

104
GENERAL REPORT

ON THE

REVENUE SURVEY OPERATIONS

OF THE

BENGAL PRESIDENCY

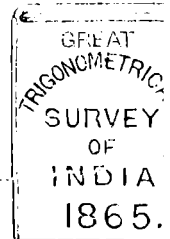
FOR

SEASONS 1858-59, 1859-60, & 1860-61.

BY

LIEUT.-COL. H. L. THUILLIER,

Surveyor General of India.



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1863.

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No. 9.

FROM THE SURVEYOR GENERAL OF INDIA,

TO COLONEL H. M. DURAND, C. B.,

Secretary to the Government of India,

FOREIGN DEPARTMENT.

SURVEYOR GENERAL'S OFFICE,

Calcutta, 25th November 1862.

SIR,

I HAVE the honor to submit, for the information of Government,

my Triennial Report,* with its enclosures, as per margin, on the operations of the Revenue Surveys now in progress under the Bengal Presidency, as well as in Sindh, for the seasons 1858-59 to 1860-61, giving a detailed account of the proceedings of the Department down to the latest date,

embracing the approximate out-turn of the current season of 1861-62.

2. The Topographical Surveys, likewise, under the direction of this Office, being under the Military Department, are reported on separately.

I have, &c.

(Sd.) H. L. THUILLIER, *Lieut.-Col.,*
Surveyor General of India.

No. 91.

FROM

THE OFFICIATING SECRETARY TO THE GOVERNMENT OF INDIA,

FOREIGN DEPARTMENT,

TO THE SURVEYOR GENERAL OF INDIA,

Fort William, the 14th February 1863.

SIR,

I HAVE the honor to acknowledge the receipt of your letter, dated 25th November last, No. 9, submitting your General Report on the Revenue Survey Operations of the Bengal Presidency for 1858-59, 1859-60, and 1860-61; and, in reply, I am directed to inform you that the Hon'ble the President in Council considers the general results therein recorded to be satisfactory and creditable to the different Officers whose exertions have elicited your commendation.

I have, &c.

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GENERAL REPORT

ON THE

REVENUE SURVEYS OF THE BENGAL PRESIDENCY

FOR THE

SEASONS 1858-59, 1859-60, & 1860-61.

No. 43A, dated Calcutta, 15th September 1862.

GENERAL REMARKS.

1. *Preliminary.*—It is proposed, in the present Operation Report, to treat of the whole of the Revenue Surveys now in course of execution, under the several Governments* of the Bengal Presidency, for the three seasons which have elapsed since the last general review was made in my Report, No. 34, dated the 27th August 1859, to the Supreme Government,† printed under the orders of the Foreign Department, No. 6502, dated the 10th October 1859.

2. The period embraced extends from the 1st October 1858, the commencement of the professional season of 1858-59, to the 30th September 1861, the end of season 1860-61. For these three seasons full and final results are recorded, the history of the operations being further brought up to date, and thus affording the approximate out-turn of the current season, 1861-62, not yet terminated, together with brief allusions to the proposed programme of operations for the ensuing season of 1862-63. I propose, also, in these preliminary remarks, to recapitulate and generalise the leading results attained, as detailed specifically under the head of each Survey, so as to afford a better idea of the real nature and extent of the working of the Department.

3. The Department has been very actively engaged in nearly the same parts of India as described in the last Report, and very extensive progress has been effected. The number of regular parties has been increased from 12 to 14; during the ensuing season there will be 15, besides three other small detached Establishments, making 18 in all. The several

* Punjab.
North-Western Provinces.
Bengal, Lower Provinces.
Oudh.
Central Province.
Sindh.

† With letter, No. 34A., dated 20th September 1859.

Executive Officers in charge of independent Surveys, and the scenes of their labors, are as follows :—

Seasons.	Nos.	Divisions and Districts.	Superintending Officers.
1860-61 ...	1	1st Division, Nagpoor and Jubbulpoor ...	Captain R. E. Oakes, Revenue Surveyor.
	2	2nd Division, Nagpoor ...	Captain J. H. Grant, Officiating Revenue Surveyor.
	3	Bundelcund, Jhansee, and Lullutpoor ...	Captain A. D. Vanrenen, Revenue Surveyor.
	4	Baiswarrah, Oudh, Purlabghur, and Roy Bareilly.	Captain F. C. Anderson, Revenue Surveyor.
	5	Lucknow, Oudh, Oonao, and Lucknow ...	Lieutenant-Colonel D. C. Vanrenen, Revenue Surveyor.
	6	Derahjat, Punjab, Derah Ghazee Khan, Ishmael Khan, and Bunnoo.	Major H. C. Johnstone, Revenue Surveyor.
	7	Right Bank, Indus, Sindh, Shikarpoor, and Kurrachee.	Captain J. Macdonald, Revenue Surveyor.
	8	Northern Division, Lower Provinces, Dinagepoor, and Tipperah.	R. B. Smart, Esq., Revenue Surveyor.
	9	Southern Division, Lower Provinces, Dinagepoor, and Maunbhoom.	Major J. L. Sherwill, Revenue Surveyor.
	10	Eastern Division, Lower Provinces, Dacca, and Sylhet.	N. T. Davey, Esq., Revenue Surveyor.
	11	Western Division, Lower Provinces, Furreedpoor, and Backergunge.	Major J. E. Gastrell, Revenue Surveyor.
	12	Arracan and Chittagong, Lower Provinces, Akyab, and Kookee Hills.	J. H. O'Donel, Esq., Revenue Surveyor.
	1861-62 ...	13	Hazareebaugh, Lower Provinces, Hazareebaugh, Burhee, and Ramghur.	Captain G. Hunter Thompson, Revenue Surveyor.
14		Left Bank, Indus, Sindh, Khyrpoor, and Hydrabad.	W. Lane, Esq., Revenue Surveyor.
1862-63 ...	15	Fyzabad Division, Oudh, Fyzabad ...	Lieutenant Penton Thompson, Revenue Surveyor.
	16	Darjeeling Waste Land Allotments ...	E. T. S. Johnson, Esq., Assistant Revenue Surveyor.
	17	Assam Waste Land Allotments ...	A. D. Smart, Esq., Assistant Revenue Surveyor.
	18	Rohilcund Revisions ...	H. B. Talbot, Esq., Assistant Revenue Surveyor.

4. The aggregate labors of the above 13 parties, employed during the period under review, or up to season 1860-61, are as follows, arranged according to their respective Governments :—

Number of parties	Jurisdiction.	Area surveyed in square miles.	Total Cost.			Average rate per square mile.			REMARKS.
			Rs.	As.	P.	Rs.	As.	P.	
1	North-Western Provinces ...	4,290	85,615	0	0	19	14	0	Chiefly Revenue.
1	Punjab	14,552	1,68,515	0	0	11	9	0	All Topographical.
1	Sindh (Bombay)	12,975	1,60,075	0	0	12	5	0	Chiefly Topographical.
6	Lower Provinces (Bengal) ...	23,041	6,44,646	0	0	27	15	7	Chiefly Revenue.
2	Central Province	7,862	2,48,436	0	0	31	9	7	All Revenue.
2	Oudh	2,440	1,16,732	0	0	47	13	5	All Revenue.
13	Total for three Seasons ...	65,160	14,24,019	0	0	21	14	0	

5. The above shows the very large area of sixty-five thousand one hundred and sixty square miles of country which has come under either the Revenue or mixed Revenue and Topographical operations by the Revenue Survey Establishments, and been completed during the three seasons. This area may be better understood, when I state that it equals about one-half of the entire British Islands, or of the Prussian Kingdom, and about a quarter of that of the whole of France. The proportion of the former description of Survey is 38,034 square miles to 27,126 square miles of the latter, and the mean annual average progress is 21,720 square miles, which is considerably in excess of the out-turn of the previous season of 1857-58, which the last Report gives at 16,697 square miles. The mean average area performed by each of the 13 Establishments annually is 1,670 square miles.

6. The area laid down on the Revenue Detail system is on the scale of four inches to the mile, the limits of every village being separately defined and mapped on that scale, as well as generalised and reduced to one inch. The portion taken up topographically only is surveyed on the one inch scale, and shows the general features of the country and all details, including territorial sub-division, up to the capability of the scale, but without the village boundaries, which are not defined or recorded, not being required at present.

7. The total cost of the entire operations comes to Rs. 14,24,019, on which the general average rate per square mile is Rs. 21 annas 14. The cost of

the Revenue Detail Survey is Rs. 9,36,133, giving an average rate of Rs. 34 annas 8 per square mile; and the expenses of the Topographical Operations are Rs. 4,87,886, yielding an average rate of Rs. 12 annas 13 per square mile, the difference being nearly in the proportion of 3 to 1 in the cost of the former over the latter. The general rate is lower than that of the previous season of 1857-58, and likewise more favorable than the mean average for as many as twelve seasons, as shown in last Report (*vide* margin). The average annual actual expenditure of this branch of the Department is Rs. 4,74,673 for the three seasons under review.

Season 1857-58 = Rs. 24 As. 4, rate per square mile.
 Mean of 12 } = „ 22 „ 14, do. do.
 Seasons)

8. It will be observed that great diversity of rates prevails under the several jurisdictions. This is caused by various local circumstances, the peculiarity and difficulty of the country, and by the difference in the style of the operations over certain areas. The mixture of Topographical with Revenue work tends to bring down the general average. In the purely Revenue work, the Central Province rate is very moderate for such difficult ground; the Bundelcund or Jhansee rate of the N. W. Provinces is also very low, the country being densely covered with jungle. The Oudh rates alone are exceptional, and have had my serious attention. The country may be said to be quite perfect for Revenue operations, but obstructions and difficulties have been met with in entering on this lately-conquered Province, and one out of the two parties hitherto employed on it is entirely new. The area yet done there is very small, and I entertain confident hopes that the unusual rates now recorded will speedily be reduced, to conform more nearly to the mean average prevailing elsewhere. It will be the object of the Executive Surveyors to endeavour to attain this end during the ensuing season.

9. The above results are submitted as in every way highly satisfactory and encouraging. The several minute details entered into in the following remarks, under the head of each Survey, will show distinctly the nature and character of the operations, the amount of accuracy attained, and the degree of confidence to be placed in the same. For the very moderate cost of Rs. 21 annas 14 per square mile, we have an excellent first Survey of an enormous area, well adapted, and amply sufficient to meet all present requirements, the whole represented by maps of the most practical description, and executed in approved style, on the one inch scale, besides the larger proportion of the area given on the larger scale of four inches to the mile, in separate village sheets.

Opinion of Results.

10. The Report will also, I trust, satisfy the Government of India, as to the continued praiseworthy and well-directed exertions of the several Officers and subordinate Staff engaged on the important and arduous task of

Opinion of Executive Officers.

the Survey of India, labors which, I believe, may be said to have been as successful as they have been useful, under the various circumstances of difficulty and risk of climate entailed. I beg respectfully to commend the zeal and devotion in the public service, displayed by both Superintending Officers and Assistants of all grades, to the favorable notice of the Supreme Government.

11. The tracts of country which have thus come under Survey, and re-

Reference Map.

presenting the above area, are conspicuously shown in the Skeleton Index Map,

No. 1, annexed. The Districts surveyed are colored red; those still in hand, with a lighter tint of the same; whilst those remaining to be taken up are left blank. The old Revenue Surveys are shown by a black wash, and include all those executed from the commencement, in about the year 1822, up to the first season now under review. This map also gives the regular Topographical Surveys, likewise under the direction of the Surveyor General, and alluded to hereafter. The completed areas are represented by a dark green wash; the work in progress by a light tint of the same color; and remaining for future Survey by a green streak.

12. The operations have been chiefly directed towards the final comple-

Districts completed and in progress.

tion of the Punjab, the Districts of Jhansee and Lullutpoor of the North-Western Provinces, with some of the Native States of Bundelcund; the Nagpoor and Jubbulpoor Districts of the Central Province; the Districts of Purtaubghur and Oonao of the Oudh Province; the Districts of Lar-khana, Jacobabad, and Mehur, and State of Khyrpoor of Sindh; with the Districts of Dinagepoor, Dacca, Furreedpoor, Kooch Behar and Akyab of the Lower Provinces. The whole of the above have been finished, whilst considerable progress has been made in the several other districts still in hand, as detailed in the margin.

Districts in hand.	Provinces.
Kurrachee	Sindh.
Nowshera	
Delhi Jagheers and lapsed States	Punjab.
Roy Bareilly	Oudh.
Lucknow	
Nursingpoor	Central.
Bhundara	
Saugor	
Tipperah	
Maunbhoom	Lower.
Sylhet	
Backergunge	
Kookee Hills, Chittagong... ..	
Hazarebaugh	

13. The blanks are still unfortunately too numerous and extensive to be approximately estimated here as remaining for Survey. There is still a very wide field whereon to employ the whole of the machinery at present engaged and allowed for the purpose, for very many years to come, for the details of which reference must be made to the body of the Report. The chief fields for employment lie in Oudh, in the enormous Central Province, in the Non-Regulation Lower Provinces, on the South-West Frontier, on the Eastern Frontier, including the whole of Assam (declared by the Government of Bengal to require a re-survey), and in Sindh.

14. The above results, added to the area recorded in the last Report (paragraph 13) as the out-turn from the season 1846-47, the date of the revival of the Revenue Surveys, after the first Punjab War, and of my own incumbency of the superintendency of this branch of the Department, give the following aggregate amount of work performed in the 15 seasons elapsed :—

Period.	Area surveyed in square miles.	Total cost.	Average rate per square mile.	
			<i>Rupees.</i>	<i>Rs. As.</i>
Last reported for 12 Seasons, 1846-47 to 1857-58 ...	1,71,868	39,28,783	22	14
Now reported for 3 Seasons, 1858-59 to 1860-61 ...	65,160	14,24,019	21	14
Grand Total	2,37,028	53,52,802	22	9

15. On the larger area, the general mean average is slightly reduced from what it was in the last Report, and this moderate cost, representing such a tract of country completed, and so many as 15 years' labors of the Department, must be taken as a fair exponent of the means and appliances brought to bear on the present Survey of India by the Officers engaged in this important duty.

16. Since the change in the Financial system and the introduction of cash payments for all transactions, the cost of the Surveys has of course appeared somewhat enhanced, and this requires to be kept in mind, in estimating the results of the latter seasons over the former ones. The contingent charges have naturally risen in the accounts rendered, and the addition of the Military allowances of the covenanted Officers employed, recently ordered by the Accountant General, will affect the results still more.

17. The present Report treats essentially of the Revenue Survey operations only, or of the results obtained by the Revenue Survey Establishments which are connected with the Civil Department; but in addition to the work thus turned out, the regular Topographical Surveys, which also came under my own direction on my succession to the Surveyor Generalship, on the 13th March 1861, and are reported on separately to the Military Department, form a very important part of the Survey of India. The extent and locality of these operations are also given on the Index Map, to show at one view the entire labors of the Department under my own supervision, and as important to illustrate the progress made in filling up the sheets of the Atlas of India.

18. The Topographical branch of the Survey Department, originally formed partially from the Staff of the Trigonometrical Branch, has been employed chiefly on the Native States, and in those extensive hilly and wild thickly-wooded parts of the British possessions which could not be treated in any other manner, and are but of small value, of which it is not necessary to have more than a good general or military map of the country, on a moderate scale, for political and administrative purposes. These Topographical Surveys are conducted entirely on a Trigonometrical basis, with minor Triangulation of the first class order, executed with a 14 inch Theodolite, the Topographical details being filled in on the one inch scale, by the Plane Table, and the whole generalised and reduced to quarter inch scale, by the Executive Surveyors.

19. Four large Parties have been thus employed for some years past, under their respective Superintending Officers, as detailed marginally, and a very considerable area has been laid down by their united efforts. A fifth Party, drafted chiefly from No. 1, has likewise been organised for the ensuing season, to be employed in the Rewah Rajah's Territory, through which the Allahabad and Jubbulpoor Railway passes, where it is of high importance for the Geological Survey to pursue its investigations for the discovery of coal, and this cannot be done without good Topographical Maps, which do not exist at present.

20. During the past two seasons, 1860-61 and 1861-62, or since my predecessor's last Report on these Surveys, an area of 16,408 square miles has been Topographically laid down, all on the one inch scale, in the Districts as per margin. In accordance with the practice observed, the minor triangulation is always in advance of the detail Survey. The above area* gives a mean average of 2,051 square miles as the annual out-turn of each party, but this scarcely represents the actual results, as the labor of the triangulation in advance forms an important part of the operations, and cannot well be reduced to a fixed area, whereon to proportion the

Districts.	Square miles.
Gwalior	2,033
Hyderabad portions of East and West Berar.	2,991
Sumbulpoor and Gurjat States, &c...	5,502
Kennjur, Moharbanj, Singhboom, and some Gurjat States in Chota Nagpoor Division	5,882
Total ...	16,408

* Tinted light green on Index Map.

expense. The nature of the country on which these parties are employed, is, for the most part, exceedingly unhealthy, and hostile to rapid progress.

21. Taking one year with another, and balancing the expenditure each season, on the actual amount of Topography furnished, whereby alone the Map of India can be filled up, the average cost of this description of work (above referred to) heretofore comes to Rs. 13 per square mile.

22. The Topographical Survey parties have been employed for several years and achieved much, but there is still a vast deal more to be accomplished, and which we cannot expect to do for a very long period. The ground already covered by these operations extends over the Nizam's Territories (including the Assigned Districts), which may be said now to be approaching completion; the Hazara, Jhelum, and Rawul Pindi Districts of the Punjab; the Goomsur, Ganjam, and Orissa Districts, and Gurjat States, brought up from the Southern Presidency; and a portion of the Chota Nagpoor Division; whilst the area remaining to occupy this branch of the Department consists of the whole of the Native States of Rajpootana, Gwalior, Central India, Bundelcund, and Rewah, on this side of India, besides the Native States of Bombay still remaining for Survey, an approximate estimate of

Native States.	Square miles.
Comprised in Atlas Sheets Nos. 18, 19, 20, 32, 33, 34, 35, 51, 52, and 53.	
Rewah	10,000
Nagode, Myhere, and Bijiragoo- } gurh.	1,872
Gwalior	33,119
Dutteeah	850
Indore Agency	15,680
Rajpootana ditto	119,859
Bhopal	8,312
Bundelcund	6,696
Total	196,388
Atlas Sheets Nos. 12, 13, 21, 22, 23, 36, 37, viz. :—	
Guzrat, Cutch, Kandeish, and } Native States in Bombay.	1,07,000
Portions of Atlas Sheets Nos. 69, } 70, 54, 38, and 24.	16,000
Total	123,000
Grand Total	319,388

the area of the whole of which is given in the margin, amounting to the large figure of 319,388 square miles.

23. The Index Map, No. 2, shows the sheets of the Indian Atlas filled up and published up to date, colored pink, whilst those unpublished and for the most part remaining for Survey are left blank. Each sheet measures $40\frac{1}{2}$ inches by $27\frac{1}{2}$, and embraces an area of 17,824 square miles; of the sheets already issued several are only partially filled up, and a few, as per margin, of a very meagre character, are independent sheets, not rigorously based on the Great Triangulation of India; these were brought out many years ago, and the late Hon'ble Court of Directors rightly interdicted the publication in future of any sheet

	No. of Sheets.
Published	68
Unpublished	109
Total	177
Deduct Sheets out of India	25
Remaining to be published of } British possessions.	84

Nos. 124, 125, 129, 130, 131, and 138.

Court of Directors rightly interdicted the publication in future of any sheet

not duly connected with the great foundation of the structure of the entire operations. The publication of some sheets containing both British and Native States, the former of which may have been long since surveyed, whilst the latter were necessarily left in abeyance, has been suspended for several years; but on an urgent reference from this Office, such sheets are now issued, with the blank portions noted as "unsurveyed," leaving this to be provided for in a second edition, and thus the materials of our surveys are brought to an early practical account, and great public convenience consulted. I anticipate the greatest advantage from this useful change having been conceded.

Atlas Sheets beyond British Frontier.

Nos. 139	Nos. 147	Nos. 159
" 140	" 148	" 166
" 141	" 149	" 167
" 142	" 150	" 168
" 143	" 151	" 169
	" 160	" 170
	" 161	" 171
		" 172
		" 173
		" 174
		" 175
		" 176
		" 177

24. From the number of Atlas Sheets recorded on the Index Map, issued by the late Hon'ble Court of Directors, and above shown to be unpublished, we may deduct 25, as cited in the margin, which, appertaining to Burmah and Siam beyond the British Eastern limits, are scarcely likely to be filled up during the present generation, thus leaving 84 which have to be yet provided for.

25. The great foundation and basis of both the Topographical and the Revenue Operations is, of course, the Trigonometrical Survey, without the aid of which neither of the former can be made full use of, or proceed systematically. The progress of these interesting and valuable operations made great strides under the successful administration of my predecessor, Sir Andrew Waugh, during the long period he was at the head of the Department, for nearly the whole of which I had the privilege of acting as his Deputy, whilst superintending the Revenue Surveys. This long experience enables me to appreciate to the utmost, and to record my sense of the valuable and hearty support always rendered by that Officer's mode of conducting the Great Triangulation, to meet the necessities and requirements of the Revenue Survey, and to his forethought and great consideration for the important objects of the extension of the Geographical knowledge of India. The extent and direction of the Trigonometrical operations up to this period are well described in the Index Map annexed, No. 3.

26. The division of the duties, on the retirement of Sir Andrew Waugh, placed the superintendence of the Trigonometrical Survey under Major Walker, Bombay Engineers. That Officer, in a similar cordial spirit, as described above, has favored me with his views regarding the future extension of the Great Triangulation, and con-

sulted my wishes as to the destination of such of his parties as may become available for fresh work. The Chart of these operations exhibits the several Meridional and Longitudinal series of the Principal Triangulation already executed, covering a very considerable portion of this vast Empire, and fixing absolutely the true positions of most of the chief Cities, Towns, and places of importance. The Meridional operations, North of the Great Longitudinal Section between Calcutta and Kurrachee, are nearly completed, forming a gridiron between two great quadrilaterals divided by the Great Arc Series, extending from Cape Comorin to the Himalayas, in longitude 78° , and checked by the six Base Lines already measured as per margin.

Base Lines.

Calcutta.
 Sonakhoda (Darjeeling Plains).
 Sironj (Central India).
 Dehra Dhoon.
 Attock (Chuch Valley).
 Kurrachee.

27. In this upper or northern section of the work, it will be observed by reference to the Index Map, there are two large blanks remaining to be filled up, one in Eastern Bengal and Assam, comprising the whole of the Lower Provinces east of the meridian of Calcutta; and the other in Rajpootana and Sindh, between the Gurhaghur Series on 73° and the Indus Series. The former of these blanks requires a Series on the meridian of Dacca in 90° East Longitude; another Longitudinal one, on the Parallel of 23° North Latitude, being a continuation of the Calcutta or Great Longitudinal Section, until it meets the Eastern Frontier, passing through the Cossyah Hills, Sylhet, and Tipperah Meridional Series in 94° East Longitude now in progress, and finally the extension of the North-Eastern or Assam Longitudinal Series, from Gowhatty on the Brahmapooter River, to which point the work is already done, up the Valley of Assam, in a north-easterly direction, to the limits of the British Frontier on the borders of Thibet and Burmah. The whole of the above may be said to be of leading importance, as appertaining to the older British possessions in close proximity to the Metropolis of India, and now well covered by the Revenue Survey.

28. The second blank requires two small or single Series on the meridians of $69\frac{1}{2}^{\circ}$ and $71\frac{1}{2}^{\circ}$, between the Great Longitudinal and the oblique Sutlej River Series, across the desert of Rajpootana and Sindh, inhospitable barren tracts, entailing heavy expense in the conduct of Trigonometrical operations, with little or nothing to fix or lay down, and of very secondary importance in a Geographical point of view. The above Triangulation will amply provide for the Topographical wants of all Northern India, down to the Parallel of 23° Latitude, and with the efforts now making by the several parties employed, may be expected to be completed in a very few years.

29. But there are still large tracts of country in Central and Southern India, in British Burmah, and on the East or Coromandel Coast of the Bay of

Bengal, below the Parallel of 23° , which have to be provided for. The chief and largest blank is that contained between the Great Arc and the Coast Series, the triangulation of which has reached Rajamundey, and it is proposed to measure a base of verification at Vizagapatam, the distance being

Marked B 3. nearly midway between Calcutta and Madras, during the ensuing season. This large ellipsoidal figure, comprising the whole of the late Rajah of Berar's Territory, Gondwana, the Jungle Mehals, Sirgoojah, Sumbulpoor, the Khond Country, Goomsur, &c., perhaps the most unhealthy and worst part of India, will involve the following triangulation, if the operations are to be carried out in the manner proposed by the former Surveyor General, Sir George Everest, and sanctioned by the late Hon'ble Court of Directors.

30. Three Meridional Series will be required; first, and of the most importance, is the meridian of 80° passing through Jubbulpoor, Seonee, and Nagpoor, where the Revenue Surveys have already made great progress, and only await the triangulation now referred to, for the purpose of being incorporated in the Atlas. The next pressing object is the series on the meridian of 84° passing through Palamow, Sirgoojah, Oodeypoor, Sumbhulpoor, Sonepoor, and Goomsur, to meet the Coast Series a little below Ganjam; the greater part of this tract of country has been Topographically laid down, or is in course of Survey, an intermediate Series on the meridian of 82° passing through Ruttunpoor, Jeypoor, &c., may be taken up. These series will be tied by a cross Longitudinal Series from the new Vizagapatam Base to the Beder Base in the Nizam's Territories, which will form a continuation of the Bombay Longitudinal Series. The several Series as proposed to be carried out are colored pink on the Index Map.

31. The above will afford ample employment, for many years to come. As far as can be at present foreseen, the Trigonometrical parties, as their services become available, will be put on to the work in the order I have given above, after which the remaining wants to complete the whole of India may be taken into consideration. They may be said briefly to comprise a short Series for Rangoon or British Burmah on $96\frac{1}{2}^{\circ}$, and the prolongation of the Eastern Frontier Series down the Coast of Arracan and the Tenasserim Provinces; also the continuation of the Coromandel Coast Series, from Madras to Cape Comorin and Ceylon. Base Lines will likewise have to be measured at Vizagapatam, Bangalore, Cape Comorin, Pegu, and Tenasserim.

