Mr. J. Campbell, Assistant Revenue Surveyor, 1st Class.  
 „ F. Grant, ditto ditto, 3rd Class.  
 „ P. Cowley, Sub-Assistant ditto ditto, 2nd Class, transferred to Darjeeling, from 1st November 1863.  
 „ G. Rae, Sub-Assistant Revenue Surveyor, 2nd Class.  
 „ E. Little, Junior Sub-Assistant ditto ditto.  
 30 Native Surveyors, &c.

under the superintendence of Lieutenant Osborne, Assistant Revenue Surveyor, who received charge from Captain Sconce, Revenue Surveyor, on that Officer being appointed to the charge of the 3rd Division, Central Provinces, consequent on the absence on sick leave to Europe of Captain A. D. Vanrenen, Revenue Surveyor.

148. Lieutenant Osborne successfully conducted the field operations from the time of his taking over charge, until relieved on the 11th of March 1864 by Captain Oakes, the permanent Revenue Surveyor of this Division, who returned from leave to Europe on medical certificate on that date.