32. Nearly the whole of the Southern Peninsula has been covered with net-work of Triangles, of different values, some of which are of an inferior order, performed nearly half a century ago, with inferior instruments, and by a less rigorous *modus operandi* than the system introduced by Colonel Everest

in 1830, and eventually it may be necessary to revise some of that work, by pursuing a fresh Series on the meridian of Mangalore in 75° Longitude, through Sattara and Belgaum, with extension down the Malabar Coast, to connect at Cape Comorin; a Longitudinal section across the Peninsula in Latitude 13° is also proposed, and the measurement of another base, on the western side, may be ultimately found necessary. The southern section of the great Arc from Beder to Cape Comorin, and a section of the Calcutta Longitudinal Series from Sironj to Calcutta, affording, as they do, bases to so many other operations, their revision was always contemplated by the late Surveyor General, as a measure to be postponed only until the completion of such series as are indispensably requisite for the Topographical Surveys.

33. In connection with the Trigonometrical Operations, the special Topographical Survey of the Himalayas, including the whole of the protected States around Simlah, Sirmoor, Chumba, Kulu, Spiti, Lahoul, Bissalier, together with Kashmeer, Ladalk, Balti, &c., has been for some years in progress, and is still being carried on in the latter country, on the smaller scale of half mile to the inch, by Captain Montgomerie, Engineers, the valuable and interesting Reports of whose proceedings have of late years been so much before the Government and the public, as described in the Journal of the Asiatic Society, and in my predecessor's Reports to Government. These operations, over ground of the most stupendous character, varying in altitude from 22,000 down to 5 or 6,000 feet, and within reach of snowy peaks up to 28,000, have taxed the utmost energies, skill, and resources of the picked Officers and Assistants of the Trigonometrical Department, and have obtained for them the admiration of the scientific European world. The extent of these Surveys beyond the British Frontier is shown in the Index Map No. 3, which embraces the whole of the work under the direction of the Superintendent, Great Trigonometrical Survey, and which is fully reported on by that Officer.

34. From such an area as that above recorded as the result of the Revenue Surveys, it might be expected that the number of Maps and Plans produced would be very large. From the details given in this Report it will be found that 199 Pergunnah or Main Circuit Maps, on the scale of one mile to the inch, have been rendered. These are all large and elaborate Maps, generally of Atlas size (some double), each containing very intricate details, involving much time and labor in their preparation. The whole of these have been supplied in duplicate, one copy being for the local Civil authority, thus making a total of 398 to represent the full labors of the Executives for the three seasons. The Village Plans, on

the scale of 20 chains to the inch, amount to 31,161 in number, or with duplicates, 62,322. These latter Plans are now rendered on imperial sheets, in clusters of villages congregated together, and form a much better and more practical record, than by the old system of giving every village on a separate Register Form, especially when the size of the Village is small. The village Plan Sheets are most valuable for all purposes of Local Engineering, in lining out Roads, Canals, Railways, and the like, giving a clearer idea of the nature of the ground, by showing a larger area at one view, and being accessible in the Local Collectories, have afforded much satisfaction.

35. The area and statistical information for each village is recorded separately, on forms which are bound up with the numerical or traverse data, on which the Survey is based, and form complete Field Books; of these 58 volumes have been deposited. The observations and measurements, with computations deduced therefrom, of the Main Circuits or chief portion of the Professional work, are also recorded in 35 volumes, being bound up together

	No.
Pergunnah one inch Maps 199 X 2 =	398
Village Plans 31,161 X 2 = ...	62,322
Cantonment or City Plans ...	24
Index Maps ...	39
Volumes of Statistical Registers and Village Traverses ... }	58
Main Circuit Traverses ...	35

on the completion of the District. In addition to the above, 39 Index Maps, scale four miles to the inch, have been received as guides to the Season's operations. The full extent of the records lodged is given in the margin.

36. Such an enormous amount of work coming in every season affords very considerable employment for the District Maps compiled. Head Quarter Superintending Office, in the compilation and reduction of the materials, their examination and adjustment prior to publication, as well as for the purpose of reporting on the same. It is the practice of this Office to endeavour to complete each District Map, on the reduced scale, as soon after the last Pergunnah or Main Circuit has been surveyed as possible. Each compilation is therefore carried forward, as far as the materials in hand will permit, and a preliminary Map of the District is thus prepared for the Press without any delay, and issued to the local authorities and public in this country, whilst the final Map is under preparation for despatch to England, to be incorporated in the Atlas. Two important objects are thus gained, *viz.*, the early practical use and distribution of the survey materials in this country, where they are so urgently needed, and likewise, by the circulation of a first edition of the Map in the hands of those who know the District well, the correction of inaccurate orthography or such other items as may be susceptible of improvement, the insertion of new roads, or the addition of railways or other alterations, effected since the date of Survey, is secured.

37. The several preliminary and final District or Division Maps, as follows, have been reduced and compiled in this Office, printed and issued

since my last Report, and the separate one inch Pergunnah Maps, as received from the Surveyors, also lithographed:—

DISTRICT MAPS.

Geographical Scale 4 miles = 1 inch.

LOWER PROVINCES.	Rungpoor and Kooch Behar ...	} Preliminary and lithographed.
	Dacca ...	
	Furreedpoor ...	
	Dinagepoor and Bograh ...	} Final and sent to England.
	Jessore	
	Mymensing	
UPPER SINDH.	Rungpoor and Kooch Behar ...	} Final, ready for dispatch to England.
	Dacca and Furreedpoor ...	
	Akyab ...	
PUNJAB.	Dinagepoor and Bogra ...	} Final and lithographed in Ludia.
	Mooltan Division, containing Districts—	
	Googaira ...	
	Jhung ...	
	Mooltan ...	
	Mozuffurnuggur ...	
N. W. OR CENTRAL PROVINCE.	District Derah Ghazee Khan... „ Shahpoor and Goozrat	} Preliminary and ready for the Press.
	District Rohree ...	
	„ Shikarpoor ...	
	„ Jacobabad ...	
N. W. OR CENTRAL PROVINCE.	Jagheer Khyrpoor ...	} Preliminary and lithographed.
	District Nagpoor ...	
	Nagpoor ...	} Final, ready for dispatch to England.
	Jhansee	
	Lullutpoor with Tehree, and a few intermixed Bundela States.	} Ready for the Press.
	Robilcund. Revised Survey of Terne Pergunnahs and Rivers.	
Atlas of 14 degree sheets of the Topographical Survey of the Himalayas, compiled at Dehra Office, lithographed in colors in Calcutta, with Index and Title Pages complete. Chart of Minor Triangulation of the Comandul Coast Line, from the Dhamra River to the Chilka Lake, based on Coast Series, Great Trigonometrical Survey.		} Projected and sent to England.

DISTRICT REVENUE MAPS WITH VILLAGE BOUNDARIES.

Scale 2 miles = 1 inch.

PUNJAB.	Kangra ...	} Compiled and lithographed. Ready for Press.
	Mozuffurghur ...	
	Mooltan ...	
	Jhung ...	
	Shahpoor ...	
	Nagpoor ...	

SEPARATE PERGUNNAH OR MAIN CIRCUIT MAPS

LITHOGRAPHED.

LOWER PROVINCES.	Moorshedabad ...	The whole.
	Bancoorah ...	Ditto.
	Jessore ...	Ditto.
	Mymensing ...	Ditto.
	Burdwan ...	Ditto.
	Dacca ...	Part of.
	Furreedpoor ...	Ditto.
	Hazareebaugh ...	Ditto.

N. W. P.	Jawud Neemuch ...	... All.
	Bhurtpoor ...	... Ditto.
	Jhansee ...	... Ditto.
	Jubbulpoor ...	... Part of.

CANTONMENT CIVIL STATIONS OR CITY PLANS.

Scale 10 or 12 inches = 1 mile.

Calcutta and environs in 4 sheets.
 Berhampoor.
 Hazareebaugh.
 Burdwan.
 Kamptee.
 Lucknow.
 Derah Gazee Khan.
 Derah Ishmael Khan.
 Googaira.
 Asnee.
 Mithunkote.
 Mean Meer.
 Jullundhur.
 Ferozepoor.
 Leiah.
 Sealkote.
 Umballah.
 Anarkullee.
 Dalhousie.
 Lahore.
 Bunnoo.

GENERAL OR MISCELLANEOUS MAPS OF PARTIALLY SURVEYED OR UNSURVEYED TRACTS, COMPILED AND LITHOGRAPHED.

Scale 8 miles = 1 inch and under.

Saugor and Nerbudda Territories, now attached to Central Province, in two sheets.
 Skeleton Division Maps of all the Commissionerships under the jurisdiction of the Lieutenant-Governor of Bengal.
 Cachar and Jynteah with part of Sylhet and Cossyah Hills.
 The Tea Localities on the Punjab and North-Western Provinces.
 The China Coast or Sketch of country between Canton and Peking for the use of the Troops in the China War.
 Central Asia, between the Parallels of 20° and 60° North Latitude, compiled under the Superintendence of Major Walker, Superintendent, Great Trigonometrical Survey.
 Small Scale Map of India in colors.
 Ditto Linguistical ditto.
 Ditto Telegraph Map of India.
 Disposition, or Military Division Map of Bengal Presidency for Quarter Master General's Department.
 Route Map of the Punjab for Quarter Master General's Department.
 The Head of the Assam Valley, with parts of Burmah, China, and Thibet.
 Educational Map of Bengal, Lower Provinces.
 Country North of Ganges from Monghyr to Allahabad.
 The Mahsood Wuzeree country.

38. There are various Maps of extensive character also now under compilation in this Office; some of these take years to complete, and many are exceedingly difficult, from the absence of regular Surveys, and the consequent conflicting values assigned by the various incongruous materials of travellers or Military Routes. First in importance is a new General Map of the Punjab, scale 8 miles=1 inch, embracing the entire Province under its extended jurisdiction, from the Jumna River on the East to the Soliman Range of Mountains on the West, including Kashmeer and the protected Native States in the Himalayas around Simlah, the limiting meridians being 69° to 79° and parallels 28° to 36° . The whole of the Survey operations in both branches having now been finished of this Province, I trust soon to have this fine Map ready for the Press; it is proposed to publish it in Sections of convenient size, by which means the lithography is expedited, and the publication rendered more convenient for intending purchasers, as well as local authorities. Another very useful Map in hand is one of the entire North-Western Provinces and part of the Punjab, on a scale of 16 miles to the inch. It embraces a very large area from Monghyr, on the Ganges, to the Indus, and from the Himalayas to the parallel of Nagpoo in Central India, or from Longitude 71° to 86° , Latitude 21° to 32° , and will form a very valuable reference, and supply a desideratum long felt. By publishing it in Sheets or Sections, I hope to include, in course of time, the whole of the British and Native Possessions attached to this Presidency, and to render each Sheet available, as fast as prepared, without waiting for the entire Map.

39. A General Map of Eastern Bengal, scale 8 miles=1 inch, from the meridian of Calcutta, including Assam and the Hill Territory on that Frontier down to Chittagong, is in a forward state, but awaits the triangulation to tie in the extreme limits and assign correct values for the Capitals of the Eastern Districts. The results of the Topographical Operations in Ganjam, Sumbulpoo, and the Gurjat States of Orissa, have been put together, to the extent received from the Surveyors, on the scale of four miles to the inch; the originals of which have been sent to England, and great exertions are now being made to square up the Survey Sections in that quarter, with a view to complete Sheet No. 106 of the Indian Atlas, and so to render these materials of some practical utility.

40. In connection with the Drawing Office is the Lithographic Press, for the multiplication of the Maps, by transfer drawing, on stone. This branch of the Department has only been in existence a few years, but it has made rapid strides with very inadequate means, and the present style of our Printed Impressions is equal to that produced in England. The Establishment is but small, and was fixed when the out-turn of the Surveys was one quarter what it now is. Al-

though, therefore, it is unable to cope with the enormous progress made by the Executives as above shewn, yet it manages, under the excellent Superintendence of Mr. H. M. Smith, to turn out a vast deal of very highly creditable work, and to meet the most pressing of the wants of this large Presidency, as respects our regular Survey Maps, as well as to execute a large amount of miscellaneous desultory work sent to this Department from the various Secretariats, to illustrate the Official Reports published by the several Governments.

41. The foregoing paragraphs specify to some extent the chief or most important Maps lithographed during the period under review in this Report, but the bare mention of a Map gives but little idea of the nature or extent of the labor expended upon it. The following Abstract of the extent and estimated value of the Lithographic work executed may serve to shew in a measure what has been effected by this branch of the Department during the three years, from 1st January 1859 to the 31st December 1861 :—

Description of work Lithographed.	Number of Impressions or Sheets struck off.	Cost of the Transfer Drawings.	Cost of the Printing.	Total actual Cost.	Value or selling price of Maps.	Difference to credit of the Department.
		<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
382 Maps and Plans	214,397	37,077	37,077	72,958	1,13,565	
287 Departmental Forms	306,527	2,501	12,957	15,458	34,273	
669 Total	520,924	39,578	48,838	88,416	1,47,838	59,422

42. The cost of the Lithographic work is reckoned on the total sums drawn in the Permanent and Contingent Bills as per margin, the difference between this sum and the estimated value or selling price of the Maps gives a balance of Rs. 59,422 to the credit of the Department, but from this the value of the paper obtained from the Stationery

	<i>Rupees.</i>
Permanent Establishment	70,682
Sundry Contingent Expenses	4,768
Extra Contingent Bills for Job-Work performed for Government for Special Reports.	12,968
Total	88,418

Department ought to be deducted, so as to shew the actual sum accruing to the credit of the Office. This cost of the quantity of paper expended, it has not been practicable to calculate, but the account as it stands is sufficient to exemplify the degree of usefulness attained by the Lithographic Branch, and the economy with which it is worked.

43. The value of this appendage to the Office can scarcely be over-estimated. By the power of supervising the reproduction of the Maps of the Department, as they pass through the Press, great advantages are afforded, and the utmost accuracy ensured in the publication of the Maps. The general style and execution of the Maps now turned out has been well exemplified

on the lithographed Atlas of the Degree Sheets of the Himalaya Topographical

Surveyor General to Government, No. 1278, dated 8th January 1862.

Reply, " 988, " 21st " "

"In reply I am desired to convey to you the assurance of the Governor General in Council, that he has seen these Maps with much pleasure, and that the execution of them is highly creditable to your Department and to that Branch of it over which you have presided with so much advantage to Government."

"The exertions of Mr. H. M. Smith and others who chiefly aided you in the work, have merited notice, and I am to request that you will express to them the commendation of the Governor General in Council for their valuable and zealous co-operation in the successful achievement of results so creditable to the entire Department."

Extract paragraph 17, of No. 206, dated 31st May 1862, from the Hon'ble the Secretary of State for India.

"Execution of the volume of the Degree Sheets of the Topographical Survey of part of the Himalayas, conducted from 1848 to 1854, reflects very great credit on the Surveyor General's Department, and especially on Mr. H. M. Smith and the Assistants in the Lithographic Establishment of that Department."

Survey, which I had the satisfaction of submitting for the inspection of the Government, with my letter to the Military Department cited in the margin, and which elicited the commendations of the Government of India and of the Secretary of State, as quoted in the margin. These

intricate and elaborate Maps, on the scale of four miles to the inch, delineating this most difficult mass of mountainous country, were executed in the style of Chromo-Lithography, each plate having four printings, and by a combination of Chalk Drawing for the Hills, direct on the stone, with transfer Drawing for the outline, writing, and figures, a very successful result was produced, which has been much admired by scientific men generally. A copy of the same Atlas sent to the Great Exhibition of England, through the Calcutta Committee, has, according to private accounts received from home, obtained for the Department the honor of a prize medal, which I hope will be a further incentive to exertion towards effecting still greater improvements, in the beautiful art of printing from the stone, and to which my anxious attention is constantly devoted.

44. To the well-directed and praiseworthy exertions of Mr. H. M. Smith, the energetic Superintendent of this Branch, is due the credit attached to this, as well as all the other publications emanating from this Office. With this Assistant, it is a real pleasure to work, and my daily intercourse with him for a period of ten years, enables me to record the high sense I entertain of his services, in instructing and bringing forward the Lithographic Draftsmen to their present state of efficiency. Mr. Smith is an old and meritorious servant of the Government, of nearly forty years' standing, having served previously in the Quarter Master General's Department.

45. The multiplication of Maps in this country by Lithography, as well as the engraving of the sheets of the Indian Atlas in England, has opened out a new and extended sphere of duty in this Office by the coloring, sale to the public, and distribution to Officials, of the Printed Maps. As the Survey of India progresses, and the Maps of Districts and Provinces are available, the demand for them increases, until of late years, especially since the mutiny, it has become so great as to absorb almost the whole of the editions struck off, and to entail a most onerous

Sale and Distribution of Printed Maps.

task on my already over-burdened Establishment, by a multifarious correspondence with private and official persons all over India, and keeping of cash accounts.

46. During the three years from the 1st April 1859, the date on which the last Map Account Sale was rendered in the Deputy Surveyor General's Report to the Bengal Government, for season 1857-58, as per margin, up to the 31st July last, the following number of Maps were colored and issued :—

Number of Maps Sold and Issued.

Dated the 2nd April 1859.

		No.
To Officials	Unpaid	11,040
To Non-Officials	Paid	3,297
Total ...		14,337

The value or selling price of the above Maps issued to Officials comes to Rs. 38,470, and if all the Maps had been paid for, this sum would have been actually credited in cash to the Department, but up to the present Financial year, the system of money payments was not introduced. This, under the existing Financial Rules and Budget system, is now rigorously enforced, and every Map issued is paid for and carried to the credit of Government in account with this Department, a wholesome change, which will induce greater care of valuable official records.

47. The cash account for the 3,297 Maps sold to the public stands as follows. Of this, Rs. 9,500 cash has been deposited in the Treasury :—

	Rs. As. P.	Rs. As. P.
Balance outstanding in favor of Government as per last Report, dated 2nd April 1859 ... ..	.....	736 13 1
3,297 Maps, of sorts, sold ... ..	.....	11,775 1 8
Total realised up to 31st July ...	.....	12,511 14 9
By Cr.		
Amount paid into General Treasury as per Sub-Treasurer's Receipt, No. 269, dated 20th August 1860, <i>vide</i> letter to Foreign Department, No. 32, dated 24th idem	4,500 0 0	
Amount paid to Government Treasury as per Bank of Bengal Receipt, dated 25th July 1862	5,000 0 0	9,500 0 0
Balance outstanding, or deposited in Bank of Bengal Account with this Office, and under adjustment ... ..	.....	3,011 14 9

These balances are paid into the General Treasury when they amount to an even sum.

48. The coloring of this immense number of Printed Maps has to be provided for by hand-work, and entails a heavy amount of labor, which is effected

Coloring how effected.

by contract at cheap rates; the cost of this Job Work is charged in the Contingent Bills, and, as will be seen above, is returned to Government in the proceeds realised by the sale of the Maps. During the current year the profits from this source will be more defined and real, but it must be remembered that the price affixed to the Maps is remarkably small, not being intended as a source of gain or profit to the State, but valued merely for the object of diffusion and wide circulation, and to be within the competency of all parties both Europeans as well as Natives. The sale, therefore, of these Maps cannot in any way reimburse the Government in the cost of the Survey, or of the compilation and preparation of the originals, but it will, I believe, defray the printing and publishing charges, and thus give this most valuable Establishment and appendage of the Department to the State almost, if not quite, for nothing, with the additional advantage of a full supply of Maps always in store for public purposes.

49. In order to facilitate and expedite the coloring of Lithographed Impressions of Maps, I am anxious to introduce tinting on the stone by the process of Chromo-Lithography, which is difficult of attainment, and for this purpose a practised European Printer has been applied for and recommended by the Government of India to be sent out from England. Whatever has been achieved here, has been done without any previous practical knowledge in the Art, or any apprenticeship on the part of a single individual in a Lithographic Establishment elsewhere. The means at our disposal have been extremely small and inadequate to the required end, but considerable success and progress has been attained by dint of hard perseverance. With the addition of a competent Chromo-Printer, and an extension of the Lithographic Establishment to meet the proportionate increase in the Executive progress of Surveys, which it is now imperative to apply for, I have every expectation of giving a good impetus to this useful and most important branch of the Department.

Tinting on the stone.

50. As yet engraving on copper has not been practised in this Department,

Copper Plate Engraving.

because the final Maps are, under the old Orders of the late Court of Directors, forwarded to the India Office, and are there incorporated into the Great Atlas of India, the sheets of which appear periodically, as before stated, and it forms the special business of the Geographer to the Secretary of State to bring out these engraved Maps; but it would in my opinion be very desirable to attempt engraving on copper here, because there are many Maps and Plans, as well as Charts, of the Trigonometrical Survey, which it is most important to retain, with a view of printing fresh editions whenever wanted. With our

Lithographs, the most elaborate Map, which may have taken months to transfer to the stone, is obliged to be cleaned off, to make room for other important work, the stock and material of the Office being altogether inadequate to its growing wants. The Natives of India, moreover, are susceptible of being made excellent engravers, and this description of work, I believe, could soon be effected much cheaper than in England. I propose, therefore, with the approval of Government, to add a Copper Plate Engraving Press to the Office, and commencing to put some of our more important Maps on copper, the plates of which can be kept so conveniently, and impressions struck from them as required.

51. Another improvement recently introduced in the publication of the Maps in this country, is the employment of Type for setting up the notes, remarks, tabular statements, &c., and transferring the impression from the type to the stone, and so striking off the whole by Lithography. This gives a superior finish and uniformity to the accessories of a Map, which no hand-work can accomplish, and it is a point of great importance that the descriptive notes should be clear and readable, the cramped writing of Native Draftsmen, ignorant of the English language, being unsuited to this object; economy and expedition will likewise be secured, and the Draftsmen kept to that more important part of the Map, in which they excel.

52. The combination of type has likewise been introduced by Major Gastrell into the manuscript original Survey Maps, with good success. It enables Executive Surveyors to economise their Draftsmen's labors, and to get a very large number of Maps and Plans out of hand in the Recess, which might otherwise be difficult to complete, in an equal style, in a much longer period; it is also highly advantageous where there may be a scarcity of good Draftsmen, always a difficult class of men to procure. Many of the one inch Maps by the above Surveyor, as well as of two or three other Executive Officers, have been well finished with the type auxiliary, and are good specimens of ingenious contrivance.

53. The great success which has attended the reduction and re-production of Maps by the Photographic process in England, at the Ordnance Survey Office at Southampton, under Sir Henry James, and the transmission, for the use of this Department, of two fine Cameras specially selected for the purpose, with complete sets of Photographic apparatus, by the Secretary of State, induced me to apply for two Sappers trained in the Southampton Office, to be sent out, to assist in this work. Two Sappers, as cited in the margin,

accordingly arrived from England on the 1st June last, and joined this Office, under the Orders of the Government of India, in the Military Department, as quoted,*

* No. 1083, dated 29th August 1862.

on a salary of Rs. 100 per mensem each, to cover all demands, including their Military pay and allowances as soldiers.

Extract para. 1 of No. 27, dated 31st January 1862, from Secretary of State, to His Excellency the Right Hon'ble the Governor General of India.

"With reference to paragraph 31 of my Military letter, No. 436, of 15th November 1861, I have to inform you, that Acting Corporal Mackenzie and Sapper Crossley, of Her Majesty's Indian Engineers, have been instructed in the art of Photography at the Ordnance Survey Office, Southampton, and have been reported by Colonel Sir Henry James to be qualified to make Photographic reductions of Plans, and to print them, either for direct use or for any other purpose, and also to take the Chromo-carbon prints for transfer to zinc or stone for printing any number of copies of any Plans, Engravings, or Manuscripts, which may be required."

Their reported qualifications are described in the annexed extract of a letter from the Right Hon'ble the Secretary of State.

54. None of the Maps hitherto produced having been drawn with special reference to the requirements of Photography, and all being highly colored, the attention of the Sappers has been directed chiefly towards the re-production on the same scale of certain Maps of Districts long since surveyed, but still unpublished. Various experiments have been made and they are still going on, but much remains to be done to turn the labors of the Photographers to a good practical account. The rainy season has been much against them, and the want of a proper glass house and various other necessaries, including competent superintendence for carrying on work of this description, militates against rapid success. The chromo-carbon prints transferred to zinc or stone have not been at all successful, and such manipulation, although well adapted to ancient manuscripts or old printed records, I believe is a very long way from adaptation to our wants for fine and large Maps. Photography, to be carried out successfully as a system for a large and wide-spread Department, must be prosecuted under Officers who have ample time to devote to it. The Manuscript Maps, of course, must be prepared by Executives, strictly in conformity with Photographic requirements, and in this there will be no difficulty.

55. The progress of the adaptation of the useful art of Photography to our mapping purposes will continue to engage as much of my attention as the multifarious duties devolving on me will admit. The development of the Anastatic process for the re-transfer of old Prints, Drawings, or Maps, to the stone or zinc, by immersion in solutions of strontia and nitric acid, has of late been successfully applied in England, and with the highly important advantage of preserving the original unhurt. The employment of the Anastatic Press in India is likely to afford great facilities for re-producing those Lithographed Maps which have been long out of print, and of those parts of India which cannot be as yet engraved for want of correct Surveys; much has yet to be done in India in the above way, but I hope

we are in a fair way towards keeping pace with all such-like modern improvements.

56. The large extension of Surveys, as shown in paragraph 3, naturally tends to increase the general out-turn of

Extension of the Executive involves the necessity for increased ministerial Establishment.

work of the Department, and to throw a heavy extra burden on the supervising Office; but whilst of late years the powers

and capabilities of the Executives have thus expanded, the means for check and control in the ministerial Office have unfortunately stood still, until so many additions have been made to the duties performed, under my single Superintendence in this Office, as to preclude the possibility of the same being satisfactorily carried on, without corresponding assistance being afforded.

57. Every new Survey party raised and set to work involves a corresponding increase of labor and supervision on the Head Quarter Office, and I trust the contents of this Report will sufficiently prove the great change which has taken place in the strength and progress of the Department within the last few years. Not only is the legitimate and absolute work caused by superintending the prosecution of so many Surveys, both Revenue and Topographical, largely increased, but the desultory and petty details of business in both branches of my Office, now entailed by the altered state of this country as regards the applications for waste lands, and Tea allotments, of Indigo Planters, the sale of Maps, and the heavy correspondence, collection of money and accounts connected therewith, are such as to absorb the ordinary Office hours of one Head, rendering his more important avocations exceedingly arduous, and likewise occupy a large portion of the time of his Establishment, the strength of which was framed under a totally different state of things.

58. By a calculation made I find that the percentage of cost of superintendence, incurred in the Revenue

Cost of Superintendence.

Branch of my own Office, is Rs. 7 annas

10 per cent. for the three past years.* This includes the entire expenses of the Supervising Office, including the compilation and preparation of the Revenue Survey Maps for publication. This percentage, I believe, is remarkably small. In a similar way, the General Branch of the Office has also received heavy additional duties by the transfer of the Surveyor

	Rupees.
* Cost of Executive Revenue Survey 1859 to 1861	14,24,019
Cost of Ministerial Office, including Contingencies.....	1,09,872

General's Head Quarters to Calcutta, and by the new Division of the Department between the Superintendent of the Trigonometrical Survey and myself, involving the superintendence of the Topographical Surveys, which appear likely to increase in an equal ratio with the Revenue parties. The introduction of the new Financial system of accounts has materially increased the general business of the Department, and entailed much additional labor and

responsibility on the supervising Office. In short, the extent of correspondence and work of all descriptions at the present time and a few years ago, bear no comparison whatever. The remodelment of my ministerial Office, therefore, on a scale adapted for the increased and perpetually growing demands on it, is a matter of pressing necessity, an application for which will be submitted in due course.

59. In consequence of the great extension of Surveys, and the pressing

Uncovenanted Executive Agency.

demands for the services of qualified Surveyors, for employment under the Fee-simple Waste Land Rules, as well as

owing to the superior advantages now held out to Uncovenanted Assistants in various other lines of employment, great difficulty has been of late experienced in recruiting the Department and keeping it up to full strength. The secessions of many of our best Sub-Assistants have tended materially to embarrass the proceedings of several Executives, and I attribute it chiefly to the absence of any Field or Travelling Allowance, whilst actually employed in the interior of a District, such as is universally granted to every other description of public servant. The subject of a graduated uniform scale of Travelling or Field Allowance for this Department has been very earnestly

To Foreign Department, No. 23,
dated 16th May 1862.

advocated in my letter as per margin, and believing that the efficient working of the Department greatly depends on this measure being carried out, I confidently look for the sanction of the same benefits for the Revenue Branch, as have already been accorded by the Government in the Military Department to the Trigonometrical and Topographical Branches.

60. With the view of supplementing the subordinate grades of the De-

Employment of Sappers.

partment, and of trying a new element, an application was lately submitted to

obtain the services of some of the Sappers who pass through the Engineering course at Roorkee, and six of these men have been accordingly drafted into three of the Surveys, under the charge of Military Officers. Under the au-

No. 3491, dated the 8th September 1862, from Secretary, Government of India, D. P. W.

thority contained in the letter as per margin, the Sappers are to be paid at the same rate as if they had entered the Department, Public Works, and this puts them on an exact equality with the civil grade of 3rd class Sub-Assistants. I anticipate good results from the introduction of the Military element into the Department; the qualifications of the passed Sappers are undeniable, and if they are of steady habits, and can, when detached, be kept in proper control, I have no fear as to the result.

61. The present strength and number of the European Grades, com-

Nominal Roll of Subordinate Grades.

posing the Revenue Branch of the Department, is as abstracted in the

Grades.	Number.
Revenue Surveyors, Covenanted	13
Ditto Uncovenanted	4
Assistant Revenue Surveyors, Covenanted	8
Ditto Uncovenanted in charge	3
Assistant Revenue Surveyors, 1st Class	3
Ditto 2nd Class	8
Ditto 3rd Class	2
Senior Sub-Assistants	8
Sub-Assistants, 2nd Class	8
Ditto 3rd Class	6
Ditto Junior Class	33
Office Assistants	4
Total	100

margin, of which a detail Nominal Roll will be found in the Appendix marked G, showing the length of service and salary of every individual. This list was furnished to the Chief of the Military Finance with letter, No. 220, dated the 23rd July 1862, with the view of the question of consolidated salaries being taken into consideration; 401 Native Surveyors are likewise employed.

Departmental Budget.

	Rupees.
Great Trigonometrical Survey	4,94,372
Topographical Surveys	2,43,728
Head Quarter Ministerial	84,693
Mathematical Instrument Department	32,927
Total, Military	8,95,720
Revenue Surveys (Civil)	7,99,354
Grand Total	16,95,074

62. The passed estimates for the several branches of the Department are as detailed in the margin, of which Rs. 8,95,720 are debited in the Military, and Rs. 7,99,354 in the Civil Budget, making up the aggregate sum of Rs. 16,95,074, for the Survey of India under its present constitution.

63. To meet the extra pressure on the Department above described,

Ministerial Office.

considerable exertions have been necessary on the part of my Ministerial Establishment, and they have been rendered with a cheerfulness and energy which deserves my warmest acknowledgments. Without the valuable assistance of Mr. J. O. N. James, Assistant Surveyor and Chief Draftsman, who is in immediate charge of the Drawing Office, it would have been quite impossible to have effected what has been done. This Assistant has had a long Departmental experience, and since his connection with the Head Quarter Office in 1858, the style of the Maps turned out has manifestly improved, under his practical knowledge of Hill Sketching and Military Drawing, acquired in the Jhelum and Rawul Pindi Survey. Mr. James's professional knowledge, both in the Trigonometrical and Topographical Departments, is of a superior order, whilst his industry and hearty assistance is above all praise.

64. I am likewise much indebted to Mr. G. P. Webb, Registrar, for his management of the correspondence and accounts. Mr. Webb was transferred from Dehra Dhoon to this Office, on the retirement of Sir Andrew Waugh, under whom and the previous Surveyor General he served for a long period, always affording the highest satisfaction. The Subordinate and Native Establishments have also worked well.

65. Major Gastrell, Boundary Commissioner for the adjustment of Civil and Criminal Jurisdictions in Bengal and Behar, has been directed to devote such portion of his time as may not be required in such duties, to aid me in the Revenue Branch of my Office. This has been rendered for the past six months, and I have to acknowledge the valuable and efficient assistance thus afforded me, which has been of the most material importance. Major Gastrell's ripe and long experience in the Department, and entire devotion to business, renders the addition of such a colleague doubly valuable.

66. The progress of so many Surveys, and the working of the Lithographic Press, has necessarily increased both the Manuscript and the Printed Records of this Office to a very great degree, and the house, although a large one, is becoming inconveniently full. Additional furniture has likewise to be procured from time to time for the safe custody of the Maps and Volumes of computations and Field Books. Geographical Records being of a permanent value cannot be reduced or destroyed, and this has been explained to the Record Committee, with whom I have been in communication.

67. With the foregoing Summary of the general results and transactions of the Department, I now proceed to give the detail information respecting each Executive Survey.

EXECUTIVE SURVEYS.

NORTH-WESTERN PROVINCES AND SINDH.

FIRST, OR EASTERN DIVISION, NAGPOOR.

68. The District of Nagpoor, which was only just commenced on in the

Captain D. C. Vanrenen, Revenue Surveyor. On leave to England.—Medical Certificate, 8th February 1859.

Lieutenant R. E. Oakes, Assistant Revenue Surveyor, in charge.

Assistants.

Mr. E. T. S. Johnson, 1st Class.

„ J. Campbell, do.

Sub-Assistants.

Mr. F. Grant, 1st Class.

„ P. Cowley, 3rd do.

32 Native Assistants.

General average rate per sq. mile, Rs. 29-2-0.

previous season of 1857-58, as shewn in the last Report, was again taken up, and the Eastern, or No. 1 Division, prosecuted with vigor by Captain D. C. Vanrenen and his Establishment, detailed in the margin, from the 27th November 1858, on which date the Commissioner deemed it safe for Europeans to be detached out in the District, the country having previously been in a disturbed and excited state,

from the reports of the approach of Tantia Topee and his rebel followers. The field selected for the operations of this party is all that part of the District, comprising the several Pergunnahs lying to the east and south of the City of Nagpoor; whilst the Pergunnahs to the west were allotted to the 2nd Division Party, under Captain J. H. Grant, in order to provide both Establishments, suddenly deprived, in consequence of the mutiny, of the means of carrying on their usual operations in the Saugor and Jubbulpoor Districts, with suitable employment.

69. The difficulties entailed by the natural features of the District,

Basis of Survey.

necessitated that the Surveyor should base his Revenue or detail work on a complete system of minor triangulation, and to aid this object, a party of the Great Trigonometrical Survey, under the able direction of J. Mulheran, Esq., Superintendent of the Hyderabad Survey, during the same season, established some fine Polygons, thrown out from the Great Arc Series, and traversing the entire breadth of the District to the Wurdah River, under special instructions from the late Surveyor General, and thus great facilities were afforded for establishing this important Survey, on the most rigorous principles, a point the more necessary, since it was detached from all previously executed Surveys. The general principles on which this Survey was established, are recorded much in detail in my last printed Report for the season 1857-58, paragraphs 45 to 51.

70. During the season 1858-59, the triangulation executed by the Revenue

Change of Superintendence.

Surveyor and his Assistants extended over an approximate area of 1,774 square miles.

The whole of this triangulation was performed by Lieutenant Oakes, with a Troughton and Simm's 10 inch Theodolite; two sets of angles being observed on both faces of the instrument and four zeros. As soon as this primary part of the work was effected, and the programme of the season's operations advanced beyond the probabilities of failure, Captain D. C. Vanrenen was compelled to quit his post, and proceeded to Bombay on the 8th February 1859, from whence he embarked for England for 15 months, under medical certificate. His Covenanted Assistant, Lieutenant R. E. Oakes, was placed in charge, and conducted the duties throughout, up to the completion of the District. With such an excellent Staff of well-trained Assistants, it was not difficult for the Assistant Surveyor to see the plans and orders of the Revenue Surveyor carried out. In the following season, the triangulation was prosecuted over the remainder of the District, and a net-work of minor triangles laid down in close connection with the large triangles extending to the Weingunga River.

71. In the former season, 940,441 acres, or 1,469 square miles of Topography was obtained, including a regular **Area effected in Season 1858-59.** Village Sub-Division Survey, on the usual scale of 20 chains to the inch, or 4 inches to the mile, all carefully engrafted on the triangulation. This area embraces the seven large Pergunnahs specified in the margin, one of which, Ambaghur, belongs to the Bhandara District. Nine hundred and ten Village Circuits were separately defined and laid down, the average size of which is as high as 1,033 acres each.

- Season 1858-59. { Ramtaik.
- { Tharsa.
- { Oomrair.
- { Ambhora.
- { Pohonee.
- { Baila.
- { Ambaghur (part of).

72. In the following season of 1859-60, a still larger area of 1,057,702 acres, or 1,653 square miles, was effected, **Area effected in Season 1859-60.** in the same detail precisely, in the six Pergunnahs, also marginally noted, comprising 936 Village Circuits of the average size of 1,130 acres each, belonging to the Nagpoor District, in addition to the small portion of Pergunnah Ambaghur left the previous season, of 42,719 acres, or 67 square miles, of the adjoining District of Bhandara, containing 29 Village Circuits, giving an aggregate area of 1,057,702 acres, or 1652.66 square miles, as the season's out-turn.

- Season 1859-60. { Ambaghur (part of.)
- { Hingunghat.
- { Girur.
- { Pohna.
- { Powuar.
- { Undoree.
- { Natchengnon.

73. The tract of country thus brought under minute survey, during the above two seasons, together with **Geographical limits of Tract surveyed.** part of the prior season of 1857-58, when ground was first broken, and during which period this party remained in the Province, is bounded by the Weingunga River on the east, on the south by the District of Chanda, on the north by District Seonee and Chindwarra, and on the west by

that portion of the Nagpoor District, executed by the 2nd Division, and forming the larger portion of the District, east of the meridian passing through the Capital, with the Pergunnahs to the south lying contiguous to East Berar, or newly Assigned Hyderabad District, on the Wurdah River.

74. The entire area thus surveyed by this party, in the Nagpoor District only, amounts to 3,318 square miles, whilst the Western, or No. 2 Division party, executed 2,794 square miles during the same period, making a total of 6,112 square miles, as the total area of the District which was completed during season 1859-60, and thus occupying both Establishments nearly three seasons each.

75. During the following season of 1860-61, or the 3rd season embraced in the present Report, and in conformity with the orders of Government cited in the margin, the services of this Establishment were re-transferred to their old District of Jubbulpoor, in the Saugor and Nerbudda Territories. The Survey of the Bhandara District, just commenced, was consequently made over to the 2nd Division, under Captain Grant; and Lieutenant Oakes marched back to Jubbulpoor, and arriving there on the 20th November 1860, immediately took up the Survey of Pergunnah Burghee, south of the Nerbudda, and Pergunnah Sonepoor to the north of that River.

76. The Eastern portion of the District, bounded by Mandlah and Seonee Districts, on the east and south, and the remaining, or previously surveyed Pergunnahs of Jubbulpoor on the north and west, had been demarcated for Survey. A small Pergunnah, Byronghat, west of the Herun River, detached from the rest of the work, was also taken up, to supply an omission made in previous seasons; and a net-work of triangles, duly emanating from sides of the Great Longitudinal Series of the Great Trigonometrical Survey, thrown over the whole, on which to correct the chaining, which could not be trusted to entirely over such ground. A due connection was also made with certain stations of the old Survey of the Ranghur Talooqua of Mandlah, by Major Wroughton, in 1841-42, and the boundary of that Survey duly laid down.

77. An area of 634,926 acres, or 992 square miles, of difficult country, was thus accomplished, with 578 Village Circuits of 1,098 acres average size each, in the Pergunnahs

Area effected.

	<i>Sq. Miles.</i>	
* Pergunnah Soncipoor	... 498	
" Burella	... 67	
" Burghee	... 378	
" Byronghat	... 49	
	<hr/>	
	992	
	<hr/>	

marginally detailed, forming a fair season's work, when we consider the change of Districts, and other severe obstructions met with, in regard to the clearance of the dense jungle. One Pergunnah, Koombee, to the north-east, however, on the borders of the Rewah Territory, could not be completed, and thus an area of about 500 square miles of very dense jungly and hilly country remained for Survey, of this long-pending District, at the close of season (1860-61) under review. The out-turn of this latter season is much in defect of that obtained in Nagpoor, which the Surveyor fully accounts for, and was to be expected.

78. During the three seasons embraced in the operations above sketched,

Aggregate Results for three Seasons.

this very able and efficient Establishment had a very arduous task to perform, in two Districts similarly situated, interspersed with hills and jungle, and presenting many difficulties in the delineation of the details, on such a large scale as required for Revenue purposes. Bearing this in mind, the cost of the work may be reviewed; and in order to place the same as succinctly as possible before the Government, the following Tabular Abstract of the results of this Survey for the three years is given, showing the total cost and rate per square mile, as well as per Village Circuit, in juxtaposition with the area surveyed, and on which the necessary comparisons, one year with the other, can be instituted:—

Seasons.	Number of Villages.	Average size of Village Circuits.	Area surveyed in square miles.	Total cost.			Average rate per square mile.			Average rate per Village Circuit.		
				<i>Rs.</i>	<i>As.</i>	<i>P.</i>	<i>Rs.</i>	<i>As.</i>	<i>P.</i>	<i>Rs.</i>	<i>As.</i>	<i>P.</i>
1858-59	910	1,033	1,469	40,138	0	0	27	5	0	44	2	0
1859-60	936	1,130	1,653	36,882	0	0	22	5	0	39	6	0
1860-61	578	1,098	992	42,746	0	0	43	1	0	73	15	0
Total	2,424	1,086	4,114	1,19,766	0	0	29	2	0	49	6	0

79. Thus 4,114 square miles have been minutely surveyed, during the

Cost and Rate.

three seasons embraced in this Report, on the 20 chain to the inch scale, and reduced and generalised on the one inch scale by the Surveyor, at a cost of Rs. 1,19,766, which gives a mean average rate per square mile of Rs. 29-2-0; and 2,424 Village Circuits, of the average size of 1,086 square miles, have been separately defined and mapped, at the rate of Rs. 49-6-0 per Village Circuit, including contingent and every expense. The mean average progress is 1,371 square miles, and the average expenditure Rs. 39,922; the average cost per square mile is moderate for the style of country, whilst the average cost of the Village Circuits is higher than on many Surveys, owing to their increased

average size. The cost of the latter season has been greatly enhanced, by the necessity for employing so many coolies for jungle cutting, no assistance being rendered by Zemindars as in most other Districts.

80. Of the total expenditure incurred, Rs. 1,08,614 is on account of permanent charges out of the fixed Annual

Permanent and Contingent Charges.

* Grant for three years	1,12,572
Expended ditto	1,08,614
	3,958

Grant of Rs. 37,524 for each Party per annum. Thus the maximum authorized expenditure was not incurred, the sum of Rs. 3,958 being short drawn under this head.* The Balance, Rs. 11,151, is for Contingent Charges, for the several usual items

necessary for professional purposes, as detailed in the following Statement :—

Description of Contingencies.	NAGPOOR.			JUBBULPOOR.			TOTAL.					
	Season 1858-59.			Season 1859-60.			Season 1860-61.					
	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.			
Feed and keep of Elephants ...	926	11	0	1,104	10	0	1,045	3	0	3,076	8	0
Clearing Jungle	1,226	10	0	742	4	0	2,357	6	0	4,325	13	0
Carriage of Government Stores ...	78	0	0	49	12	0	408	2	0	535	14	0
Special Travelling Allowance ...	88	0	0	47	12	0	264	11	0	400	7	0
Camp Equipage ... ..	.....	.....	.....	.....	.....	.....	297	0	0	297	0	0
Chuprassees for ensuring attendance of Zemindars. }	782	10	0	867	11	0	865	0	0	2,515	5	0
Total... ..	3,101	7	0	2,812	2	0	5,237	6	0	11,150	15	0

81. Under the present Financial system, every possible charge becomes a

Cause of Increase in Contingent Charges.

cash transaction, and the Contingent expenses consequently must now show a considerably larger figure. By calculating every item of this description also, against the cost of the Survey, the rates must be enhanced, and it will be necessary to keep this fact steadily in view, when contrasting one season's results with another.

82. During the season of 1859-60, Captain Vanrenen, the Revenue

Transfer of Revenue Surveyor.

Surveyor who stood permanently attached to this Division, returned from furlough to Europe, reporting his arrival at Calcutta on the 28th May 1860; but in consequence of a new Establishment having been ordered to be raised for Oudh, this Officer was transferred to the charge of it by G. O. G. G.

Casualty. No. 4568, dated 2nd October 1860, on the occasion of the death of Captain Edward Willoughby, which took place in England, on the 28th July of the same year. Lieutenant

Oakes having given much satisfaction was consequently advanced to the higher grade of Revenue Surveyor, from the same date, and by the same G. O. G. G. ; the latter Officer has therefore remained in undisturbed charge of the party, since his first assumption of it, and continues to work the Establishment to great advantage.

83. The style of the various Maps and Plans furnished by this Surveyor, to the extent specified in the margin, is all that I could desire. The general

Records for Season 1858-59.

- 1 Index Map of Operations.
- 4 Pergunnah or Main Circuit Maps, Nos. 6 to 15; scale 1 mile to the inch.
- 1 Atlas of Congregated Village Plans embraced in the above Main Circuits, Nos. 6 to 15 inclusive; scale 20 chains to the inch.
- 6 Volumes Village Registers and Traverse Computations of Main Circuits, Nos. 1 to 15.

Records for Season 1859-60.

- 1 Index Map of Operations.
- 8 Pergunnah or Main Circuit Maps, Nos. 16 to 25; scale 1 mile to the inch.
- 1 Atlas of Congregated Village Plans embraced in Main Circuits, Nos. 9, 10, 16, to 25; scale 20 chains to the inch.
- 1 Volume of Village Registers and Traverse Computations of Main Circuits, Nos. 16 to 24.
- 1 Volume of Main Circuit Traverse Computations of Main Circuits, Nos. 1 to 24.

Arrears not yet lodged.

- 1 Volume of Village Registers of Main Circuit, No. 24.
- 1 Ditto ditto of Main Circuit, No. 25.

Records for Season 1860-61.

- 1 Index Map of Operations.
- 5 Pergunnah or Main Circuit Maps, Nos. 17 to 22; scale 1 mile to the inch.
- 1 Atlas of Congregated Village Plans embraced in Main Circuits, Nos. 17 to 22.

Arrears not yet lodged.

- Volumes of Village Registers and Traverse Computations of Main Circuits, Nos. 17 to 22.
- Volumes of Main Circuit Traverse Computations of Main Circuits, Nos. 17 to 22.

adapted, with proper coloring expressly for the purpose, for reduction by Photography.

one inch Maps, showing the village boundaries and forming a complete index to the village survey, are admirably drawn, and as full of Topographical details as the scale possibly admits; they are at the same time clear and perspicuous, easily readable in all the features depicted, and finished with great taste. The Village Plan Sheets, on the larger scale of 4 inches to the mile, are also very good serviceable records, bold and practical plans, highly useful for all local purposes, and well

84. The Maps for season 1859-60 are an improvement on those of the previous season's work, and have afforded me the greatest satisfaction. These have been executed by Messrs. Johnson and Campbell, Assistant Revenue Surveyors, whose superior attainments and excellent practical knowledge of all the duties connected with their profession have been so frequently noticed. The greatest credit is due to these Assistants for the manner in which they turn out all their work.

85. The Pergunnah Maps for season 1860-61, of the Jubbulpoor District, are in every way most valuable and interesting documents, full of

information, and the details given well up to scale. In Main Circuits, Nos. 20 and 21, Mr. Campbell has surpassed his former endeavour, and much enhanced the general usefulness of the records of this Survey, by adding Contour Sketches and Sectional Views of the Geological formation, which are depicted with great artistic taste. All the Pergunnahs of this District, through which the Railway is intended to run, have been lithographed on the one inch scale, and distributed to the great satisfaction of Railway Engineers, Contractors, and others.

86. The nature of the country under survey in the Nagpoor District

Description of Country surveyed.

will best be understood from the Surveyor's own description. I therefore give the following extracts from Lieutenant Oakes's able and full Annual Reports of the two former seasons under review :—

EXTRACT FROM ANNUAL REPORT OF SEASON 1858-59.

“ 42. Ramtaik, towards the north-east, is very hilly, and almost entirely covered with jungle, and intersected by ravines. With the exception of some grass lands, which occur here and there, it is totally unprofitable as far as revenue is concerned. In rare instances cultivation has been attempted, but, as a general rule, the land is irreclaimable, many of the villages are deserted, and where they exist, half a dozen huts or so alone serve to show that a few acres, less barren than the rest, have been brought under the plough. More to the east, bordering on Seonce, the soil is far better, and could in many places be cultivated with advantage, if cleared of the jungle.

Pergunnah Ramtaik.

“ 43. In the plain, the land is excellent, and very highly cultivated. The principal crops are jowaree, wheat, gram (poor), linseed, hemp, cotton, arrur-ke-dal (lentils), and kodoo, which last will grow anywhere. Chillies also are cultivated in very large quantities near considerable villages and towns. The trees are the Mhowa, Taleye, Ebony, Babool, Cotton-tree, and Chiroongee. A valuable resin exudes from the Taleye tree, much resembling Venice turpentine in appearance and medical properties. It has been used in Kamptee hospital, like Venice turpentine (*Gundla Barosa*) on open sores, and found to be most efficacious.

Plains.

“ 44. I have secured a specimen of an ore, which I believe to be Manganese; it is found in considerable quantity at Munsur, the whole hill in fact is a mass of it. It is close to the highway, and if of sufficient value to pay for its carriage, the transit expenses would be the only ones incurred.

Ores.

“ 45. The principal towns are Ramtaik, and Nuggurdhun, the former a considerable place, celebrated for its sacred temples of the greatest antiquity; there are many tanks round about. The Ambarra Tal, built with stone, and dammed up between hills, is a beautiful spot, and is held very sacred. A flight of stone steps reach all the way from the tank to the temples on the top of the hill, a considerable distance. This is very well shown in Mr. Campbell's Pergunnah Map.

Towns in Ramtaik.
Tanks.

Pergunnah Ambagurh.

“ 46. Pergunnah Ambagurh is also very jungly on its northern boundary, being much the same style of country as Ramtaik.

Towns.

“ 49. The principal towns or villages of the Pergunnah are Moharce and Toomsur.

“50. Tharsa, Oomrair, Ambhora, and Baila, contain jungle tracts, but are generally highly cultivated; the crops and trees similar to the above-mentioned. In addition, there are considerable quantities of the Khyr tree, from which an excellent gum may be gathered in considerable quantities during April. This, if not actually “Gum Arabic,” resembles it very closely, and could be used in all the manufactures in which the article known as Gum Arabic is employed. The principal towns are Baila, Oomrair, Koohee, Ambhora.

“51. The chief rivers of this part of the District are the Kanhun, Weingunga, Pench, Soor. The Roads, Nagpore to Jubbulpoor, Nagpore to Bhundara, Nagpore to Madras, *via* Chanda, Nagpore to Bombay.”

Rivers.
Roads.

* * * * *

“73. I herewith forward by Banghy a specimen of the Manganese ore from Munsur, and the iron ore from Ambaghur. I have also added a specimen of coal from Chindwara. I have had no opportunity of visiting the locality whence it was obtained, but I have been assured the vein is of considerable extent; it crops up above the surface, and is set at an angle.*

“74. I am not aware whether or not Government are acquainted with its existence even, probably they are, but I consider under any circumstances, that I should be remiss in not sending the specimen, as I have been able to procure ore.

“75. The contemplated line of Railroad to Jubbulpoor makes the discovery of coal in this part of the country of the highest importance, and I mention its existence, in case it has not been previously reported.”

EXTRACT FROM ANNUAL REPORT OF SEASON 1859-60.

“34. Pergunnah Baila, the greatest portion of which was surveyed this season, is in parts jungly, but otherwise generally a very rich, well-cultivated District; the soil is excellent, and well suited to the growth of cotton, of which a great quantity is sold annually at Baila Khas, the principal village of the Pergunnah. In addition to cotton, the principal crops grown are wheat, dāl, tillee, and bajra. The jungle where it exists is very dense brushwood, composed of rank grass, with Khair bushes and Chiroongee intermixed. No timber of any consequence in the District. The hills are mostly trap rock covered with dense jungle.

Pergunnah Baila.

“35. Pergunnah Girur has a great deal of jungle and hill in parts, the open country a series of undulations; wheat, dal, cotton, and bajra, is grown in this Pergunnah. The jungle is almost entirely scrub and brushwood, very thick, with occasional trees of Mohwa and Salye, especially on and about the hilly portions of the Pergunnah. Girur, the principal village, is celebrated as a Mussulman place of pilgrimage, and numbers of the faithful annually visit it.

Girur.

“36. Hingunghat is a paying country, highly cultivated; a great deal of cotton is grown in this Pergunnah and cleaned. At Hingunghat, the principal village of the Pergunnah, which is situated on the Hyderabad or Great Deccan Road, and has a Post Office, wheat, dal, bajra, tillee, &c., are grown, but cotton is the staple produce of the country. The whole of the produce is carried on the very small two bullock haekeries of the part of the country which are well suited to the narrow and rugged roads here met with.

Hingunghat.

* No analysis of the Manganese and coal was made by the Superintendent, Geological Survey, the specimens being considered as of very ordinary kind, and not even retained in the Geological Museum.

“37. Pergunnahs Pownar, Undoree, Pohna, and Natchengaon are open, and very well cultivated tracts, producing the same crops as the Pergunnahs above mentioned. There are jungly portions to the north, but they are generally open and cultivated.

Pownar, &c.

“38. The whole of this part of the District is a continuous series of undulations of remarkable appearance, and it is a highly productive country, intersected by numerous nullahs and small rivers. The water is near the surface, and the nullahs consequently do not dry up till late in the season, *viz.*, February or March. The soil is generally throughout Nagpore that known as the black cotton, it is never irrigated, and but seldom manured. The agriculturists are without exception the worst tillers of the soil I have met with in India; they scratch the surface, sow the seed but sparingly, and wait for the harvest, which, thanks to the soil, is generally very good. What it would yield, if properly cared for, it is impossible to estimate. If irrigation were introduced, the difference in crop would be immense, judging from their appearance, particularly cotton on lands near the bed of natural water-courses.

Description.

“39. The Nagpore District taken as a whole should be a most paying one to the Government. A very large proportion of the cultivated tracts are black cotton, the best of all soils. On the stony ground grass appears to flourish luxuriantly, whilst many of the jungly tracts could be cleared with advantage. In many places now covered with jungle, the soil is most excellent, and in many more, very tolerably good.

“40. The cultivators are perfectly satisfied with the present state of things, the supply is more than sufficient for the demand, and with exception of cotton, it does not pay, with the present want of good roads and rapid means of conveyance, to grow crops for a distant market. The Railroads will doubtless make great changes in this respect.

Crops.

“41. The principal roads in the District under description are the Great Deccan, which passes through the villages of Asola and Scindee, of Pergunnah Baila, and Mandgaon, and Hingunghat Khas of Pergunnah Hingunghat. The great Bombay line passes through the upper portion of Pergunnah Pownar, and thence into Natchengaon, which it traverses in a south-westerly direction, passing through the villages of Teegaon, Waephull, and Natchengaon Khas.

Roads.

“42. The rivers of importance are the Wurda, skirting the western and southern boundaries of great portion of the season's work; the 'Damun,' passing through Pergunnahs Pownar and Hingunghat; and the Wunna, separating the latter Pergunnah from Pohna and Pownar.

Rivers.

“43. The 'Naud and Bore' (tributaries of the 'Wunna'), are the next in order, the former flowing westward through Pergunnah Girur, and the latter skirting Pergunnah Pownar on its north-eastern boundary.

“44. The principal villages are Hingunghat, Girur, Baila, Natchengaon, Ulleepoor, Deolee, Pownar, and Mandgaon, of which Hingunghat, Baila, and Girur are the most important, the two former for their cotton markets, and the latter for its pilgrim visitors, and religious fair.

Villages.

“45. In Pergunnah Ambagurh, a considerable quantity of iron stone is found, which is manufactured by the Natives into iron. A considerable quantity of pig iron thus finds its way into the market; great wastage occurs in the smelting, owing to the very primitive furnaces used by the Natives; the ore lies on and close to the surface, and requires little more labor than the mere picking up and carriage.”

Iron Stone.

87. Of the portion of the Jubbulpoor District brought under Survey, the Surveyor thus speaks in his Report for the last season :—

EXTRACT FROM ANNUAL REPORT OF SEASON 1860-61.

“ 29. A description of the different Pergunnahs surveyed during the season may not be uninteresting, and I therefore proceed to give you a slight sketch of the Districts, with a list of their mineral and vegetable products.

“ 30. Sonempoor is a large Pergunnah lying to the east of Jubbulpoor, it is bounded on the south by Jawur River and Burraila, on the north by Punagur, Koombee, on the east by Mahanuddee, and on the west by Jubbulpoor and Punagur.

“ 31. A large portion of this Pergunnah is waste, and a good deal of the cultivation merely kodoo, which is a grain sown where nothing else will grow. The open portions of the Pergunnah are black cotton soil, and will produce wheat, cotton, dall, gram, oil-seeds, and, in fact, any crop which will grow on these latitudes. The jungly portions of the country are stony and unproductive, yielding only the above-mentioned kodoo; the jungle generally consists of bush, with here and there the Saleye, Mahowa, and Dak tree. In places to the south and east timber trees are found, such as the Teak and Saj, but not in quantity. The principal Towns are Sonempoor, Peepurea, Imleea, Koondun. The Roads are the Mundlah road, and the road to Koondun, both pukka. The Rivers are the Mahanuddee, the Gawur, the Purryut, and Herun; none of them navigable; the two latter rise in the Pergunnah.

“ 32. Almost all the villages on the borders of Punagur, or within reasonable distance of the Iron mines in that Pergunnah, have their primitive forges, where Iron is smelted and sold in the crude state to the Iron-workers. I cannot estimate the quantity of Iron thus manufactured during the year, but it must be considerable, as I have seen as many as eight or ten furnaces in one village, though generally three or four is the average.

“ 33. The small portion of Punagur and Gosulpoor surveyed this season, lie north-west of Sonempoor, they are generally open and cultivated. A considerable quantity of Iron ore is found in the portion of Punagur surveyed in season 1855-56, and also in the hills in the northern portion of Gosulpoor, surveyed in 1860-61. This is worked without difficulty, lying as it does on the surface; the sides of the small hills where it is found have been considerably cut away in places by the excavation of the ore. The furnaces in which the ore is smelted are very primitive, being merely a mud pillar of about 10 feet in length, with a flue running from top to within a foot of the bottom; the lower part of the flue is about 2 feet 6 inches by 2 feet interior measurement, which gradually narrows to about 9 inches by 6 inches at the top. The flue is filled in the morning with charcoal and ignited, and a blast kept up by a pair of hand-bellows; portion of ore and charcoal are then added throughout the day; the furnace is worked for about 12 hours, when it is opened, and the mass of reduced metal extracted, and cut into two pieces, which are sold to the Iron-workers. These masses passed once more through the fire are worked by the smith's hammer into rough lumps, which are sufficiently pure to be worked into articles for the market. Vessels of every kind and in large quantities are annually manufactured in Punagur, which, in consequence of this trade, is a very flourishing town, 10 miles from Jubbulpoor, on the Mirzapoor road.

“ 34. The following shows the approximate weight of fuel and ore expended in one furnace in the day, with the average amount of crude iron procured, and the average cost at which it is sold to the blacksmiths. The information was furnished me by an ironsmith of the village of

Sukree, near Bichna, in Sonepoor. Charcoal 144 seers, crude ore 108 seers, metal obtained, 42 seers more or less, and sold to smiths for 12 annas.

“ 36. Burghee is very similar to Sonepoor in soil. Where open tracts are found it is generally excellent, and produces good crops, but the hilly tracts are valueless for agricultural purposes, being very stony. The Pergunnah is bounded on the south-east and north by Nerbudda, on west by Seonee and Nursingpoor Districts.

“ 37. The principal Villages are Burgey, Chingowa, Bhurutpoor, Sonewarra, Dhurumpoor, Hoolkee, Googree, in which markets are held. Rivers, Nerbudda, Gawar, Tawar, and Soonair. The Nagpore road traverses the Pergunnah.

“ 38. The jungle is much the same as in Sonepoor, excepting that I observed no Saj, and the Teak where it occurred, was small, but this is doubtless owing to the large trees having been cut down. It is only within a few years that the forests have been conserved. The Saleye and Mahowa are very abundant in this Pergunnah. From the fruit of Mahowa (not the flower, from which spirit is distilled) a very good oil is procurable, but I am not aware that the Natives extract it in any quantities.

“ 39. Iron is found in considerable quantities in this District, in Villages Dhurumpoor, Gungai, Bijooa, Doobola, Birkee, and Bugrai, and the same method of working the metal obtains as in Punagur. There is a coal seam in the Village of Lumetta.

“ 40. The small portion of Byronghat which remained to be surveyed is generally culturable in the plain. The Bhowrair and Khymore Ranges run in a north-westerly direction through the tract. On the table land, want of water is the principal drawback to cultivation, the soil being good. The chief village is Byronghat Khas. The Herun, the only important river. There are no roads through this tract, foot-paths being the only communication between the villages.

“ 41. Burrella Pergunnah being for the most part heavy jungle, and adjacent to Mundlah, a large portion was transferred to that District. A strip bordering upon Burghee was incorporated in that Pergunnah, and the remainder, a pretty open valley, was transferred to Pergunnah Sonepoor, which bounds it on the north. The hills bordering on this District are clothed generally with bamboo and forest trees, teak, &c., but there are but few trees in the immediate vicinity of Jubbulpoor of any great size.

“ 42. A great variety of wild animals abound in the jungly Pergunnah above mentioned; tigers, bears, panthers, the sambar, neilgai, spotted deer, and pigs, many of the lesser deer are very numerous. The wild dog also is to be found, but is rare.

“ 43. The population consist of Hindoos, Mussulmans, and Gonds, the last being almost entirely confined to the more jungly tracts of the country; they are a wild but inoffensive race, wretchedly poor, and with apparently no comforts; they live almost entirely upon the kodoo which they cultivate in cleared tracts of jungle, and on the tops of hills. They constantly, from various causes, such as sickness, exhaustion of land, &c., &c., desert their villages *en masse*, and wander to some more suitable spot in the jungles, where they run up their wattle and dab-huts; they are a very timid people, and I have constantly seen men, women, and children, rush out of their houses and hide themselves in the trees and jungles at the sight of a white face near their villages. A most remarkable trait in their character, well-known in our Civil and Criminal Courts, is, that a Gond is seldom known to tell a falsehood, even though by speaking the truth he criminales himself, an unusual virtue amongst Asiatics.”

88. The work which has engaged the attention of this party during the

Duty employed on in Current Season.

current season of 1861-62 is the remainder of the Jubbulpoor District; Pergunnah Koombce has been completed, estimated

at 500 square miles, and containing 289 villages, one portion of which has been laid down topographically only, the remainder has been sub-divided in the usual detail way. This brings the survey of the Jubbulpoor District to a conclusion, and I trust to be able to expedite the publication of the Map, which is anxiously looked for. The next District, to the west of the above, Nursingpoor, has also been commenced, and an area of about 475 square miles, in 308 villages, effected in the Pergunnahs marginally cited, south of the Nerbudda.

Pergunnahs Sreenuggur, Nursingpoor, and Butchye.

89. The out-turn for this season is therefore 975 square miles, but other important work is still going on in the prosecution of the Survey of the Coal Mines at Mopany and Tendukhera in Pergunnahs Chawurpatha and Gurarwarra, on both sides of the Nerbudda, the latter in the Nursingpoor District, and the former in Dumoh, undertaken by the special and emergent orders cited in the margin, on the requisition of the Government of the North-Western Provinces, on account of a mining lease and privileges proposed to be granted to the Nerbudda Iron and Coal Company.

Government of India, Department Public Works, No. 3891, dated 5th November 1861.

90. The precise extent or area of these Mining localities is as yet unknown, but they are thus described by the Under-Secretary to Government, N. W. Provinces, P. W. Department, Railway Branch :*—"Tendookhera. The space bounded by two north and south lines, drawn from the south face of the Vindhya Hills in the immediate vicinity of Tendookhera to the Nerbudda, one of these lines to pass two miles east of the town of Tendookhera, and the other lines to pass four miles west of the same town. The north boundary to be the foot of the Vindhya Hills, immediately north of Tendookhera, and the south boundary to be the Nerbudda.

* No. 423, dated 2nd Dec. 1861.

"Mopani. North boundary the Nerbudda; south boundary an east and west line two miles south of the escarpment of the Gondwara Hills overlooking the Nerbudda Valley; east boundary a line drawn from the exit of the Hurd River from the said Hills due north to the Nerbudda River; and west boundary a parallel line drawn from the exit of the Sitwa Rewa River due north to the Nerbudda."

91. Both localities are detached from the scene of the current season's operations, and great difficulty has been experienced in consequence of providing for this desultory Survey, which could only be done on the conclusion of the regular operations, previously undertaken, very late in the season, by keeping up the Native Establishment expressly for the purpose, the cost being met by the N. W. Government, as the Budget

Inconvenience and extra cost of desultory detached Surveys.

Estimate of this Department could not admit of the extra expenditure thereby incurred. The object of this Survey is stated to be "to ascertain and lay down on the Map, correctly, the size and position of all existing quarries, pits, mines, and workings, whether in work or abandoned; to distinguish cultivated from uncultivated land, the land bearing jungle from the tree forest; the sites of towns and villages with the extent of their holdings, if the boundaries of the latter can be at once marked out by the District Officers, for the guidance of the Survey; the lines of all Streams, Rivers, Roads, and all requisite particulars."

This work, estimated at about 250 to 300 square miles, was got out of hand before the setting in of the periodical rains, and will be mapped and submitted with all possible despatch, taking precedence of all other mapping, in order to meet the pressing requirements of the N. W. Government.

Extent of new Central Provinces remaining for Survey.

NAMES OF DISTRICTS.	Estimated area in square miles.	Total.	Provinces.
Nagpoor	6,781	85,241	Nagpoor.
Chundwarra	5,245		
Bhundara	5,180		
Raeppoor	19,876		
Chanda	8,411		
Seroucha	2,101		
Bustarkaroundee, &c.	21,172		Orissn.
Sumbulpoor	2,664		
Gurjhat Mehals	13,811		
Saugor	2,600		
Dunoh	3,128	29,699	Saugor and Ner- budda Terri- tories.
Jubbulpoor	4,193		
Mundlah	5,103		
Sconce	4,864		
Baitool	3,900		
Nursingpoor	2,286		
Hoshungabad	3,325		
Grand Total ... ..	.....			1,14,940

	Sq. M/s.
Nagpoor District	6,112
Bhundara ditto	2,639
Total	8,751
Saugor District	2,277
Jubbulpoor ditto	3,714
Nursingpoor ditto	475
Total	6,466
Total Surveyed	15,217
Estimated area	1,14,940
Remaining for Survey in Central Province	99,723

92. The area remaining for Survey in the old Saugor and Nerbudda Territories, now formed into the Central Province in conjunction with the Nagpoor or Berar Division by G. O. G. No. 1155, dated 20th June 1862, is exceedingly large. The estimated area of this new Central Province or Chief Commissionership, as nearly as it can be at present ascertained, is as specified in the margin, aggregating 1,14,940 square miles. Of this enormous area we have only completed up to date about 18,751 square miles of the Nagpoor, and 6,466 square miles of the Saugor and Nerbudda Territory, as shown in the margin.

93. With the annual mean average progress now making by the two Establishments employed, but little impression has been made as yet, and it will take

many years to complete the Province. A great deal of the area is sterile and unhealthy, with a large proportion of wild jungly and poorly populated ground, which may have to be surveyed only topographically, and it is to be hoped that the Local Civil Authorities may be able to dispense with the revenue detail work in considerable portions of these Districts. The special requirements as to the nature of the Survey of each District should receive early consideration.

94. The preparation of the country ahead of the Survey by the demarcation of Village Boundaries by the Settlement Department, has been perfectly satisfactory, both in Nagpoor and Jubbulpoor Districts. A comparison of the surveyed boundaries with the Hudbust (or demarcation) Maps has given very good and reliable results. In all cases of difference, a re-survey was made, and the discrepancies adjusted.

Demarcation of Boundaries.

95. The Staff attached to this Establishment, one of the oldest in the Department, is highly efficient. The European Assistants have served long and zealously, and the Native Assistants have been trained to great usefulness and done good service. Amongst the former, Messrs. E. Johnson and J. Campbell stand conspicuous; they are both excellent officers, and have been as strongly, as regularly every year, brought to notice in the Annual Reports. Mr. Johnson's professional abilities are of a high order, he is equally good in the field and office, and from his long practical experience and steady application, he renders most valuable service at all times.

Character of Assistants.

96. As promised in the previous Report, this Assistant was promoted from 2nd to 1st Class Assistant, on Rs. 350 per mensem, from the 1st April 1860;* and on the lamented death of Mr. W. R. M. Graham, the Superintendent of the Drawing Branch of my own Office, I selected Mr. Johnson to supply the place, and he joined me on the 1st of November 1861. Mr. Johnson's transfer, whilst it proved highly advantageous for the Superintending Office, where the nature of the work to be performed is of the first importance, was also very convenient for the Executive Office, in which it was found difficult to maintain two 1st Class Assistants. I was also desirous to render the services of highly qualified Departmental Officers available to assist in my own Office temporarily, to enable them to obtain an insight into the details of work occupying its attention, and likewise to be ready to take the field again when necessary, with increased knowledge and experience.

Promotion of deserving Assistants.

* G. O. G. G. No. 2557, dated 10th July 1860.

97. Mr. J. Campbell, the other 1st Class Assistant, is also equally deserving; his Superintending Officer states that he cannot speak too highly of him, his abilities as an Assistant Surveyor being only equalled by his zeal for

the public service. His Maps thoroughly sustain his qualities as a Draftsman, and the care with which all his work is turned out, evidences the interest and pride he takes in his professional duties. The Assistant Surveyor was promoted to 1st Class Assistant, on Rs. 350 per mensem, from the 1st April 1860, by the same General Order as above quoted.

98. Mr. F. Grant is a very promising Sub-Assistant, and has been highly recommended; his promotion to Senior Sub-Assistant, on Rs. 200 per mensem, was authorised by G. O. G. G. No. 326, dated the 6th June 1862. Mr. P. Cowley, appointed a junior Sub-Assistant by G. O. No. 6199, dated 3rd October 1859, is favorably mentioned, and said to be likely to become an expert Draftsman. Mr. Rae, junior Sub-Assistant, was transferred from the 2nd Nagpoor Survey to this Party, from the 1st November 1861, to fill a vacancy.

99. Of the Native Assistants, those mentioned in the margin have most distinguished themselves, and it is reported, to the credit of the whole Establishment, that not a single serious complaint has been preferred against any of them.

Setul Persaud,
Goordial,
Kewal,
Venkial.

100. For a considerable period no Covenanted Assistant was attached to this Survey, owing to its very superior strength in Uncovenanted Agency, but **Covenanted Assistant appointed.** deeming it very desirable to make good the deficiency on the transfer of Mr. Johnson, the necessary application was made for the services of a competent young Military Officer, and Lieutenant J. Willoughby Osborne, of the late 44th Regiment N. I., was appointed by G. O. G. G. No. 184, dated the 28th January 1862, and he joined the Head Quarter Camp of the Survey on the 4th March 1862.

101. The constant exposure in the jungles of Jubbulpoor entailed on the Revenue Surveyor, Captain Oakes, induced severe fever, which, accompanied by great debility, necessitated a return to Europe under medical certificate for the recovery of his health. He accordingly made over temporary charge of his Party at Jubbulpoor to his Assistant, Lieutenant Osborne, on the 18th June 1861, and left Calcutta for England on the 10th July 1862, as per leave granted him in G. O. G. G. No. 671, of 1st July 1862. Lieutenant Sconce, Assistant Revenue Surveyor of the Bundelcund Revenue Survey, was appointed to officiate for Captain Oakes during his absence.

SECOND, OR WESTERN DIVISION, NAGPOOR.

102. The commencement of the operations of this party, for the first

2nd Captain E. H. Willoughby, Artillery, Revenue Surveyor, on sick leave to Europe, 17th March 1858. Died in England 28th July 1860.
Captain J. H. Grant, Artillery, Officiating Revenue Surveyor.

Assistant.

Mr. W. A. Wilson, 1st Class.

Sub-Assistants.

Mr. J. J. Burrowes, 1st Class.
" W. Vynal, 1st "
" A. F. Bonny, 2nd "
" G. Bonny, 3rd "
" G. Rae, 3rd "
32 Native Surveyors.

General average rate per square mile, Rs. 34 5 0

season under review, 1857-58, were, like those of the 1st Division in the same District, delayed until December 1857, by the near approach of the rebels under Tantia Topee, who kept this part of the country in a state of excitement. Scarcely, however, had the Establishment taken the field, in two Detachments, with Head Quarters at Bazargaon in the Northern part of Pergunnah Kailjhur, and at Khailjhur Khas on the Bombay Road, when severe sickness broke out amongst

the Native portion, and within one month nearly the whole of the Native Agency was prostrated by intermittent fever. The work was consequently nearly at a standstill; so much so, that in all January following, only 45 square miles of area could be effected. In the month of February, when the general health improved, and the places of many sick men had been filled up by new hands (Mahrattas), every exertion was made to redeem the lost time.

103. Such, however, was the debilitating effect of the fever, that few of those attacked regained their strength until the following season, and many did not do so at all. Some of the European Assistants likewise suffered, and subsequently, on returning to Recess Quarters, the Officer in charge of the party was himself attacked by the same disease, and thus the resources of this Establishment were seriously crippled, throughout this season, owing to the effects of the jungly and unhealthy nature of Pergunnah Kailjhur.

104. By strenuous exertions, the several large Pergunnahs prepared for Survey as per margin, were got through by the end of April, when the Establish-

Kailjhur.
Kulmashur.
Kailod.
Budghur.
Patim Suongee (absorbed).

ment was obliged to be removed into Recess Quarters at Seetabuldee, owing to the health of the party having been so debilitated. These Pergunnahs, lying to the north and west of the Capital of the District, aggregate

an area of 730,793 acres, or 1,142 square miles, and contain 590 Village Circuits, the average size of which is as much as 1,238 acres, or nearly two square miles each. This area was surveyed in full detail on the 20 chain to the inch scale.

105. Owing to the very unsatisfactory nature of chain measurements over

Basis of the Survey.

such a very rough and densely-covered country as the portion under Survey, a network of triangles was thrown over the work, the stations of which were connected with the Main Circuits, and the corrections derived from the Triangulation

applied to the Traverse Computations. The majority of the Hill Stations, which had been laid down by the Great Trigonometrical Survey under Mr. Mulheran, as described in the remarks on No. 1 Division, were the old ones used by the late Captain Stewart, in his Triangulation for the Topographical Survey of Nagpoor by Messrs. Morris and Weston in 1831. The platforms were duly identified and repaired, and the principal and secondary points of the Great Trigonometrical Survey as per margin were taken up, the point of Gurmasoor Hill being the identical one of Captain Stewart's Survey. Thirty-seven Triangles were thus laid down by observations at the hour of least refraction, on two faces and four zeros of the 12-inch instrument, the mean of the readings being recorded.

Lama.	}	Principal.
Pilkapar.		
Tikaree.		
Joonapani.		
Esamtah.		

Teegaon.	}	Secondary.
Kailjhr.		
Gurmasoor.		
Peependurra.		
Hurrnkoori.		
Sooraden.		
Bajadigaon.		

metrical Survey as per margin were taken up, the point of Gurmasoor Hill being the identical one of Captain Stewart's Survey. Thirty-seven Triangles were thus laid down by observations at the hour of least refraction, on two faces and four zeros of the 12-inch instrument, the mean of the readings being recorded.

106. The triangulation thus conducted was very good, giving very close results in comparison with Great Trigonometrical Survey data. For the object in view, however, it would have been better if the larger triangles had been broken up more, and additional intermediate points laid down, so as to give a larger number of Second Class Minor Triangles, on which the Revenue Survey co-ordinates could have been more correctly adjusted.

107. In the following season, 1859-60, on taking the field early, at the latter end of October 1859, sickness to a very considerable extent again broke out, and disabled at one time nearly 75 per cent. of the working strength; and in the month of February following, cholera was very prevalent in the District, and attacked one of the Sub-Assistants, who recovered, and many of the Native Establishment, several deaths occurring from this cause. The great density of the jungle over the chief portion of the District surveyed, entailed an immense amount of line-cutting both for boundary, as well as for the interior detail Survey, and added considerably to the difficulties met with, and delaying the work up to the very hottest and most unhealthy months of the season.

108. The portion of the District traversed during the above season, was on the extreme west, bordering on the Hyderabad Assigned District of East Berar and across the Wurdah River. It embraced the several Pergunnahs specified marginally, and the large area of 943,360 acres, or 1,474 square miles, in 878 Village Circuits separately defined, the Revenue and Topographical details of which are completely laid down, on the same scale of 20 chains, or 4 inches to the mile. The work was based precisely in a similar way to that before described, on a network of Triangulation connected with the stations of the Great Trigonometrical Survey enumerated in the margin. This completed the District of Nagpoor,

Katole.
Amnair.
Ashtee.
Anjee.
Koondhalee.

Malligaon.
Naulgaon.
Khurki.
Peepulkottah, or Goomgaon.
Gurmasoor.

Seasons.	Square miles.
1857-58	178
1858-59	1142
1859-60	1474
Total	2794

and formed a very arduous season's work, when the difficult nature of the country and the unhealthy state of the Establishment is considered; the total area executed by this Party in the Nagpoor District is as per margin, which has been added to the area performed by the 1st Division to give the total contents of the District (*vide* paragraph 74).

109. In the ensuing season of 1860-61, Captain Grant's Party had to cross over the whole of the Nagpoor

Season 1860-61.

District and to the eastward of the Weingunga River, and take up the next District, Bhundara, which had been commenced by Lieutenant Oakes in season 1859-60, but left by his Party owing to their returning to their old ground on the Nerbudda. By taking the field on the 15th November, a little later than in the two previous seasons, the health of the whole Establishment was greatly preserved; and this was done on the advice of the Medical Officer at Nagpoor, and the open country first taken up. The Triangulation was extended across the Weingunga from the points

Bullia } G. T. S. Stations.
 Ambora... .. }

Jambora... .. }
 Beomsain } Old Nagpoor.
 Rowunwaree... .. } Survey Stations.
 Totan Boree }
 Kurra }
 Oomurjurree or Jamhree. }

of the Great Trigonometrical Survey named in the margin, and a number of triangles fixed on the old Stations of Captain Stewart's Survey, the original platforms having been identified as detailed marginally.

110. The Pergunnahs of the Bhundara District, as specified,* situated between the Weingunga and the Choolbund Rivers, were surveyed with village boundaries during the above season, and comprise an area of 7,24,268 acres, or 1,132 square miles, in 634 Village Circuits, averaging

Area effected.

* Bhundara.
 Thirora.
 Subhangurhee (part of).
 Pohonce, Pohnee, or Pownee.

1,120 acres, or $1\frac{3}{4}$ square miles each, a very favorable size indeed. The aggregate area obtained during the three seasons under review, and the results of each season, including cost and rates, are as follows:—

SEASONS.	Number of Villages.	Average size of Village Circuits.	Area Surveyed in square miles.	Cost.	Average rate per square mile.	Average rate per Village Circuit.
				<i>Rs. A. P.</i>	<i>Rs. A. P.</i>	<i>Rs. A. P.</i>
1858-59	500	1,238	1,142	40,968 0 0	35 14 0	69 7 0
1859-60	878	1,074	1,474	45,786 0 0	31 1 0	52 2 0
1860-61	634	1,120	1,132	41,917 0 0	37 1 0	66 2 0
Total	2,102	1,141	3,748	1,28,671 0 0	34 5 0	61 3 0

111. Notwithstanding the severe nature of the greater part of the country surveyed, a general area of 3,748 square miles in 2,102 villages, was accomplished during the three seasons, giving a mean average progress of 1,249 square miles each season, an excellent out-turn for such ground. The total expenditure, including every description of charge, both permanent and contingent, comes to Rupees 1,28,671, which yields an average rate per square mile of Rupees 34 annas 5 and per Village Circuit of Rupees 61 annas 3.

	Rs.	As.
1st Division ...	29	2
2nd Division ...	34	5

This mileage rate, which is a very moderate one, is higher than that of the 1st Division, owing to various causes, originating in difference of circumstances, of Establishment, and of management.

112. The expenditure under head of permanent charges, for the three seasons, and the Maximum Grant for the same period is as shown in the margin, the Surveyor having overstepped his limit by the sum of 3,705. In the season

	Rupees.
Expended	1,16,280
Authorised Grant	1,12,575
Difference	3,705

1859-60, the increased monthly expenditure was duly retrenched from the Surveyor's Abstracts in this Office, to the extent of Rupees 3,884, as the sum overdrawn for that season only. This loss fell on the Revenue Surveyor himself, who had actually kept up the Establishment to the extent drawn for, and he subsequently

urged that his reason for doing so was solely to obtain his object of completing the District of Nagpore that season, which he effected by returning the large area of 1,474 square miles, and reducing the mileage rate by about Rupees 4 annas 10 in comparison with either the previous or the succeeding season.

113. There can be no doubt that, by occasionally increasing the Native Agency of a Survey, and spending more money than is allowed, Surveyors can effect a larger out-turn of work; but when the results of the whole Department are estimated comparatively, every Party one with another, it is essential each Executive should be regulated by the principles laid down for his guidance, and turn his allowed means to the best account. Captain Grant acted in direct opposition to the positive repeated orders of this Office, and the rules and practice guiding the Department; I had therefore no alternative, but to retrench the excess expenditure so incurred by him. For the above reasons,

however, I referred the case for the favorable consideration of the Government of India, recommending that, as it was the first case of the kind of any Officer under the control of this Office exceeding his Budget Estimate (a system we have always worked upon), the amount might be sanctioned to be defrayed out of the general savings of the Department, a course which was authorised by the orders conveyed as per margin. After the suspense experienced by Captain Grant, and the pecuniary

inconvenience he was thus put to, I believe he is not likely to incur similar responsibility again, and additional check has been placed on his proceedings.

Contingent expenses.

114. The Contingent Charges for the several seasons are detailed in the following Statement:—

DESCRIPTION.	Season 1858-59.	Season 1859-60.	Season 1860-61.	Total.
Feed and keep of Elephants ...	1,850 1	2,148 1	2,066 14	6,065 0
Pay of Tehseel Peons ...	736 10	1,098 7	818 13	2,654 0
Line clearing ...	690 4	1,022 2	1,002 2	2,714 8
Carriage of Government Property	191 2	54 8	45 8	291 2
Travelling allowance to Euro- pean Establishment ...)	88 0	0 0	478 3	566 3
Instruments, Apparatus, and Sundries ...)	44 12	54 6	0 0	99 2
Total ...	3,600 13	4,377 8	4,411 8	12,389 15

These items, all absolutely necessary for the furtherance of the Professional Operations, have been included, in casting the rates. The expense forms but a small proportion to the total outlay, and the strictest economy and watchfulness has always been observed over this part of the Survey expenditure.

Records rendered and remaining.

Records for Season 1858-59.

- 1 Index Map of Operations.
- 4 Pergunnah or Main Circuit Maps of Main Circuits, Nos. 2 to 6, scale 1 mile=1 inch.
- 3 Atlases of Congregated Village Plans embraced in the above Main Circuits, Nos. 2 to 6 inclusive, scale 20 chains to the inch.
- 1 Volume of Main Circuit Traverse Computations of Main Circuits, Nos. 2 to 6.
- 2 Volumes of Village Registers and Traverses of Main Circuits, Nos. 3 and 5.

Arrears not yet lodged.

- The Volumes of Village Registers and Traverse Computations of Main Circuits, Nos. 2, 4, and 6.
The Volumes of Village Registers of Main Circuits, Nos. 3 and 5.

Records for Season 1859-60.

- 1 Index Map of Season's Operations.
- 5 Pergunnah or Main Circuit Maps of Main Circuits, Nos. 7 to 11, scale 1 mile=1 inch.
- 14 Sheets of Congregated Village Plans of Main Circuit, No. 8.
- 37 Ditto ditto of Main Circuits, Nos. 10 and 11, scale 20 chains to the inch.
- 13 Ditto ditto of Main Circuit, No. 7.
- 1 Volume Main Circuit Traverse Computations of Main Circuits, Nos. 7 to 11.
- 2 Volumes of Village Traverses of Main Circuits, Nos. 8 and 11.

115. The Maps, Plans, and computations received from this Surveyor are detailed marginally for each season. In this Survey alone, it will be observed, are there any arrears due of previous seasons.

116. Captain Grant, as above shown, has always effected a good quantity of work in the field, but the value of it is greatly reduced, if the same cannot be

Arrears not yet lodged.

The Atlas of Congregated Village Plans of Main Circuit, No. 9.
The Volumes of Village Registers and Traverse Computations of Main Circuits, Nos. 7, 9, and 10.
Volume of Village Registers for Main Circuits, Nos. 8 and 11.

Records for Season 1860-61.

- 1 Index Map of Season's Operations, District Bhundara.
- 4 Pergunnah or Main Circuit Maps of Main Circuits, Nos. 12 to 16, scale 1 mile=1 inch.
- 22 Sheets Congregated Village Plans of Main Circuits, Nos. 12 and 13.
- 11 Ditto ditto of Main Circuit, No. 16.
- 1 Volume of Village Traverses of Main Circuits, Nos. 12 and 13.

Arrears not yet lodged.

The Atlases of Congregated Village Plans of Main Circuits, Nos. 14 and 15.
The Volumes of Village Registers and Traverse Computations of Main Circuits, Nos. 14 to 16.
The Volume of Main Circuit Traverse Computations of Main Circuits, Nos. 12 to 16.
The Volumes of Village Registers of Main Circuits, Nos. 12 and 13.

mapped, computed, and transmitted to this Office within a reasonable time, and prove to be without error when received. An Officer, who possesses good administrative abilities and foresight, will never undertake more in the Field Season than he can truly render in Recess, and it forms one

of the leading rules and principles guiding this Department that all Maps and computations shall be got out of hand, during each Recess, and lodged in this Office.

117. This Officer has had a difficult task to perform in a troublesome District, and with an Establishment weakened by sickness and inferior in point of efficiency to many others, for all of which allowances must be made ; but though zealous in Surveying large areas, he is as yet wanting in method, system, and regularity.

118. The style and execution of the one inch Pergunnah or Main Circuit Maps, received in this Office, are fair, but not of the same excellent style and stamp as exhibited in those of other Surveys. His last season's work is better, but it is well susceptible of still further improvement.

119. The Village Plans on the large scale partake of the same order ; some are very fairly done, but many are very inferior, and the whole bear an unfavorable comparison with the records lodged by other Surveyors.

120. For the above reasons, I have not had it in my power to submit Captain Grant's name for the permanent rank of full Revenue Surveyor in the Department, and he still continues officiating only. I have now reason to believe that amendment is taking place ; I am assured that the arrears are in course of speedy completion, and therefore I may express a hope of this Officer doing better in future, and in another season the defects in his administration may, I trust, entirely disappear.

121. Captain Grant's Report for 1858-59 contains some interesting particular **Statistical and Geographical Notes.** lars of the country surveyed, in respect to the geographical and geological features of the several Pergunnahs traversed, as well as of the inhabitants, their manners, and customs. These are too lengthy to embrace in a Report of this nature, and

it is usual, on the completion of a District, to submit a separate complete Statistical and Geographical Report, which is published for general information. The following extracts must, therefore, suffice to show the connection of the state of the Nagpore District with the Survey operations, and to account for the particular obstacles met with, and the influence it may have had on progress :—

EXTRACT FROM ANNUAL REPORT OF SEASON 1858-59.

“18. The area of Pergunnah Kailjhur (Main Circuits, Nos. 2 and 3) is 415 square miles, the greater portion of which is a mass of trap hills, averaging 1,800 feet above the sea level, covered with tree and bush jungle. These hills rise abruptly from the plains, the summit generally presenting the monotonous level peculiar to basaltic ranges, the highest portion being the Gurmasoor plateau (2,000) above the sea, where one of the Great Trigonometrical Survey principal points is fixed. Every flat piece of ground appears to be cultivated where the soil is good; the soil is that known as black cotton, overlying nodular limestone, occasionally in the plains intersected by horizontal spits of colored clay, chiefly red and yellow. In many cases the nodular concretions, mixed up with the surface soil, are so small, superficial, and numerous, as to form a highly productive loam. Near Gurmasoor there are traces of iron, the soil being impregnated and colored by its oxides. I picked up some specimens of highly indurated clay almost crystalline in appearance.

“19. Water in the plains is close to the surface (this applies to the whole of the District surveyed this season), and wells are consequently numerous. These are occasionally used for irrigation for crops, such as poppy, chillies, &c. In the hills few villages have wells, depending on the Nullahs for their supplies. In the Nullahs, reservoirs, called jheras, are dug, which furnish scanty supplies during the hot season.

“21. There are few tanks in the Pergunnah: one at Bazaargaon, a fine one with stone embankment and steps, one at Kownis, ditto at Deoli, and two in Kailjhur.

“22. The jungle trees of this, as well as the other Pergunnahs surveyed, are chiefly Lagonni, Sal, Gubdea or Goongly, Babool, Seharoo, Tendoo, Sehmur, Mouhwa, Annli, Chirounji, Bear, Bael, Peepul, Burgut, Bilawa, Kooloo, Behara, Pulus. From the flower of the latter a red dye is extracted. The timber is generally of small girth, and the teak is cut for rafters when it is only a few years old. In the valleys and near the villages the trees are generally very fine, chiefly mangoe, tamarind, mohna, &c. The Guldi or Goonglee is a light-colored wood, with a large yellow flower. This is highly resinous, burning with a bright flame, and the wood is used as a torch by Dâk-runners and villagers at night. The undergrowth of the jungle is generally thorny, with coarse thatching and spear grass. Wild indigo is very common both on the hill and in the hedgerows of the plain.

“23. In principal villages, as Bazaargaon, Behar, Arregaon, Kownis, Kaledoongree, Kanboli, Hingni, Sailoo, Kailjhur, the last giving its name to the Pergunnah. At Lailoo there is a Dâk Bungalow and a Chowkey for collecting Transit Duties. Bazaargaon was originally called Jambooldurra.

“24. Bazaars are held once a week at Bazaargaon, Kaledoongree, Kownis, Arregaon, Kanboli, Hingni, and Sailoo.

“25. Melas take place at Sailoo for five days in February; at Koolar five days in March; Nilianni five days in February.

“26. Kailjhur, though much reduced, was formerly a fine village, being a favorite hunting-ground of the Rajah's. It is situated picturesquely among beautiful trees at the base of the hills. The village is clustered round a small natural elevation, on which stands the Fort,

which, though in ruins, must have formerly been of great strength. On the summit of the hill is the body of the Fort, built of hewn blocks of stone without cement. On a lower canton is a second wall constructed like the former, while the whole is enclosed at the foot by a curtain with bastions built of masses of well-puddled earth. The Fort was, I believe, originally built by the Gonds, and consisted of the two first portions, the exterior having been added by the Mahomedans, who also raised the inner walls with brick-work parapets, crenellated for musketry. The Fort contains a fine baolee, and to the north there is a tank which was formerly deep and embanked with fine steps, but now is so shallow as to dry up shortly after the rains, and the ghâts are quite ruinous. To the south-east of the village are two tanks with fine trees. They are merely separated by a bund, which had rows of stone steps, but they are utterly ruined and broken. These tanks are silting up, and one is generally dry early in the hot weather. In the immediate proximity of one is a peculiar little temple, probably of Jain architecture. It is square and open on all sides. The roof is remarkable, being supported by the four corner pillars, across which are four solid slabs of stone, on which are pitched rough, unhewn masses of rock, forming a rude dome. Though presenting this rough exterior, the interior of the dome shows that the stones are carefully fitted to each other, and the whole concavity carved up to the summit about 12 feet high. The corbells supporting the spring of the arch are well-executed specimens of fabulous monsters. I have seen several temples resembling this in the Jubbulpoor District, but they were generally completely in ruins. The luxuriance of the trees, the two tanks, the old ruined Fort, the whole scene backed by the range of hills, combine to make Kailjghur one of the prettiest spots in the District.

“27. The Great Deccan Trail (it is a misnomer to call it a road) passes through Kailjghur Khas, and runs due west across the Pergunnah. The Ellichpoor Track runs parallel through the north of the Pergunnah through Bazaargaon. There are no made roads anywhere in the District, those mentioned being merely broad cart tracks, deeply rutted by the continual traffic, and almost impassable during the rains. Every Nullah crossing the road is a serious impediment to carts, as the soil being black loam forms a deep, squashy pool. The bridges are slight erections thrown across the Nullahs for the passage of Dâk-runners during the rains: these are merely made of wood and grass, generally having a large hole in the middle, and are too frail for the passage of carts. The traffic throughout the District is by means of carts, which traverse the country in every direction, even in the hills. One peculiar description of cart is the Ringhy; these are small, capable of holding one or two persons only, having low wheels and broad axles. They are universally used all over the District, as they are capable of being drawn anywhere, over every description of ground; they rarely upset, as the driver adjusts the balance, throwing his weight right or left as necessary.”

EXTRACT FROM ANNUAL REPORT OF SEASON 1859-60.

“16. The general nature of the country surveyed is very hilly and stony, the hills for the most part being covered with dense jungle. Pergunnah Ashtie and a portion of Amnair, in fact the strip along the banks of the Wurda, is the cleanest and the best cultivated, but even this is much cut up with ravines. The hills are very steep on the western and southern faces, and slope away gradually towards the north. Pergunnah Koondalee is almost wholly a mass of jungle, and the same may be said of the majority of Pergunnah Anjee: in these two Pergunnahs there was great difficulty in cutting the lines, from the size of the trees and the rugged nature of the Nullahs and ravines. The Road Ellichpoor crosses from east to west through Pergunnah Koondalee; it is merely a cart track, rather better than any road in the plains, owing to the stony nature of the soil. The road has a very steep incline at Tullaigaon, at the foot of which extra bullocks are always hired to enable carts to reach the summit.

“17. Wild beasts abound in the jungly portions, and bears more particularly are very

numerous in certain parts of Koondalee. Tigers are likewise very common; in my former Report mention was made of small effigies of tigers, called Waghawahs, erected in memory of men killed by these animals; in one village of Pergunnah Koondalee I counted 42 of them.

“18. The principal villages in each Pergunnah are: in Pergunnah Koondalee, Koondalee, Karinga, and Saonga; in Annair, Jalalkhaira, Nurkhaira, Mowar, Thurree, Ponee, Thara, Saongee, Bailona, and Lohar Saongee; in Katole, Katole Khas, Saurgaon, Parud, Singa, and Mohogaon; in Anjee, Anjee Khas and Bairool; in Ashtee, Ashtee Khas, Arnee, Saoor, Dharee, Bhisnoor, Bhainswara, Thillaigaon, Julgaon. Most of these villages have regular Bazars and market days, and have Police Chowkies stationed in them.

“19. Pergunnah Ashtee and parts of Anjee and Annair are very richly cultivated, being the most productive portion of the Nagpore District. The position is well adapted for flourishing cultivation. On the west flows the River Wurda, and on the east it receives the drainage of the hills. Sugar-cane, pan, huldee, opium, and tobacco are grown in large quantities, likewise onions, garlic, tomatoes, brinjals, sweet potatoe, ginger, chillies, plantains, urhur-dal, moong, and indigo. In Pergunnah Ashtee there are very fine groves of mango, orange, and plantain trees.

“20. The mass of the population consists of Hindoos and Gonds, with a few Mussulmans. There is a small group of villages to the north-west of Ashtee, where the inhabitants are chiefly Mahomedans, as is apparent by the names Ishmaelpoor, Kasimpoor, &c. There is one village inhabited by Coles.

“21. Owing to the density of the jungle over the greater portion of country surveyed, the Surveyors met with great difficulty, particularly the interior hands. The lines in Koondalee were cut previous to the Boundary Surveyors commencing work, and the line-cutters were distributed among the interior hands. Great numbers of coolies had to be entertained in addition, a matter of the greatest difficulty in jungly villages mostly deserted or with few inhabitants.”

122. The Bhundara District being conterminous with that of Nagpore, differs very little in point of geographical aspect; the Officiating Surveyor thus treats of it in his Report for 1860-61:—

EXTRACT FROM ANNUAL REPORT OF SEASON 1860-61.

“25. The Town of Bhundara, which gives its name to the Pergunnah, is situated about a mile from the west bank of the Weingunga. In the Civil Station, which is built nearer the river, there are a few houses, the residence of the Deputy Commissioner and other Civil Officers. It is not placed in a good situation, as, during the rainy season, when the river is at flood, the water flows back through a Nullah right into the Station. In the west of the town there is a large Native Fort built of stone, now used as the Jail. The chief manufactures are cloth and brass, and copper vessels. There are many coppersmiths in the town, and I believe Nagpore is chiefly supplied with lotas, cooking utensils, &c., from this place. The charcoal used in their forges is brought from the jungly villages across the river.

“26. The road to Raepoor passes through the Station, and crosses the Pergunnah in a south-easterly direction. It is an old road with pukka bridges, many of which are falling into ruins. The road is very much cut up by the traffic from the Raepoor District, which is great during some months of the cold season. The carts, which are generally dragged by buffaloes, are laden with gram and rice. The hire is Rupees 12 from Raepoor to Nagpore; on arrival at the latter place, the cartmen generally sell the cart. If they take a return load, it is chiefly of salt. These carts have all large heavy solid wheels, with very narrow iron tires, and destroy any roads they may travel over. No metalled road even would stand a week's traffic. On arrival at the village of Karda, opposite Bhundara, the carts halt and make the passage of the river, one march, since, owing to the heavy drag over the sand, they have to yoke six or eight pairs of buffaloes to each cart. The buffaloes are generally very fine ones, and appear to have a cross of the wild blood in them.

" 27. Pergunnah Bhundara is studded with ranges of hills, and numerous isolated smaller ones. They are generally granitic and schistose, overlaid in many places by laterite, which is also found resting on dolomite, the latter cropping out from the surface of the ground in many places. The hills lie generally north and south. Toward the south there are two ranges running east and west, forming the boundary between Bhundara and Pohonee. From the upper portion of Bhundara the hills run in a north-easterly direction, forming the eastern boundary of Hurora, and are massed to the north of Sahangurri. These are chiefly lateritic, and abound in manganese and iron ore. The iron is roughly smelted in large quantities at several villages, where the greater number of the inhabitants are chiefly occupied in the trade. The charcoal is burnt by Gonds in the dense jungles adjacent to the villages. Pergunnah Pohonee to the east of the Weingunga, the Delta formed by the junction of the Weingunga and Chosland is flat champaign country, a sheet of cultivation. In this tract there are only four small hillocks, two at Digree Bagree at the east, two at Ghoosee on the west. The portion of the Pergunnah west of the Weingunga is hilly and jungly. Here the laterite is found on sand stone, granite, and gneiss. At Ambora, where it is marked as Scarp Station in Captain Stewart's map, the river appears to have forced its way through the rock, which, on the right bank, rises in bold scarped bluff.

" 28. Gold is found in small quantities at Thirola, and also in one or two villages about the centre of Pergunnah Bhundara. The quantity washed in one day by a single man is small, averaging in value from 3 to 4 annas, but this may be owing to the rough process in use. I was not aware of this at the time of Survey, but will inspect the ground on my return to the District.

" 29. The hills are generally covered with dense jungle, consisting of trees, low bushes, and thorns, bamboos intermixed. In many places in the valleys I could not force my way, though even on an elephant. When the hills are annually fired, and the moss of undergrowth burnt, the ascent is much easier. There is scarcely one hill in the tract surveyed which has not several village lines crossing it, often in almost inaccessible places; which caused great trouble to the Surveyors, owing to the bad positions they were obliged to select as Stations for the Theodolites, the difficulty of chaining correctly, and the heavy extra expense in cutting lines through the jungle. In several places, which I ascended, it was necessary to catch hold of boughs and trunks of trees to assist in the ascent, and to preserve one's footing in descending. In such cases, I entrusted the Theodolites to Gonds to carry, as they were surer-footed than the common Klassies.

" 30. Every village in Bhundara (with the exception of a few on the river's bank), and the majority in the other Pergunnahs, have at least one tank, generally small. They are chiefly constructed for irrigating the rice fields, also to furnish drinking water, as few of the villages have wells; several of the tanks are very large ones, especially the one at Jamborah, Pergunnah Thirora, which is a fine sheet of water. During the cold season they are covered with flocks of wild fowl of every description, wild geese, ducks, teal, and koolung; snipe abound in the marshy edges of the tanks and rice fields.

" 31. The soil is generally good, and is classified under the following heads:—Kalee, 1st and 2nd Moorund, Khurdee, Bhurdee, Raitharee, respectively black, brown, hard, stony, alluvial. A great portion of the land covered with jungle is good soil, and capable of being reclaimed."

123. The exertions of the Settlement Officer, Mr. Ross, and his Native Deputy Collector, in the preparation of the country for Survey, by defining the village boundaries, are spoken of as highly satisfactory, and the requisitions of the Surveyor were always promptly met and anticipated by the Commissioner of that

Demarcations.

period, Mr. George Plowden, whose intimate knowledge of Settlement Proceedings in connection with Surveys in Bengal, enabled him at once to appreciate the wants and difficulties of the Surveyor. During the season of 1858-59 the Demarcation Maps, from unavoidable causes, were backward, but in the following season this was fully rectified. The hearty co-operations of both the above Civil Officers, in meeting the requirements of the Professional Survey, are duly acknowledged by Captain Grant. The comparison between the Professional and the (Khusrah or Kistwar) field by field measurement Maps is described to be very good; the latter operation was conducted by the Settlement Branch, and appears to have been placed on a very good footing.

124. The Survey of the Bhundara District has continued to be prosecuted

Duty employed on during Current Season of 1861-62.

Hutta ...	Completed.
Sahangurree ...	Portion of.
Kampta ...	"
Lanjee ...	"

during the present season; the Pergunnahs, noted in the margin, have been either completed or partially so, yielding a rough approximate out-turn of 930 square miles in 426 Village Circuits; possibly this area may be increased to 1,000 square miles when computed out.

The area, although below the out-turn of former seasons, owing to the great difficulty in cutting the lines through very dense jungle, which prevails in Pergunnah Hutta to a large extent, is a very fair return, and quite as much as can be fairly expected for such a country. In consequence of the unhealthy character of this part of the District the work was commenced late.

125. An estimated area of about 3,000 square miles still remains in the Bhundara District to complete it.

Area of District in hand remaining for Survey.

This, for the most part, is pronounced very jungly, and fit only to be taken up topographically on the reduced scale, and I hope the Local Authorities may be able to dispense with the usual village boundary definition in this wild country, as the cost of such operations is almost prohibitory, and the time taken to effect the clearance of so much jungle very great. The minor triangulation necessary for prosecuting this Survey next season has already been laid down in advance, and the triangles computed.

126. The next District for Survey is not yet fixed on. Raepore or

District next for Survey.

Chutteesgurh lies to the east, and in the greater part of this immense District the villages are said to have no regularly defined boundaries. Chanda, lying to the south, is likewise scarcely adapted for ordinary Revenue Survey, and of the whole of this enormous and totally unexplored area, a first Survey is a crying want. The subject of actual Revenue requirements of the Survey in these Districts has been referred to the Chief Commissioner. That Officer states that the country in the immediate vicinity of the high road between Bhundara and Raepore, as well as the tract to the north of that place, called

Ruttunpoor and Belaspoor, are of the most pressing importance. He also presses for a village by village detail Survey of the cultivated plateau between the Bagh River and Raepore, as well as of the lower valley of the Wurda River, from Wurroda Chanda where the finest cotton is grown. These points are now under careful consideration in communication with the Executive Officers, and local wants will have the best attention.

127. The District of Nagpore having been completely surveyed, the **District Map of Nagpore published.** General Preliminary Map has been compiled in this Office on the usual Geographical Scale of 4 miles to the inch; this has now just been transferred to the stone, and will be ready for issue immediately. It is a fine map, and will serve a good purpose, pending the return of the final map from England.

128. The absence of a qualified Covenanted Assistant on this Survey had **Covenanted Assistant appointed.** been much felt, and it was not until the past season of 1860-61 that one was found. By G. O. G. G. No. 5832, dated 1st December 1860, Lieutenant J. W. Taylor, Bengal Artillery, was appointed, and he joined at Nagpore on the 4th January 1861. During the time this young Officer has been employed, he is reported to have been of great assistance, and to have taken part in the triangulation in company with the Revenue Surveyor. He is a very superior Draftsman, and promises to become a valuable member of the Department. I have every hope of his being qualified in due time to undertake executive charge of operations.

129. The Senior Assistant on this Survey, Mr. W. A. Wilson, a very **Staff of Assistants re-enforced.** old Departmental Officer, being no longer equal to the very hard work entailed by such a hilly and jungly country, was transferred to the new party raised for Oude by G. O. G. G. No. 4626, dated the 5th October 1860, and Mr. W. Ellison was taken in exchange from the Hazareebaugh Survey. These changes were made with the view of strengthening Captain Grant's hands, and improving the efficiency of his establishment, a point of pressing importance. Mr. Ellison is a pains-taking and good Assistant; his work is reported to be always neat, and accurately performed, and he is a superior Draftsman, for which I was glad to recommend him for promotion to the grade of Assistant Surveyor, 2nd Class, on Rupees 300, from the 1st January 1862, as sanctioned by G. O. G. G. No. 218, dated the 14th February last.

130. Messrs. Burrowes, Vyall, and A. F. Bonny, Sub-Assistants, each **Promotions.** received a step of promotion, as per margin, by G. O. G. G. No. 4626,

dated 5th October 1860. Mr. Vyall is highly spoken of, and his maps are certainly the best of all those executed by this party; he was consequently raised to Senior Sub-Assistant by G. O. G. No. 1536, dated 2nd April 1861. Mr. G. Rae, a very promising candidate, having passed the required examination, was appointed as Junior Sub-Assistant by G. O. G. No. 6199, dated 3rd October 1859.

THIRD DIVISION, BUNDELKHUND.

131. In the last Report, dated 27th August 1859, paragraph 91, it was recorded that the old Bhurtpoor Party, on the completion of that District, had been transferred to take up the unfinished Survey of the Jhansee Division, and, in the first instance, to endeavour to recover and arrange the records left by the late lamented Captain Burgess, and found in the Fort of Jhansee, on the re-occupation of that place. The Establishment, as per margin, after marching towards the Assigned Districts of Hyderabad, were re-called by Government Orders, Foreign Department, No. 5493, dated 31st December 1858, and arrived at Jhansee in the early part of February 1859, after completing a Survey of the Cantonment of Sepree, whilst halting there, which proved of great service to the Military Authorities of that place.

132. During the Season 1857-58, owing to the Military operations, nothing whatever could be done in this District, but, in the following Season of 1858-59, it has been shown in the last Report how this Establishment was occupied in mapping and computing the old work of the Season 1856-57, and likewise in making good, by partial re-surveys in the field, of isolated villages and small tracts, to fill up all the gaps caused by the destruction or loss of portions of the Field Books and Field Sections, to the extent of 144 square miles, embracing 45 villages. This enabled the Surveyor to put up and map correctly the three Main Circuits* of the large Pergunnah of Jhansee, containing an area of 998 square miles in 296 Village Circuits, bounded on the north by the Duttia State, Pergunnah Bandere, and the Jagheer of Goorserae, on the west by Pergunnahs Pundwaha and Mow, on the south by the Oorcha and Tehree State, and on the east by the then unsurveyed Pergunnahs of Puchore and Kurrehrah. Several Great Trigonometrical Survey principal Stations† are duly connected with this Survey.

	Rs.	Rs.	1st May	1859.
Mr. Burrowes, from	200	to 225,	1st	May
„ Vyall „	175	„ 200,	2nd	April
„ A. F. Bonny „	125	„ 150,	1st	Oct.
				1859.

Captain A. D. Vanrenen, Revenue Surveyor.
Assistants.

Lieut. J. Sconce.

Mr. H. B. Talbot, 2nd Class.

Sub-Assistants.

Mr. F. Kelly, 1st Class.

„ H. L. Pemberton, 2nd „

„ W. Ward, 3rd „

„ M. Brennan „ „

„ J. L. Pemberton „ „

28 Native Surveyors.
General average rate per square mile ... 19 14 0

* Nos. 24, 25, and 26.

† Algi.
Gwali.
Bhitari.
Kuthera (uncertain).

133. The remainder of the originally surveyed work of Season 1856-57, topographical only, being altogether incomplete and unintelligible, was ordered for entire re-survey, and consequently the area of such portion, *viz.*, Main Circuits Nos. 20 and 27, parts of Chutterpoor and Tehree or Oorcha States, was not included in the Returns for that Season. The portion preserved was that surveyed in detail, village by village, and on this the cost of the Establishment for the time employed has been thrown for the calculation of rates. The object of this Establishment proceeding to Jhansee, as expressed in the correspondence to Government, was "to rescue some of the 2,000 square miles of Topographical and Revenue Survey effected in 1856-57 by the late unfortunate Jhansee Party, who were all massacred there on the 8th June 1857, and whose Field labors were still preserved." The chief duty being thus confined to Office purposes only, the greater part of the Field hands were reduced and allowed to go to their homes, and the expense of the Establishment brought down to the usual Recess strength.

134. The Surveyor's detailed specification of the state in which he found this work, and how it was originally surveyed, is here given, in order that a full understanding of the peculiar difficulties connected with the adjustment and re-arrangement of the same may be arrived at:—

EXTRACT FROM ANNUAL REPORT OF SEASON 1858-59.

"10. This tract of country had been divided for the convenience of Survey into the following Main Circuits, *viz.*—

How divided for Survey.

No. 24, Pergunnah Jhansee,	1st portion.
„ 25 ditto	2nd „
„ 26 ditto	3rd „
<hr/>	
Total	... 3

"11. No. 24 Main Circuit comprises the whole Talooka of Burwa Saugor, given over to our Government by Scindiah, to defray the expenses of the Gwalior Contingent; it is now incorporated with the Jhansee Pergunnah, of which it forms an integral part; its former designation is now seldom used in official documents, and it is always alluded to as a part of the Jhansee Pergunnah. A large portion of the Oorcha Territory, which was interlaced with our own Pergunnahs, has also been included in this Circuit, and has been surveyed topographically on the scale of 1 mile=1 inch: in addition to this, several villages of Pergunnahs Pundwaha and Mow have been surveyed Mouzawar in this large Circuit.

"12. No. 25 Main Circuit contains that part of the Jhansee Pergunnah to the west of the Betwa River, and surrounding the City of Jhansee, also a strip of villages of the unsurveyed Pergunnah of Kurehrah lying to the north and south of the celebrated "Denara" tank, and some villages of the "Oorcha" and "Duttia" States intermixed with our own.

Main Circuit No. 25.

“ 13. No. 26 Main Circuit comprises the remaining portion of the Pergunnah and the country in the vicinity of the Bobeena Thannah, and also some villages of the Oorcha State, and the Puchore, and Kurrehrah Pergunnah of the Jhansi District.

Main Circuit No. 26.

“ 14. The above three Circuits were surveyed Mouzawar, and such portions of independent States contained in them were done topographically on the one mile = 1 inch scale.

These Circuits how surveyed.

“ 15. In addition to these three Main Circuits there are two more, the mapping work of which had not been rendered you; they were surveyed entirely topographically and are numbered as follows:—

The two extra Main Circuits incomplete.

No. 20, part of the Chutterpoor State.

No. 27, ditto Tehree or Oorcha State.

“ 16. No. 20 Main Circuit comprises about 780 square miles of the Chutterpoor State, and embraces the “Oormul” Nullah, on the north the City of Chutterpoor and eastward nearly touches the ancient Hindoo City of Rajnugur; the calculations of this portion of the work had not been completed when the mutiny broke out, and they are in a most unfinished rough state. The Field or Board plans are also, I regret to say, not complete: only two of them are to the fore, and the others, required to finish the map of this Circuit, have been either destroyed or are in an unfinished state.

Description of Main Circuit No. 20, and its hopeless state.

“ 17. No. 27 Main Circuit comprises about 500 square miles of the Oorcha State: it is contiguous to Main Circuits No. 15 of Mow, No. 24 of Jhansee 1st, and No. 25 of Jhansee 2nd, and extends as far as the Bomori tank to the south, and to the “Oor” Nullah (the east boundary of the State). This Circuit was the last one surveyed, and is, if anything, in a more unfinished state than Main Circuit No. 20. The angular work of the calculations had only been closed, and the true bearing of the lines determined; but the traverses had not been worked out. Most of the Board plans have been saved, but even these have been injured here and there by insects, damp, or other causes, and a re-survey would be necessary before the mapping work of this Circuit could be made anything of.

Main Circuit No. 27 worse than No. 20.

58. I need hardly dwell upon the unsatisfactory nature of the duties we have had to perform during the past Season, as I have the satisfaction to know that they are well known to the Head of my Department. At all times it is a disagreeable job for one Surveyor to map the Field work of another; but, when it is considered that the work now noticed had been in the hands of the rebels for months, and in parts destroyed, it is needless to say that the difficulties were increased ten-fold, and that the task of mapping the work was not one of an ordinary nature, and which, I sincerely hope, I may never have to perform again; and when to it was attached the melancholy, deplorable fate of our unfortunate brethren who were so cruelly massacred to a man, their handwork at times re-called to the mind the most sad and painful recollections.”

Unsatisfactory nature of the duties performed during the past Season.

135. In the succeeding Season of 1859-60, the Survey of Pergunnahs Kurehrah and Puchore, west of the Betwa River, remaining of the Jhansee District, with several detached portions of the small intervening Bundela States of Kumádhana, Oorcha, and Duttia, together with a part of Nurwar belonging to Scindiah, a small tract 63 square miles lying to the south and east of the Sindh River, were completed. The above gives an area of 8,89,580 acres, or 1,390 square miles: of this 1,184 is the

Area surveyed in 1859-60.

usual Revenue Detail Survey, village by village, comprising 425 Village Circuits, the average size of which comes to 1,782 acres each, and the remainder, 206 square miles, topographical work only of Native States on the one inch scale.

136. The tract surveyed this Season is bounded on the north and west by the Sindh River and the Gwalior State, on the south by the Betwa River and District Lullutpoor, and on the east by Pergunnahs Jhansee, Kurrehra, and the Duttia State, and this brought every village of the Jhansee District under Survey, extending down to the left bank of the Betwa River, half the stream of which forms the boundary line with the Lullutpoor District. Considerable difficulty was experienced in connecting with the old work, owing to the time elapsed since the Revenue Survey Station marks had been made, and the destruction of most of them; but some were forthcoming, and fortunately the Great Trigonometrical Survey Stations of the Budhon and Ranghir Meridional series, which traverse this District and were readily identified, formed a sure basis on which the Topographical Survey was started. A comparison of the direct distances between all these Stations, consisting of 4 principal and 6 secondary points in paragraph 148, will show the ratio of error between the two Surveys.

137. The operations in this Division were again prosecuted by the same Party in the following Season of 1860-61.

Area surveyed in 1860-61.

The tract of country demarcated and prepared for Survey was that portion of the Lullutpoor (formerly Chandairee) District west of the Dussan River, and south and east of the Betwa, immediately contiguous to the Main Circuits, Nos. 24 and 25, of the Jhansee District, and No. 15 of Mow, and extending as far south as the Town of Lullutpoor and forming about one-half of the District. The British Pergunnahs west of the Betwa having been all made over to Scindiah, in one of which the Town of Chandairee is situated, the name of the British District was consequently altered to Lullutpoor.

138. The Surveyor's instructions were to work down southwards continuously through the Lullutpoor

Object of the Survey.

District, taking up the scattered portions of any Native States in succession according to their geographical position, and so to close on the Saugor District already surveyed. Accordingly a large tract of the Tehree Bundela State, north and round about its Capital or Chief Town, "Tehree," was likewise taken up, of which a topographical delineation has been effected on the one inch to the mile scale. The Banpoor lapsed State has been treated as a Pergunnah and surveyed in detail.

139. The area comprised in the British States above referred to is 6,04,732

acres, or 945 square miles, all of which has been laid down on the usual large Revenue Scale, and embraces the Pergunnahs, marginally noted, with 351 Village Circuits, the average size of which is 1,723 acres. The Topographical Survey amounts to 1,181 square miles, making a total of 2,126 square miles as the Season's out-turn. The greater part of the Tehree work was previously surveyed in 1856-57 and upheld; it therefore appears to me sufficient to allow half the area of the same $\frac{44^8}{2} = 224$ square miles in the present Returns for the Surveyor's labors in mapping, computing, and arranging the details, and this makes his topographical area 957 square miles, or a total of 1,902 square miles, on which the cost is cast.

Pergunnah Talbehut.
 ,, Bansee.
 ,, Lullutpoor.
 ,, Banpoor (lapsed).

140. The results of the three Seasons under review, showing total cost and average rates per square mile and per Village Circuit, will be as follows:—

Seasons.	Number of Village Circuits.	Average size of Village Circuits.	Area surveyed in square miles.	Cost.		Average rate per square mile.		Average rate per Village Circuit.	
				Rs.	A. P.	Rs.	A. P.	Rs.	A. P.
				Rs.	A. P.				
				* 8,249	0 0				
1858-59	296	2,158	998	18,737	0 0	18 12 0	63 4 0		
1859-60	425	1,782	1,184	30,283	0 0	} 23 11 0	71 4 0		
	TOPOGRA	PHICAL...	206	2,634	0 0		0 0 0		
1860-61	351	1,723	945	22,641	0 0	} 17 13 0	64 8 0		
	TOPOGRA	PHICAL...	957	11,320	0 0		0 0 0		
			3127	71,661	M. 0 0		66 14 0		
			1163	13,954	T. 0 0		0 0 0		
Total ...	1,072	1,867	4,290	85,615	0 0	19 14 0			

141. An aggregate area of 4,290 square miles, or an average of 1,430 each Season, has been surveyed, of which 3,127 is Detail Revenue work, and 1,163 Topographical. The total expenditure for the same period comes to Rupees 93,864, of this sum 8,249, the expense of the Establishment for the months of October to December 1858 inclusive, whilst bringing up Bhurtpoor maps and records, and marching to another part of the country, has been debited to that Raj, and the expenses of the Jhansee Survey reckoned to commence from the 1st

* This item of expenditure in 1858-59 was debited to the Bhurtpoor Raj.

January 1859. The mileage average rates of Rupees 19-14, and of Village Circuit Rupees 66-14, are therefore calculated on the balance as noted in the margin. The mileage rate is very favorable indeed, but it can scarcely be accepted as final, until the remainder of the Division is concluded, and the true area of the whole thrown on the absolute total cost, including that incurred prior to the mutiny; one-fourth of the total area, moreover, is Topographical Survey only, which description being rapidly executed on a reduced scale, of course can be done cheaper.

Rs.	
8,249	Bhurtpoor charges.
85,615	Jhansee ditto.
93,864	Total for three Seasons.

142. The contingent charges on this Survey, included in the above expenditure, are as follows for each season :—

Description of Contingencies.	Season	Season	Season	Total.	
	1858-59.	1859-60.	1860-61.		
Debitd to } Special Travelling Allowance } Bhurtpoor } for Party transferred ... } Treasury. } Carriage of Government Stores	375 15 3	0 0 0	0 0 0	375 15 3	586 13 0
	210 14 6	0 0 0	0 0 0	210 14 6	
Debitd to } Special Travelling allowance ... } Jhansee } Carriage of Government Stores } Treasury. } Carriage of sick and wounded ... }	73 2 5	0 0 0	310 14 10	384 1 3	681 8 3
	63 12 0	71 3 7	93 15 5	231 15 0	
	0 0 0	65 8 0	0 0 0	65 8 0	
Totals	723 12 2	139 11 7	404 14 3	1,268 6 0	

143. These items are remarkably small, and the more so when taking the jungly character of some part of the country into consideration. In many Districts the zemindars and village authorities cheerfully co-operate in the Survey operations, each village clearing its own boundary lines, and thus saving a material expense which is unavoidable at times and under some jurisdictions; the contingent charges debited to the Bhurtpoor Raj, for the three months of 1859, on the winding up of that Survey, have been separately shown, amounting to Rupees 586-13-9.

144. On the resignation of Captain George Hamilton, and the succession of Captain A. D. Vanrenen to the charge of this Survey, a vacancy was caused in the appointment of a Covenanted Assistant, and Lieutenant J. Sconce, of the Artillery, was nominated by G. O. G. G. No. 6409, dated the 21st October 1859, and that young Officer joined on the 13th December of the same year.

145. All the Maps and Records received from this Surveyor, as detailed in the margin, are carefully got up, well finished, and complete in every respect. The one inch Maps are well executed, and

Style and execution of Maps lodged.

Records for Season 1858-59.

- 1 Index Map of Season 1856-57.
- 3 Maps of Main Circuits Nos. 24 to 26, scale 1 mile=1 inch.
- 1 Plan of the City of Jhansee, scale 4 chains=1 inch, surveyed in 1858-59.
- 1 Plan of the Sepree Cantonments, scale 10 chains=1 inch.
- 1 Volume Atlas of Congregated Village Plans comprised in the above Main Circuits, Nos. 24 to 26, scale 20 chains=1 inch.
- 1 Volume Main Circuit Traverse Computations of Main Circuits Nos. 24 to 26.
- 1 Volume Village Registers and Traverse Computations of Main Circuits Nos. 24 to 26.
- 1 Volume Village Plans of Pergunnah Mow.
- 1 Volume ditto ditto Pundwaha.

Records for Season 1859-60.

- 1 Index Map of Season's Operations.
- 3 Maps of Main Circuits Nos. 1 to 7, scale 1 mile=1 inch.
- 1 Plan Cantonments of Jhansee, scale 10 chains =1 inch.
- 1 Volume Atlas of Congregated Village Plans of Main Circuits Nos. 1 to 6, scale 20 chains=1 inch.
- 1 Volume Main Circuit Traverses of Main Circuits Nos. 1 to 7.
- 1 Volume Village Registers and Traverse Computations of Main Circuits Nos. 1 to 6.

Arrears not yet lodged.

- Volume of Congregated Village Plans of Main Circuit No. 7.
- Volume of Village Registers and Traverse Computations of Main Circuit No. 7.

Records for Season 1860-61.

- 1 Index Map of Season's Operations.
- 4 Maps of Main Circuits Nos. 8 to 16.
- 1 Volume Atlas of Congregated Village Plans of Main Circuits Nos. 8 to 13, scale 20 chains=1 inch.
- 1 Volume Main Circuit Traverse Computations of Main Circuits Nos. 8 to 16, and 27.

NOTE.—1 Map of Main Circuit No. 27, containing the northern part of the Tehree State surveyed in 1850-57 and partly in 1860-61, scale 1 mile=1 inch.

Arrears not yet lodged.

- Atlas of Congregated Village Plans of Main Circuits Nos. 14 to 16, and 27. Volume of Village Registers and Traverse Computations of Main Circuits Nos. 8 to 16, and 27.

approached by the regular Passes, thus making it a matter of considerable difficulty to carry on Survey operations. The streams intersecting the country are characterised by heavy masses of closely-set ravines, and all these have been very well shown on the Maps. Reliable and excellent details are supplied by these Maps of a country hitherto but little known, and which, during the late mutiny, was the scene of some of the most daring exploits of the British Troops. Geographical notes are also given, which add materially to the general usefulness of the results of this Survey, which are most interesting and valuable.

146. I have derived the highest satisfaction from the manner in which

Credit due to Surveyor for restoring Jhansee Records.

Captain Adrian Vanrenen has succeeded in turning the labors of the late unfortunate and lamented Jhansee Party, under their brave leader, Captain Burgess, to such practical results. The success attained in putting these mutilated records of 1856-57 to rights is due entirely to Captain Vanrenen's and his Assistants' energy and perseverance. Nothing but the decided professional ability and experience exhibited by this Surveyor could have disentangled a mass of figures and Field Books from such confusion, and the highest credit is due to him and his Establishment for saving the

Government a heavy expense in re-surveying the whole, which must otherwise have been done. The entire duty was a novel and unpleasant one for all engaged on it, and it was gone through most effectually and zealously.

147. Separate Surveys and Plans on a large scale (4 chains to the inch) have been made of the City and Fort of Jhansee. These Plans are beautifully rendered, and most useful additions to the ordinary records of a Revenue Survey. The Village Congregated Plan Sheets are also highly approved, and the Village Registers are complete with the statistical information. Captain A. D. Vanrenen not only does all his work admirably well, but he is ever precise and regular in every business matter.

148. Three separate Meridional Series* of the operations of the Great Trigonometrical Survey pass directly through Bundelkhund, whilst the Calcutta or Great Longitudinal Series traverses the southern limits of the Province, skirting the Saugor and Nerbudda Territories. Great facilities were, therefore, afforded for connecting the present Survey, and a large number of Stations have been taken up, chiefly of the Budhon and Rangir Series; and notwithstanding all the difficulties met with as above described, it is a matter of satisfaction to be able to record the following comparison of the direct distances obtained from both operations:—

* The Bundhon Series.
Rangir "
Amna "

NAMES OF G. T. STATIONS.		Distances from Revenue Survey.	Distances from G. T. Survey.	Total error of Revenue Survey.	Average error per mile.
		Feet.	Feet.	Feet.	Feet.
SEASON 1856-57.	Kathera ... to Bhitari ...	109581-78	109663-13	- 81-35	3-91
	Kathera ... to Gwali ...	174808-26	175533-32	- 725-06	21-90
	Bhitari ... to Gwali ...	147649-26	147902-70	- 253-44	9-06
	Bhitari ... to Algi ...	125350-50	125159-48	+ 191-02	8-04
	Average where the error is +	125350-50	125159-48	+ 191-02	8-04
" where the error is -	432039-30	433099-15	- 1059-85	12-95	
SEASON 1859-60.	Mao ... to Shergarh ...	112683-78	112688-80	- 5-02	0-23
	Narwar ... to Shergarh ...	11970-42	11990-00	- 19-58	8-63
	Narwar ... to Algi ...	150258-24	150233-39	+ 24-85	0-87
	Raon ... to Algi ...	79673-88	79734-00	- 60-12	3-98
	Ghataoli ... to Algi ...	95088-18	95089-00	- 0-82	0-04
	Algi ... to Gwali ...	119323-38	119314-26	+ 9-12	0-40
	Amarpoor ... to Gwali ...	61226-88	61307-00	- 80-12	6-90
	Talapahari ... to Gwali ...	82399-68	82406-00	- 6-32	0-40
	Ghataoli ... to Gwali ...	61112-04	61111-00	+ 1-04	0-09
	Talapahari ... to Amarpoor ...	34826-22	34773-00	+ 53-22	8-06
	Ranha ... to Amarpoor ...	42368-04	42332-00	+ 36-04	4-49
	Ranha ... to Talapahari ...	37472-82	37467-00	+ 5-82	0-82
	Average where the error is +	445360-74	445230-65	+ 130-09	1-54
" where the error is -	443042-82	443214-80	- 171-98	2-05	
SEASON 1860-61.	Gwali ... to Paba ...	31563-64	31526-00	+ 37-64	6-30
	Gwali ... to Benarsa ...	106863-31	106779-00	+ 84-31	4-17
	Gwali ... to Andhiari ...	189249-26	189177-21	+ 72-05	2-01
	Gwali ... to Dhandkna ...	169392-10	169197-35	+ 194-75	6-08
	Paba ... to Talapahari ...	71198-62	71234-00	- 35-38	2-62
	Paba ... to Jhakaora ...	80004-68	79965-00	+ 39-68	2-62
	Paba ... to Andhiari ...	169474-80	169445-00	+ 29-80	0-93
	Paba ... to Dhandkna ...	138204-66	138059-00	+ 145-66	5-57
	Paba ... to Benarsa ...	80117-40	80090-00	+ 27-40	1-80
	Paba ... to Ratangaonwa ...	113425-16	113366-00	+ 59-16	2-76
	Andhiaree ... to Balapahar ...	28487-65	28461-00	+ 26-65	4-94
	Andhiaree ... to Talapahari ...	109568-38	109544-00	+ 24-38	1-18
	Andhiaree ... to Jhakaora ...	90773-99	90779-00	- 5-01	0-29
	Andhiaree ... to Barh ...	136375-80	136354-00	+ 21-80	0-84
	Andhiaree ... to Dhandkna ...	167545-62	167616-29	- 70-67	2-23
	Andhiaree ... to Birari ...	92467-91	92464-00	+ 3-91	0-22
	Balapahar ... to Birari ...	74938-45	74995-00	- 56-55	3-98
	Birari ... to Barh ...	58366-84	58370-00	- 3-16	0-29
	Birari ... to Dhandkna ...	75332-40	75428-00	- 95-60	6-69
	Dhandkna ... to Barh ...	54202-50	54189-00	+ 13-50	1-32
	Dhandkna ... to Benarsa ...	77049-46	76992-00	+ 57-46	3-94
	Dhandkna ... to Bijli ...	11401-10	11398-00	+ 3-10	1-44
	Dhandkna ... to Ratangaonwa ...	89467-13	89499-00	- 31-87	1-88
	Dhandkna ... to Mamon ...	52813-00	52785-00	+ 28-00	2-80
	Barh ... to Ratangaonwa ...	91353-11	91496-00	- 142-89	8-25
	Bijli ... to Mamon ...	53357-50	53278-00	+ 79-50	7-88
	Benarsa ... to Ratangaonwa ...	39090-35	39058-00	+ 32-35	4-37
Bhoraj ... to Datara ...	143809-71	143743-40	+ 66-31	2-43	
Average where the error is +	1876918-37	1875870-96	+ 1047-41	2-94	
" where the error is -	718976-16	719417-29	- 441-13	3-24	
Average on the whole where the error is +	2447629-61	2446261-09	+ 1368-52	2-95	
" " where the error is -	1594058-28	1595731-24	- 1672-96	5-54	

149. The above Table shows a general average error in the Revenue Survey chain measurements, on the excess and defect differences respectively as follows :—

	Fect.
For Season 1856-57 {	+ 8.04
Mapped 1858-59 {	- 12.95
1859-60 {	+ 1.54
	- 2.05
1860-61 {	+ 2.94
	- 3.24
	<hr style="width: 50%; margin: 0 auto;"/>
Mean of the whole {	+ 2.95
	- 5.54

These results are highly satisfactory, and bear ample testimony to the care which has been bestowed on the operations. The differences for the late Captain Burgess's work are higher than what generally obtains now in the Department, but that unfortunate Season must be held exceptional. Better results than those of Captain Adrian Vanrenen's, I believe, could not possibly be obtained with the instrumental means and appliances of the present day. The ground gone over in 1856-57 was also worse and more rugged than that of the succeeding Seasons.

150. The following explanatory remarks, geographical and statistical, given in the Revenue Surveyor's Annual Reports for 1859-60 and 1860-61, afford interesting and useful information of the description of country passed over, the features, soil, roads, tanks, forts, &c., of Bundelkhund :—

EXTRACT FROM ANNUAL REPORT OF SEASON 1859-60.

“ 49. With regard to the country brought under Survey, the eastern parts of Pergunnah Kurehrah and Puchore are open, rocky, and undulating, through which a few small streams flow; and in these there is generally water during the cold weather months: towards the west the country becomes more hilly; a part of the celebrated Bindachal Range is here met with, and which extends as far as Nurwur to the north-west. Small sharp ranges of hills also crop out of the ground here and there; they are of granitic origin, and their surface is covered with loose stones and small stunted-looking shrubs; they are nowhere of any great height.

“ 50. With the exception of the country in the vicinity of the tanks, for which these parts are so famed, the cultivation may be said to be very limited, which is greatly attributable to the poorness of the soil. The “ Mar,” or rich black cotton soil, is hardly known, except near the “ Sonairee Dahaila” tank to the north, where a little of it exists. The cultivated parts are generally covered with loose stones and stunted shrubs, which grow very rapidly, so much so, that a field, which has lain fallow for more than two seasons, is hardly recognizable from the jungle which surrounds it; mixed up with the small jungle there is a great deal of grass, on which graze large herds of bullocks and numerous flocks of sheep.

“51. The forest and fruit trees, common to the rest of India, are also found here, but generally of stunted growth. The “Mohwur” appears to be here quite what the cocoanut is in Bengal; its blossoms, when they drop, are carefully collected, dried, and eaten; its fruit is also eaten and distilled into spirits; from its seed oil is expressed, and its trunk gives the best planks and timber which are to be got in the country. It is consequently much prized in a poor country like that we surveyed, and each tree is carefully watched and attended by its owner.

Forest and Fruit Trees.

“52. The Bindachal Range to the west, famed in Hindoo lore, have a very picturesque appearance from the plains; they rise abruptly out of the ground, and look like a wall of mountains in the distance; when the ascent has been made a table-land is got to, on which are numerous villages: some of them are fairly cultivated, but others are entirely covered with dense dwarf jungle. The high road from Goonah to Jhansee passes over this plateau.

Bindachal Range.

“53. A small aboriginal tribe of Bheels inhabit the jungles of this range; they are denominated “Sehuryas” here, and live in the jungle or in the outskirts of the village; they subsist principally on wild fruits and roots, never plough the ground, but sometimes during the rainy season dribble some maize, or pulse, into the ground, with a sharp-pointed stick; they are altogether in a most primitive condition, and are generally looked upon by the other races as outcasts.

The small tribe of Bheels.

“54. A small flat-topped hill, called “Mohar-ke-puhar,” situated in the centre of the Puchore Pergunnah, has a curious appearance from the distance. Its top is quite flat, and on it a few small tanks have been excavated; some strange superstitious legends are attached to it, and on its sides some small temples have been built. It was formerly covered with bamboo jungle, but which has been lately cut down to build the new Cantonment at Jhansee.

The Hill Mohar-ke-puhar.

“55. I must not fail to allude to the tanks for which Bundelkhund is so well known; they have been mostly formed, with great skill, by throwing a masonry wall or Bund across some opening or outlet in a range of hills. The drainage of the country during the rainy season having been thus dammed up, a large sheet of water is formed; from this numerous cuts have been made to carry the water to the fields at a lower level. Some of the Bunds are stupendous and immense masses of masonry; they have been principally formed for irrigation purposes, the sterility of the soil requiring such an artificial aid; and the dark green vegetation of the fields around these tanks is quite the exceptional feature of the country. As they were made in a lawless period of history, the range under which they are situated has generally a Fort or Gurri on it; the most of these are now in ruins, which adds to the picturesque appearance which these Forts, with a large sheet of water in the foreground have when viewed from the distance. The tanks abound with fish, and, during the winter months, their surfaces are covered with thousands of water-fowl of all kinds, which afford a great attraction to the lover of such sport. Of the tanks surveyed those of “Sonairee Dahaila,” “Mohareer Doomdooma,” and Puchore are the most important, the first-named being largest.

Tanks of Bundelkhund.

“57. The high roads which pass through the tract surveyed are those leading from Jhansee to the Stations on the Agra and Bombay road and to Lullutpoor. The road to Kurehrah, and thence onward to Nurwur and Amola, is in fair order during the cold weather months; it is slightly raised by an embankment and is bridged in a few places; it passes through some large villages where supplies are abundant. The road which passes through the Tehscelee Station of Puchore and onwards through the Meyapoor Ghât is also fair, but has a few or no bridges on it.

High Roads.

“58. The road to Lullutpoor, over the SIRRUS Ghât, is little more than a village path, the greater length of which is covered with loose stones, and I believe it has not yet been decided over which of the two Ghâts of the Betwah,

Saugor Road.

viz., Sirrus or Jerrer, the line of road from Jhansee to the Head Quarter town in the neighbouring district should be taken. The other roads connecting large villages and the Tehseel towns with each other are little more than paths, over the most of which wheeled carriage lightly laden can be taken; the light two bullock primitive-looking Bundela cart being well adapted for this traffic.

“59. The “Sind River,” which passes through a great part of the country surveyed, is a clear, picturesque stream, with a rocky bed and well-defined banks.

Sind River.

Like all Indian streams, it is subject to sudden rises during the rainy season, and is then sometimes unfordable for days, but at other times is fordable nearly opposite each village. The best fords over it are those at Amola, Begowan, Mahaorah, and Kainwaha, where a large body of men have to cross these fords; it would be advisable to send parties in advance to clear the passage of the large rocks and loose boulders which generally cover the bed of the rivers in these parts. In the vicinity of Nurwur two noble stone bridges span it, built by the Mahomedan Emperors for their road which led to the Deccan. The one to the west has 33 arches, 28 pointed and 5 flat; the latter of modern construction, and when I saw it last was in fair preservation. Troops sometimes pass over it when marching to Seepree, in order to avoid the rocky ford at Amola, but the traffic of the country now goes over another line; the bridges are consequently little used. The north-east bridge has 24 arches, some of which have sunk and are out of repair, but do not interfere with the roadway.

“60. The Mohwur Nullah, a tributary of the Sind, rises in the Bindachal Range to the south-west of Meyapoor, and after flowing for about 60 miles in a north-east direction, through the Kurrehrah Pergunnah, joins the

Mohwur Nullah.

Sind near Hunotia in the Dutteah State. There is water in it nearly throughout the year; its bed is rocky and covered with loose stones; the banks high and well defined; it is subject to freshes during the rainy months, which sometimes render it unfordable for a few hours. It derives its name from the Mohwur tree, one of these growing near its rise, or over the spring at its head.

“61. The Betwa, or Betwanti, flows to the south of the Puchore Pergunnah, half the stream forming the boundary between it and the neighbouring

Betwa River.

District of Chundairee. From its source to its junction with the Jumna River near Humeerpoor, it receives many small streams to the right and left; during the rainy months it is liable to sudden rises, becoming a large river overflowing the banks here and there for a few hundred yards, and remaining unfordable for days. A ferry boat then plies opposite “Sirrus” from bank to bank; at other seasons it is fordable in most places; its bed is rocky, covered with large boulders and loose stones. It is well stocked with a great variety of fish, some of which readily take the fly, and it is considered one of the best fly-fishing streams in Bundelkhund; along its bed, like that of the “Cane River,” some beautiful pebbles are to be found, which take a high polish, and form very pretty ornaments. During the cold weather months the scenery along its rocky banks wooded to the edges is very beautiful, the water being clear as crystal, and the noise of the stream flowing at a gentle rate over and between large rocks harmonious to the ear.

“62. Of the cities of note met with, Nurwur may be named as the chief; it is situated to the south of an isolated hill, on the height of which a long irregular Fort has been built; it is surrounded by a high masonry wall,

Nurwur City.

and a ditch with water in it in places; but the most of it has been silted up. At the openings through which the different roads lead, large gate-ways have been built; a broad flight of stone stairs, excavated out of the sides of the hill, lead from the town to the Fort, which contains an old palace and numerous old buildings, all built of stone, but the most of which are now in ruins; the palace occupied by the Europeans in the employ of Scindiah is pointed out as a noted place, also the small Catholic Chapel built by them, in the yard of which are several Christian graves. The tablets of a few of them still remain, and on one of them the year A. D. 1747

is plainly legible; legends are also told of the dense population which inhabited the Fort in past times, and how valuable every foot of land in it was for building purposes. Numerous wells and a large tank have also been excavated out of solid rock for supplying the inhabitants with water. The ruins, and the view of the surrounding country which you have from the Fort, make it worth visiting. With the exception of the guard, which Scindiah keeps at the gates, it is almost uninhabited; the roads through it being now grown over with grass and strewn with loose stones from the ruins of old palaces and mansions the nobles formerly inhabited. In the vicinity of the town on the outside, numerous graves, the ruins of temples, palaces, &c., are met with, all which tend to show that it must have been an important place once, and history mentions that it has oftentimes been a battle field. To the west of the town and along the sides of the tank a few pawn gardens exist, the produce of which is exported to Gwalior and other markets, where it obtains a good name.

“63. The walled City of Kurehrah is situated at the foot of the hill on which the Fort is. It contains a few pukka houses, also the Tehseelee. The Fort was dismantled in 1858-59 by a Company of Bombay Sappers, and the most of its towers blown up. The interior is now strewn over with the *debris* of the explosions, and all the old buildings destroyed and roofless.”

Town of Kurehrah.

EXTRACT FROM ANNUAL REPORT FOR SEASON 1860-61.

“37. The characteristic features of the country surveyed are much the same as those parts of Bundelkhand reviewed in my previous Reports; the general aspect being undulating, with small sharp ridges of low hills abruptly rising out of the ground. Numerous small streams water the country; their banks are overhanging, rocky, well-defined, and, unlike most Indian streams, they seldom change their course. The soil is everywhere strewn with loose stones, which interfere much with agriculture, and will always prevent the extensive cultivation which we see in other more favored parts of India. Round and about each village site some limited cultivation is carried on, but the most of the ground is covered with a thorny, scrubby jungle interspersed here and there, with the usual Indian fruit and forest trees, mostly of a dwarf character, caused, I fancy, by the stony nature of the sub-soil. This jungle is intermixed with long luxuriant grass, which forms good pasturage for the vast herds of cattle which they keep in the villages; it makes good hay, which is cut and stacked in the autumnal months for consumption in the rainy season, when it is difficult to send out the cattle to graze.

“38. The Betwa River I have described in my last Report; the Jumnee and Dussan Rivers in this part partake of its character, except the latter is less over-strewn with huge boulders, and a ford over a sandy bed is in places met with. During the last rainy season these three became large rivers, overflowing their banks, and remaining unfordable for months. The volume of water and the velocity of the stream in the Betwa was so great, that all postal communication between Jhansee and Lullutpoor was cut off for eleven days. The Sajad, Sujnam, Suprar, and Oor Nullahs, tributaries of these, have also a great deal of water in them during the rains, and are often unfordable for days.

“39. The “Saugor and Calpee” high road, lately made a 3rd Class Imperial one, passes through Lullutpoor and Tal-Behut; just now it is little more than a village road, not metalled, but some of the streams along it are crossed by bridges or causeways. It is proposed, I am informed, to take this road over the Jerur Ghât. I may state that this passage has been unfordable since the first rain fell to the present moment, a period of upwards of six months. The bed of the river will, therefore, have to be greatly altered to render the communication over it available throughout the year, and which, I should say, can only be done at a great

Features of Bundelkhand; its soil, &c., &c.

Betwa, Dussan, and Jumnee Rivers.

expense. The Ghâts which were used during the last rains are the SIRRUS (where a ferry boat plied), and the Soorung or Sooraiya Ghât, about three miles higher up than the Jerrur, where canoes were placed, which have brought over the Post bags since the rains commenced. The Gooreeya Ghât on the Dussan is a good one, and the best for wheeled carriage.

“40. The road connecting Lullutpoor with the large City of Chandairee, now in a ruinous state, is a fair one, not metalled, and with a few bridges on it; it crosses the Betwa by the Raj Ghât, a good one and fordable in the dry season. In the rainy season a ferry boat is generally placed here.

“41. The roads leading through “the Tehree State” are little more than village paths, being without bridges, and only receive some slight annual repairs, which just keep them open for wheeled traffic. On the one connecting Tehree with Oorcha where it crosses the Betwa, a ferry boat plies.

“42. Of the tanks for which Bundelkhund is famed, those at Tal-Behut of Lullutpoor, Bumrol (called the Beer Saugor), Jairown, Nudunwara, and Burana of Tehree are literally, I may say, artificial lakes; these large sheets of water add greatly to the picturesque beauty of the country, and their importance and value in a sterile country cannot be over-estimated; every drop of water which can be carried from them to the lower levels being used to raise crops of grain, where, without this means of irrigation, hardly a blade of grass would grow in the spring. Their extent varies greatly during the course of the year, and as the ground at their sides is left dry by the water being drained off, it is at once put under cultivation; the deposit thrown on it from the water making it rich and fertile. It is a matter of regret that, on the whole, they are somewhat neglected; their Bunds, stupendous erections of stone, imbedded in mortar, do not receive those annual repairs which all such artificial works require; the consequence of which is a great deal of water leaks through them and escapes to waste. The surface of the one at Tal-Behut was nearly a square mile in December last after a remarkably dry season, and those in the Tehree State are, if anything, larger than this.

“43. The Head Quarters of the District are at Lullutpoor, which is centrally situated. The Civil Station has been neatly laid out; numerous metalled roads, with fine avenues of trees, intersect it. As it is situated on the black soil with water near the surface, it is green throughout the year, which gives it a pretty appearance. It has a pukka Jail, small Staging Bungalow, a Court House, Police Lines, the usual other Civil buildings, and a few private Bungalows, which have been lately erected. The Cantonments adjoin it, where European Troops, consisting of two Companies of Infantry, since the mutiny, have been located, and for whose accommodation five fine large barracks have been lately erected. A Wing of a “Native Levy” is also stationed there. As the place has, however, proved itself unhealthy during the autumnal months for Europeans, it is, I believe, contemplated to withdraw them. The town is little more than a village; it possesses a Tehseelee and Thannah, both insignificant buildings.

“44. The Fortress of Tal-Behut to the west of the tank is situated on a ridge of low hills; it covers an extensive space of ground, and was formerly a most important post of the Banpore Rajah. In 1859 it was completely dismantled, and its strong outworks blown up by a Company of Bombay Sappers and Miners stationed there for that purpose. The village at the foot of the Fort is a large one, and its situation on the high road enables it to carry on a good trade in grain. A Thannah and small Staging Bungalow have been erected here.

“45. The Town of Banpore, where the rebel Rajah of that name resided, is of no importance; it is of some extent, but most of the houses are cutcha. The Ghurree, or small Fort, is on a commanding height, and surrounded

by a large wet moat; the access to it being over a Bund thrown across it. All the buildings in it have been more or less destroyed; the eastern face having been blown up by Sir Hugh Rose's Force in 1858; this place can be seen from a great distance, and, as it quite overtops everything, has a pretty appearance. The Tehseelee used to be here, but it has now been removed to Mehrownnee.

“46. The village of Jukora is a flourishing one, where a good trade is carried on. The tank to the west of it is a fine one; the water being extensively used for irrigation.

Villages of Lullutpoor.

“47. At Sirsee there is a small Ghurree, in which reside a colony of Gossain Fakeers, who have possessed, for ages past, five rent-free villages: they have some local influence, and their villages are well cultivated.

“48. At Barr and Bansee Thannahs have been located; the tank at the former is a fine one.

“49. The other villages, Kottera, Kundharee Kullan, Kullianpoora, Kelgawn, and Dehulwara, are large ones for these parts, but of no significance, with the exception of a pucka house or two, in which the head man and his family reside: most of the other buildings are cutcha and mere huts.

“50. Oorcha, the old Capital of the Tehree State, is now almost in ruins; most of the inhabitants who resided there having quitted it for other towns.

City of Oorcha.

With the exception of a few permanent places, such as temples, stone palaces, every building within the walls has fallen into ruins. It covers about $3\frac{1}{2}$ square miles of ground, and the circumference of its walls is about seven miles, which show its extent and the importance of it in former days. The fortress within the city, situated on an island of the Betwah, is a fine, massive-built structure; it contains a citadel, within which is the Rajah's palace, all in fair preservation; and from the top of the palace you have a fine commanding view of the surrounding country. A Detachment of the State Troops is stationed here and located within the Fort; a long stone bridge spans the branch of the Betwah, connecting the Fort with the city. There are some fine temples about the town, whose lofty spires can be seen from a great distance. The Court abandoned it as the Capital when the Jhansee Territory was wrested from the State by the Mahrattas, from which period its decay is dated.

“51. Tehree, the present Capital of the State, is little more than a large village, of little or no importance, with a few pucka buildings, in which the Sirdars (nobles) reside; it is surrounded by a wall to the east on a ridge of hills; a Fort has been erected in which is the State Palace now occupied by the Regent Dowager Ranee (the heir being a minor). The country about it is rather open, and appears to be well cultivated; outside there are some extensive gardens in fair order; also parts of a fine pucka bund not completed, which was evidently designed for the purpose of forming the Bindrabun Tank into a much larger one, like those in other parts of the State.

The City of Tehree.

“52. The Town of Pirteepoor has a flourishing appearance, and a good trade is carried on there. Its position on the high road from Tehree to Burwa Saugor is a good one for trade. In the small Ghurree the Tehseelee is placed.

Towns and Villages of Tehree.

“53. The Village of 'Lidhowra' is of some extent; when Oorcha was abandoned as the Capital the Court was located here for a year, which caused many of those who had to quit Oorcha to make their homes here.

“54. The Fort of Pursotumghur is situated near the Dussan River, and in a good strategical position to command the ghât, and the road leading from Tehree to the Native States east of the river. It is a strong one, built in the plain about 450 yards from the ghât; it has high masonry ramparts and bastions. The village of Puchaer is situated about half a mile to the west of it, and the Gunge (hamlet) a short distance to the north of it.

"55. Juttara is situated on the edge of a tank, and was formerly named Selimabad after the Emperor of that name; the many ruins about it denote that it must have been of some importance formerly. Several respectable Mahomedan families reside here. The palace is pleasantly situated within the Fort and over the tank; it is in fair preservation, and one of the best, I may say almost, in Bundelkhund; the Court occasionally remove to this place for a short residence. The hill to the east is called Ubda Peir-ka-pahar, the summit of which is of considerable extent, and where a fair is held annually.

"56. The Fort of Ramgurh has been built on a commanding position on a hill about 200 feet high; the walls being in good preservation. The town itself is a thriving one, where a good red dye from the Aal plant is manufactured, and extensively used about here to make the kurwa cloth, which is so largely exported to all parts of India.

"57. The Town of Pallehra is of considerable size, and well situated on the Tehree and Nowgong Road. The Rases of Pallehra owns several of the surrounding villages, and was compelled to abandon his Fort during the disturbances in Bundelkhund in 1842. The jungle to the south of it is a dense impenetrable one, covering a succession of low hills, and abounds in game and the wild beasts indigenous to the country.

"58. At Dehree there are the remains of a Fort which the Rao of that place was forced to dismantle at the same disturbed period.

"59. The Fort of Mohungurh is an important one, situated on the sharp ridge of a hill; from it a chain of small bastions runs southwards along the crest, the object of which is to protect the town immediately below. It is confined by the tank to the west.

"60. 'Dogara' is a large and thriving place, where a considerable trade is carried on; large exports of grain were made from it during the famine year of 1861. The roads from Jhansee to the south, and that from Lullutpoor to the east, pass through it. A small Gurhee has been erected here.

"61. Bumori-Meer-kee is an important place, possessing a large pukka Fort in fair preservation.

"62. Jairown is a fine village along one of the famed tanks; it is held in jagheer.

"63. There are small Gurhees, or loopholed pukka houses, generally built in commanding positions, and with only one opening, in which the takoor, or head man of the village, resides at Mujna, Phootaer, Goona, Ramnugger, Koomehree, Kooraonee, Mogna, and Malpeeta, and as the policy of the State is not against such strongholds being built, they are kept in good repair unlike those in the British Districts, which have been either dismantled or allowed to fall into ruins."

151. The labors of the current Season of 1861-62 furnished the remainder of the Lullutpoor District, bringing the Survey down to the old surveyed boundary of the Saugor District; a complete junction having been formed. An area of 1,022 square miles of Revenue detail work, village by village, has been effected, together with 453 square miles of topographical delineation of the Native State of Tehree or Oorcha, which has now likewise been completed. The Pergunnahs, as per margin, have fallen within the operations of the Season, either entirely or partially, and this completes all the British Districts on this, or the western side

of Bundelcund, commonly called the Jhansee Division or Commissionership, under the North-West Government. The small Native State of Oocheerah, in which Nagode (or Nagoudh) is situated, was separated from the North-West

Lullutpoor.
Banpoor.
Melhrownce.
Murowra-Narhut.

Government by a Resolution of Government, Foreign Department, issued from Allahabad in 1858, and it was placed with the three States of Myhere, Bijragoogurh, and Sohawal, under the administration of the Political Agent at Rewah.

152. The operations of this Establishment having advanced so far, the subject of its further employment was recently referred to the North-West Government, when His Honor expressed his views to the effect that all the British Territory in this neighbourhood being completed, it was desirable that the territories of the Native States in Bundelcund, geographically incorporated with our own possessions, should be surveyed topographically, with a view to the compilation of a general Map of the whole of the Province, both British and Native, or, in other words, for the filling up of the several sheets of the Atlas of India, Nos. 69 and 70, with parts of 51 and 52. This is strictly in conformity with the original Resolution of the North-West Government issued in 1853, when the late Captain Burgess entered the territory, and which it may be convenient for future reference to record in this place.

No. 212A. of 1853.

REVENUE DEPARTMENT, N. W. P., DATED 29TH JANUARY 1853.

Extract, Paragraphs 1 to 4.

“ 1. The Lieutenant-Governor proceeds to detail the measures which will be necessary for completing the Survey of the territory under British management in Bundelcund, and in the Saugor and Nerbudda Territories.

“ 2. Lieutenant Burgess's Survey Party now engaged in the eastern part of Rohilkhund, as soon as it has completed the work allotted to it in this Season, will move into Bundelcund, and commence the Survey of the northern part of Kuchwahaghur, where the Scinde River falls into the Jumna; thence the Survey will proceed southward through Kuchwahaghur and the other Pergunnahs transferred to British management from Scindiah and the Jhansee Rajah, and also the Territory of Jeitpoor, all of which are now within the jurisdiction of the Superintendent of Orai. When these are completed the Survey will proceed southward and westward into the Saugor and Nerbudda Territories, so as to Survey all the Pergunnahs, whether British or Scindiah's, which are administered by the Commissioner of those territories.

“ 3. Towards the close of the next Season (that of 1853-54), when Lieutenant Vanrenen will have completed his work in the western portion of Rohilkhund, his Survey Party will move down into the Jubbulpoor District and commence from the base formed by Captain Wroughton's Survey of Sohagepoor. Thence it will proceed southward and westward to Survey the territories on the Nerbudda, administered by the Commissioner. The particular parts of these territories to be surveyed by either Party will be arranged between them when the time for decision arrives.

“ 4. One of the two parties proceeding westward from Hashingabad will Survey the Pergunnahs in Nemaur belonging to the British Government, to Holkar, and to Scindiah, now administered by the Superintendent at Mundlaisur. Thence the Survey will extend to the small

Pergunnah of Manpoor, administered under the immediate orders of the Resident at Indore, and onwards to Scindiah's transferred Pergunnahs of Jeeun and Jawud around Neemuch."

153. It will be observed from the Resolution that the Saugor and Nerbudda Territories, as administered under the Commissioner of that old Division, were embraced in the original programme. It has been before shown how the separate Parties deputed to the Saugor and Jubbulpoor Districts some years ago were driven away, and one of which only has returned to renew its labors south of the Nerbudda, whilst Saugor, Dumoh, and all the Native States north of the same river remain unrepresented up to the present date. It becomes a question for consideration, therefore, with reference to the pressing necessities of the new Central Province, consisting of such an enormous area of British Revenue-paying Districts, whether or no they should take precedence of the Native States of Bundelcund. It is declared most important to relieve the pressure of the existing assessment by a new settlement of several of these Districts, which can only be effected by the means of our Revenue Survey system.

154. Looking to the great importance of this question, and believing the necessities of the Central Province to outweigh the object of obtaining only the geographical features of the Native Bundeela States, I have submitted my recommendation that this highly experienced and most excellent Establishment, fully trained and prepared for the duties of a minute detail Survey, shall be transferred from the Bundelcund Topographical work to resume the Saugor Revenue Survey, where it was abandoned in 1857 by the late lamented Captain Edward Willoughby, and from whence the operations may extend southwards to the Nerbudda and eastwards, including Dumoh, Bijiragoogurh, lately lapsed, and Nagode; the two latter now being under the Political Agency of Rewah.

155. Prior to the transfer of these Saugor and Nerbudda Districts from the jurisdiction of the North-West Government, it had been proposed by His Honor the Lieutenant-Governor to raise an entirely new Party for the purpose of pushing on the Revenue Survey of the Districts in the Valley of the Nerbudda, and a regular estimate was submitted for that purpose. But on the change to the Central Province being carried out, the North-West Government stopped the proposal, and further claimed exemption from the cost of the Party intended to be employed in the Native States, which would in right be chargeable to the Government of India from the commencement of the ensuing season.

156. The powers of expansion of the working staff of this Department are limited to the creation of new Survey Parties by degrees only. Unfortunately, trained Surveyors are not to be found for the asking; they are exceedingly scarce and most difficult to be obtained, and, as the capabilities of the

Department have been greatly tried of late, and the number of separate Parties now employed is greater than ever before known, it will not be possible to organize another new Party for the Central Province this next season, even if the Budget Estimate had provided for the same, which it has not. Consequently, the proposition above made for changing the course of Captain A. D. Vanrenen's operations is the only one whereby the wants of the British Districts in the Central Province can be met during the ensuing professional or cold season of 1862-63.

157. The Revenue Surveyor speaks in terms of warm acknowledgments of Major E. Clerk and Captain Corbett, Deputy Commissioners and Settlement Officers, for the valuable assistance and co-operation always rendered to the Professional Survey, and the interest taken by them in the work. Great attention, he states, has been paid to the preparation of the Hudbust, or Demarcation Papers, which were very neatly drawn on a large scale; the boundaries represented agreeing admirably with the Professional Maps; the Khusrah, or Field Native Measurement, being carried on under the Settlement Officer, and not yet having been completed, the Surveyor has had no opportunity of comparing the results, but he states that it has been established on a good footing, and is being prosecuted under experienced and trained men by Scale and Plane Table.

158. The arrangements made also by Dr. Stratton, Political Agent, were very good; the District of Lullutpoor having up to a very recent period been in an unsettled state, owing to the presence of small parties of rebels still lingering about there, and making inroads from the adjoining Native States; each detached Assistant's party had, therefore, to be protected by escorts of Cavalry and Foot, which were supplied from the Military Police under Lieutenant A. Thain, whose excellent disposition of his men had the best effect, and happily the operations were brought to a termination without any disaster similar to that mentioned in paragraphs 100 and 101 of my last Report.

159. To the survivors of that attack made by the rebels on a Native Surveyor's Party in a village in the Jhansee District, the North-West Government have been pleased to bestow small pensions as per margin, as communicated to me by letter, No. 1892, dated the 27th September 1859, the first-named individual being the only son of the late Native Surveyor, Torab Ally, who died from the wounds he then received whilst in the performance of his duty, and the remainder are Klassies; the pension granted to Moomtaz being one-sixth of

	Rs.	
Moomtaz	6-0	per mensem.
Untoo	2-8	"
Rajaram	2-8	"
Kuramt Khan	2-8	"
Khoosialloo	1-4	"
Gungaram	1-4	"

his father's salary, and to continue until he attains the age of 18, when he may be expected to be in a position to provide for himself.

160. The Revenue Surveyor reports most favorably of his European As-

Qualifications of the subordinate Staff.

sistants, who are declared to have worked with an energy and good-will highly commendable. Of Lieutenant Sconce, who has had two and a half year's practice, the highest expectations are formed; he is a most zealous, pains-taking Officer, with excellent judgment and temper. During his novitiate he has had ample means in a difficult Survey of perfecting himself in all the duties of his profession, and he has mastered them well.

161. From the progress this excellent Officer has made, and the highly favorable reports received regarding him from his immediate Superintendent, I had no hesitation whatever in recently selecting him for the officiating charge of the Jubbulpoor and Nursingpoor Survey in the room of Captain Oakes, proceeded to Europe on Medical certificate under the new Rules, and he was appointed accordingly by G. O. G. No. 1318, dated the 27th June 1862, and he joined at Jubbulpoor on the 24th of July, where I hope an extended sphere of usefulness is opened to him. That he will take advantage of it I have no doubt.

162. Messrs. H. B. Talbot, F. Kelly, and H. L. Pemberton are all most deserving Assistants, and highly spoken of. Messrs. Talbot and Pemberton especially are distinguished for good qualities and persevering efforts. Mr. Kelly, who originally came from the Sindh Survey, was transferred to the 2nd Oudh Division Party by G. O. No. 1536, dated 2nd April 1861.

Mr. H. B. Talbot to Assistant Surveyor, 2nd Class, by G. O. North-Western Provinces, No. 152A., dated 25th February 1862...	Rs. 300
Mr. F. Kelly to Senior Sub-Assistant by G. O. North-Western Provinces, No. 321A., dated 24th April 1861...	200
Mr. H. L. Pemberton to Sub-Assistant, 2nd Class, by letter No. 150A., dated 25th February 1860	175
Mr. M. Brennan to Junior Sub-Assistant...	100

Messrs. Brennan and J. Pemberton, two Junior Sub-Assistants, appointed after passing the prescribed examination, the former in December 1858, and the latter in October 1860, are promising young men, and have given satisfaction. The several promotions,

as per margin, have been carried out during the period under review. Mr. W. Ward, a Junior Sub-Assistant on this Survey, entertained December 1858, was transferred to the 2nd Oudh Party by G. O. No. 4626, dated 5th October 1860.

163. The Native Staff of this Party is also highly efficient, and, under such Native Surveyors distinguished for good work.

Radhanath Chuckerbutty.
Koor Singh.
Hittan Loll.
Aggur Allee.
Pursootum Singh.
Jye Loll.
Oomrao.

excellent supervision, have been brought to their present state of usefulness. The Native Surveyors, named in the margin, are declared "to have given great satisfaction, and to have performed good work." Of the first-named, the Surveyor reports that "it was almost solely by the aid of his extraordinary powers of memory, that

he was able to put together the whole of the mapping records surveyed by the late Captain Burgess, under whom he served. This Native Surveyor, Radhanath Chuckerbutty, has a great aptitude for figures, is hard-working, trustworthy, correct in his calculations, and invaluable in a Survey Office." He has been promoted to a salary of Rupees 60 per mensem, and the others so well spoken of, also suitably provided for.

164. It will be apparent from my several observations on this Survey that I entertain a very high opinion of **Opinion of Revenue Surveyor.** Captain A. D. Vanrenen as a most practical and indefatigable Surveyor. In my last printed Report I had occasion to point out his superior qualifications and aptitude for the Department, and the three years' experience he has since gained, in command of important operations, which he has managed with great effect, proves his value as a Department

Extract of letter, No. 108-659, dated 3rd October 1860, from the Surveyor General, to the Deputy Surveyor General.

"2. Having yourself inspected this Survey Party last year, you are well aware of Lieutenant Vanrenen's careful management and the able manner in which he performs his duties. It was a great pleasure to me to see the excellent drawing of the Maps, and careful style in which the records are brought up. The quantity of work executed with the moderate means at his disposal appeared creditable to the industry of himself and the Assistants under his orders. The fair 1 inch scale Circuit Maps are remarkably well done, and the topography well executed. From my personal knowledge of part of the ground, I can bear testimony to the fidelity of the delineation. I think these Maps will please you, and they will prove a valuable addition to our accurate geography of the country. The country I know to be difficult to Survey, and this circumstance enhances the merit of the Surveyor.

"3. I was much pleased with the Assistants attached to Lieutenant Vanrenen's Party. They appear to be zealous, active, smart, able in the performance of their duties. Lieutenant Vanrenen informed me that he was well satisfied with their excellent conduct both in field and quarters, as well as with their professional merits.

"4. Lieutenant Sconce's character, as an excellent Officer, is well known, and I congratulate you on having secured for the Department a gentleman of such excellent promise.

"10. Altogether, I was highly pleased with my visit of inspection to this Survey Party. The tone and spirit of the whole Establishment impressed me favorably. The work, Maps and records, afford a good proof of the excellent manner in which the important and interesting Department over which you preside is conducted. I append a Statement of the result of this Survey contrasted with the numerical values of the G. T. Survey. This comparison, you will observe, is highly satisfactory."

then at Agra, whilst on a short privilege leave, and I was much impressed with the manner in which he conducted all his work, and with the efficiency of his Establishment generally.

165. A new Covenanted Assistant is now required for this Survey in the place of Lieutenant Sconce promoted, and as soon as a duly qualified young Officer can be found likely to meet the special requirements of this Department, his name will be submitted, and I trust in good time for the ensuing Field Season's operations.

New Covenanted Assistant.

166. The one inch Pergunnah Maps of the Jhansee District having been greatly in demand for various purposes, **One Inch Maps published.** they have been lithographed and issued.

These valuable Maps have enabled the Civil Authorities to lay down the new boundary of Scindiah's Territory; all the Pergunnahs west of the Betwah, including the Fort but not the Cantonment of Jhansee, having been transferred to Scindiah in exchange for other territory made over to the British.

167. A general Map of all the work done by the late Captain Burgess, in the Bundelcund Division, together with that described in the present Report, has been compiled on the usual geographical scale of 4 miles to the inch, but owing to

District or General Map compiled and preparing for publication.

the scattered nature of some of the Pergunnahs and parcels of Native States surveyed, it is not yet in a fit state for publication, but on receipt of the remainder of the Lullutpoor and Tehree Maps, containing the result of the current Season's Survey, I hope to be able to lithograph the compilation at the end of the present year, and this desirable object will not be lost sight of. These materials will correct large portions of the two sheets of the Indian Atlas, Nos. 69 and 70, already published, but very defective, and give at one view the entire new Jhansee Division.

FIRST, OR BAIWARRAH DIVISION, OUDH.

Late Sindh Saugor Doab, Punjab.

168. During the period under review in this Report, this Establishment, under the management of Captain F. C. Anderson, Revenue Surveyor, has been employed first in the Punjab, and subsequently in Oudh. In the Season of 1858-59 the Sindh Saugor Doab Survey was taken up and brought to a conclusion, as briefly alluded to in my last Report, paragraph 180. The whole of the remainder of the Plains of the Leia District, together

Captain F. C. Anderson, Revenue Surveyor.

Assistants.

Lieutenant P. Thomson.

Mr. A. Foy. 3rd Class.

Sub-Assistants.

Mr. W. H. Patterson 1st Class.

„ C. W. Campbell „ „

„ G. R. Buttress 3rd „

„ W. S. Buttress „ „

30 Native Surveyors.

General average rate per square mile... 37 7 0

with portions of the Shahpoor District, up to the Salt Range, have fallen within the operations, together with such portions of the River Indus and the Khussore Hills, west of that river, as subtend the work, and were necessary in a geographical point of view to complete the Maps and render them most acceptable in this Office for due connection with the Surveys under execution or already finished by other Officers in the Derahtat, whilst one entire Main Circuit, No. 22, of 1854-55, was re-surveyed this Season, and the old points re-laid down in Circuit, No. 28, for the better assimilating the lines common to the Jech Doab.

169. The area embraces 1,560 square miles, and consists of the Tehseels of Laheewal and Jaba (plain portion) of Shahpoor, with a small portion of Durraya

Season 1858-59.

Khan and the large Tehseel of Meeanwalla belonging to the Leia District, and lying between Kalabagh and Bilot, or Kulloorkot on the Indus, on the one side, and the Salt Range on the other. Of this area 8,82,884 acres=1,379

	Square Miles.
* Salt Range	... 47
Kussore	... 14
Total	... <u>61</u>

square miles, is the usual Village Survey, 119 square miles of the Indus River, and 61 of Hills.* The number of villages amounts to 78 only, with one additional chuck containing portions of other villages.

The proportion of land under cultivation to waste is 1,74,468 acres to 8,24,320 acres, a good portion of the latter being Thul or Barh, waste sandy Desert.

170. The expenditure for this Season, including both permanent and Contingent charges, is Rupees 37,959-11, on which the average mileage rate comes to Rupees 24-5. But to this has to be added, for the fair adjustment of accounts, the expenses of the Establishment for the two months, October and November, of the following Season of 1859-60, whilst engaged in perfecting the Punjab records and in travelling down to their new District. This swells the actual cost of the Punjab work to 43,105 and the average mileage rate to 27-10, which, although considerably in excess of the rates of the three previous Seasons, is still moderate for regular Village Survey; the cause of the excess over former Seasons being the absence of such vast tracts of Barh as were then met with, and the completion of the whole of the remaining area in the Doab, and consequent inability to do more during the Season under review.

171. This completes the whole of the Plains of the Punjab, and in due connection with the Topographical Survey of Jhelum and Rawul Pindee by Captain Robinson (likewise finished), places us in possession of materials for the whole of the Punjab Proper, or country between the five rivers. The Sindh

Mozuffurgurh.
Leia.
Shahpoor (part of).
Jhung

	Square Miles.
Village Survey	... 6,132
Thul or Waste	... 6,072
River	... 952
Hills	... 62
	4)13,218
Average	... <u>3,304</u>

	Rupees.
Permanent...	... 1,63,194
Contingent...	... 6,978
Total	... <u>1,70,172</u>

Saugor Doab having thus been successfully concluded, a Statement exhibiting the whole of the results, embracing the Districts as per margin, and a period of four Seasons, viz., from 1855-56 to 1858-59, is given in the appendix (marked H.). The total area amounts to 13,218 square miles, as detailed marginally, yielding a large annual average progress of 3,304 square miles, the extensive Barh, or desert tracts, leading to this favorable result. The total cost for the same period and area amounts to Rupees 1,70,172, as per margin, and gives a mean average rate of Rupees 12-14 per square mile on the general area. The cost for each District is

likewise separately recorded.

172. For the purpose of connecting the Revenue Survey Main Circuits of the Plains in this Doab with the Salt Range, the base of the hills, where they debouch upon the Plains, was carefully surveyed by Captain Anderson and his Covenanted Assistant, Lieutenant Penton Thompson, as well as the Senior Assistant, Mr. Housden, by throwing a series of minor triangles from the measured lines in the Plains over the low peaks, and taking up all the Stations of Captain Robinson's Topographical Survey, and thus forming ample points common to the two Surveys, on which the Plane Table sketching of the entire base or foot of the hills was laid down by this Surveyor with great minuteness of detail. This description of work being entirely new to this Establishment, it was not executed without considerable difficulty and labor, but by the excellent perseverance and good management of Captain Anderson, he has furnished a perfectly sufficient overlapping of Captain Robinson's work, as to enable me to combine the Hills and Plains, belonging to the Shahpoor District, with due accuracy.

173. A very large number of the principal and secondary Stations of both the Great Trigonometrical Survey, comprising the great Indus Series, passing down (just in this vicinity) the left bank of the river, from the Base Line at Attock to the Base at Kurrachee, as well as of Captain Robinson's minor triangulation of the Salt Range, have been taken up and connected with the Revenue Survey of this Season. The distances on meridian and perpendicular of the whole of these Stations have been computed from the original point of departure used for the Sindh Saugor Doab Survey, *viz.*, the great dome of the mosque in the Mooltan Fort. A comparison of the direct distances, as derived from the two Surveys, shows the following results:—

NAMES OF G. T. STATIONS.				From Revenue Survey.	From G. T. Survey.	Error of Revenue Survey.	Error per mile.
Sakesur	... to Bajara	... (Principal)	...	72002.6	71945.0	+ 57.6	4.22
Bajara	... to Tami	... "	...	51957.6	54894.3	+ 63.3	6.08
Tami	... to Sakesur	... "	...	83760.9	83737.4	+ 23.5	1.48
Tami	... to Thathor	... "	...	79295.0	79239.6	+ 55.4	3.69
Thathor	... to Sakesur	... "	...	73259.8	73210.1	+ 49.7	3.58
Chuniot	... to Dhok	... "	...	78730.0	78589.1	+ 140.9	9.45
Maree	... to Bokhara	... (Secondary)	...	47960.2	47920.0	+ 40.2	4.43
Dhok	... to Bokhara	... "	...	29454.4	29437.1	+ 17.3	3.10
Dhok	... to Moch	... "	...	39266.9	39256.3	+ 10.6	1.43
Dhok	... to Swas	... "	...	24933.5	24863.1	+ 70.4	14.91
Moch	... to Swas	... "	...	34436.5	34445.8	- 9.3	1.43
Moch	... to Samand	... "	...	30128.4	30120.6	+ 7.8	1.37
Swas	... to Samand	... "	...	24678.3	28733.6	- 55.3	10.18
Rokree	... to Samand	... "	...	20283.0	20250.2	+ 32.8	8.54
Rokree	... to Raniwalee Jhir	... "	...	17560.3	17557.1	+ 3.2	0.96
Meeanwalee	... to Raniwalee Jhir	... "	...	19609.3	19620.6	- 11.3	3.04
Meeanwalee	... to Kundian	... "	...	43840.1	43882.4	- 42.3	5.09
Siani Vanda	... to Aleewalee	... "	...	55000.2	55085.5	- 85.3	8.19
Average where the error is +				651592.6	651019.9	+ 572.7	4.64
" where the error is -				181564.4	181767.9	- 203.5	5.92

174. The mean average error on the above 18 Stations is 4.64 feet on the distances in excess, and 5.92 feet on those

**Ratio of error with Great Tri-
angulation.**

in defect. The above test is in some instances on principal Stations, and in others on secondary points only, and, with one or two exceptions, is very small, and gives a fair proof of the general accuracy and superior value of the Revenue Survey, which is highly creditable to Captain Anderson's superintendence. Besides the above detailed points, many other secondary Stations have been closed upon and their co-ordinate values calculated, and this shows the extent of check brought to bear on the Revenue Survey operations. The connection of the Topographical Survey of the Salt Range with the detail Survey of the plains was a difficult task, and it was admirably carried out by the Revenue Surveyor.

175. The Sindh Saugor Doab, lying between the parallels of 29° and 33° north latitude, forms the delta of the Rivers

**Geographical position of the
Sindh Saugor Doab.**

Chenab, Jhelum, and Sindh or Indus, the two former being its eastern, and the latter (from which the Doab derives its name) its western limit. The extent of this Doab, north to south, is 291 miles, and extreme breadth 77 miles, tapering southwards to the conflux of the Rivers Indus and Chenab, close to the well-known Town of Mittun Kote, situated on the right bank of the Indus, in the Derah Ghazee Khan District. The chief portion of this extensive Doab was originally embraced in the Leia District, one of the largest and most unwieldy in the Punjab, or perhaps in any other Province in India; its original area having been 8,910 square miles.

176. But great alterations and transfers of Tehseels or Pergunnahs have taken place, within the last few years, in

**Changes in Territorial Boun-
daries.**

this Doab by orders of the Punjab Government cited marginally; first of all the Tehseel of Adokot was transferred to the Mozuffurgurh District (formerly Khangurh), and subsequently the Leia District itself has been absorbed by the transfer of the whole of the southern and central portion, consisting of Tehseels Leia and Durrya Khan, to the Dera Ishmael Khan District by the transfer of the Tehseel of Noorpoor to the Shahpoor, and of Meanwallee to Bunnoo District. Leia, which is divided from the Head Quarters of the Dera Ishmael Khan District by the River Indus, becomes a sub-division only, and the name of the Division has been changed to Dera Ishmael Khan.

No. 3393, dated 29th December
1860.
General Department.

177. Considerable difficulties have attended the changes made in the

**Serious delays and difficulties
caused by altering boundaries.**

Jaba Tehseel in the Salt Range, and the conjunction of the two widely distinct physical specialities of the Plains and

Hills, the two separate surveys of which were necessarily conducted on different systems and by different Establishments, and the limits of the Shahpoor District remain unfixed in this direction up to the present date. In consequence of the great delay in carrying out the revision of the District and division boundaries in this part of the Doab, the Maps of Shahpoor, Leia, &c., could not be completed or published, and it was with a view of facilitating the adjustment of all these numerous transfers, that I found it necessary to repair to Lahore, during my late tour of inspection, in order to confer with the Financial Commissioner of the Punjab on the subject.

178. The result of my visit to that Capital, in February last, has proved highly satisfactory, and I believe now

Personal conference with the Punjab authorities regarding revision of Districts.

that the Punjab authorities have full possession of all the Maps of our Surveys, and have been thus able to understand

the real nature of the country, and the requirements essential for constituting good Districts and Divisions on sound principles, both physical and ethnological, that the frequent and embarrassing changes of boundaries, with which we have been so seriously affected for several years past, will now cease, and final arrangements be allowed to stand. What was before very difficult to understand and carry out, has, by the mutual personal explanations entered into between the Civil Authorities and myself, been rendered quite intelligible, and my first object is of course to meet their wishes as far as it is possible to do so. I now have every reason to hope the best results will ensue from the early publication of the remaining District Maps of the Punjab, which will prove of such advantage to the public service.

179. The principal divisions of this part of the Doab, which are its most distinctive features, are the "Thul,"

Description of the country under Survey.

or Desert, the "Jhick," also called "Kutchee," and the "Mohar" and

"Danda" Villages lying under the Salt Range. The Surveyor thus speaks of these different specifications of the land, the population of the District, and other peculiarities of the great Barh in his Statistical Report, dated the 7th August 1860, a document of much interest, which, I hope, will be published by the Punjab Government:—

E X T R A C T.

"THE Jhick is for the most part a rich alluvial soil, left by the receding of the Indus, which, some 200 years ago, flowed about 12 miles eastward of its present course. It is annually inundated by the river, is highly cultured and thickly populated, and has been demarcated and portioned off into village Hulkas. In breadth it varies from 7 to 12 miles from the river to the western borders of the Thul, and extends along the whole length of the Doab from opposite Dera Ghazee Khan to the Town of Kalabagh.

The Jhick.

The Thul is a waste tract of land lying between the low lands of the Chenab and Indus, and the undemarcated portion comprises an area of 5566·24 square miles, of which 48·34 square miles only have been brought under cultivation. Its actual northern limits may be described as running parallel with the Salt Range, at a distance of about 24 miles from the base of the hills; this intervening tract being divided off into separate village Hulkas, precisely as in the Jhick. Of these villages, those that are situated under the range are called "Mohar," or mouth, because the gorges of the hills debouch on them; while those lying between them and the Thul, and touching on the latter, are called "Danda."

"The Thul proper is entirely devoid of demarcation, and is very scantily populated, but, as it affords excellent pasturage for cattle of every description, strips of it have been included within the boundaries of such Jhick villages as are contiguously situated. It is a very singular tract of country, presenting to the eye a strange combination of barren waste and rich pasturage, which would suggest that its original aspect has undergone some great change; and it is difficult, with any degree of conciseness, accurately to describe its peculiar features. Of these, not the least remarkable are the "Puttees," which have been supposed to have been the bed of a river, but this idea is utterly irreconcilable with the position of the surrounding sand hills which shut them in on every side, and is also refuted by the fact of there being no less than 15 Puttees, in different parts of the Thul, quite unconnected with each other. The word Puttee is simply applied to the level tracts where there is no sand, and in which wells have been sunk in contradistinction to the "Tibbu Zumeen," or tracts covered with sand ridges. They vary in length from 5 to 25 miles, and are seldom more than 3½ in breadth. The sand ridges, which rise from 20 to 80 feet in height at irregular distances, run in a north-east and south-west direction, where they are far apart from each other; the level plains between, varying in extent from 1 to 12 square miles, are studded with wells which are nearly all pukka; and in the immediate vicinity of which alone are human habitations to be found, with a few patches of cultivation round them. Between the more closely grouped hillocks are strips of vegetation, where bushes of the Kureel, or wild Caper, small Jal and Jund trees,—the latter the *Acacia Mimosa*,—and grasses of different kinds, of which the best for grazing are the Drahmun, Chembur, and Sain. The first is the best, but is scarce, and springs only when an unusual quantity of rain has fallen. The Chembur is a fine prostrate grass with knotted runners like the Doop; the Sain grows upright and has a coarse clumpy root; both are common and eaten by every description of cattle. The Khavee is a very inferior grass and only eaten by deer. The wood of the Jund being a close hard grain is always used in the construction of the rude village ploughshares. Goats and camels feed off the leaves. The Jal is a short stunted tree, producing a berry called Peeloo, which ripens in May and June, and during these two months the poorer classes from the Kutchee, the Danda villages of Van Kyla, Bundial, and Van Buchra, and, in fact, from all such as border on the Thul, migrate to it in gangs for the express purpose of collecting the fruit, on which they subsist altogether while it lasts, carrying away large quantities to their own homes, where, in its dried state, it continues to form a principal article of consumption for many weeks. It is customary for the people, while leading this vagrant life, to take up their quarters near some well, whence they proceed every morning in a body on their fruit-gathering expeditions. Bushes of the Lana, Bubbil, Phok, and Madar grow on the sand ridges, and the leaves of all but the last, are greedily devoured by camels. The Lana bushes are cut down and collected for incineration, and from the ashes is obtained a kind of muriate alkali or impure soda. This plant answers to the description of the Spanish Barilla, and is, in all probability, the same. In seasons of famine the Phok is boiled down and eaten by the poorer classes. Round about the wells the Furash or Tamarisk, the Bair or Jujube, and the Sissoo, have been planted; these are the only umbrageous trees throughout the Thul. Every description of tree and plant found in the Thul thrives much more luxuriantly in the Jhick, where also there are some beau-

tiful specimens of the Bir (*Ficus Indica*) and the Peepul (*Ficus religiosa*). The lime, orange, tamarind, and mangoe also flourish under cultivation, and date-trees abound in the southern part of the district.

“ In the undemarcated portion of the Thul there are 1,565 wells, which are all pukka, with the exception of a few that have been sunk for watering cattle. About
 Wells. Adokot and the lower part of the Doab the water lies close to the surface, but further northwards the depth increases, till, within a few miles of the Salt Range; the sinking of wells has been found altogether impracticable, and irrigation is there carried on by means of Bunds (embankments) thrown up across the Nullahs, which, resisting the force of the torrents as they rush down from the hills, cause the fields to be flooded in every direction. The wells are all worked by the Persian wheel, and in certain parts of the Thul, where they are grouped together and belong to one proprietor, or are a family property, they are called a Duggur, and are generally named after the owner or caste to which he belongs. No well is able to irrigate more than 50 acres, and the water is generally brackish and of a deleterious quality, more particularly about Adokot in the Monda and Choubara Illaquas.

“ The camels of the Thul, though so numerous, are of little use. Small in make with blood-looking heads and slender limbs, they have neither the strength nor endurance of the Jhung-Muggeeana or the Pothwar camels of the
 Thul Camels. Rawul Pindie District.

“ The soil of the District, which changes in its nature according to its distance from the river, may be described under four heads, classified under the local distinctions of Gus, Dur, Roog, and Thul. The Gus, which borders the
 Soils. river, and extends 2½ miles inland from its edge at cold weather level, being annually inundated, is subject to continued variations, which act beneficially or detrimentally according to the nature of the alluvium deposited: for example, when sand is washed up on soil that may before have produced abundantly, it is rendered unserviceable for that year; but when earth is left upon beds of sand, the barren waste is reclaimed and converted into a rich culturable mould, unless this superstratum exceed more than a foot in depth, in which case the harvest is invariably poor. The Dur proximates the Gus, and is a harder and more clayey soil, being less influenced by the action of the water, which seldom floods it more than once in 3 or 4 years. It is well suited to the growth of every description of vegetable produce, from Indigo to the commonest grain. The Roog, which is equally productive, is a still harder soil, being next to the Thul, and generally beyond reach of the periodical inundations; except when they rise to an unusual height, as happened in 1856. The soil of the Thul between the sand ridges is very hard. Barley, wheat, bajra, and cotton are sown round the wells and produce abundantly. Each field is fenced in with reed hedges to protect it from the gusts of drifting sand which sometimes accumulate to a height of 2 feet; and would, but for the protection thus afforded, inevitably ruin the crops.

“ The cotton produced in the District is only sufficient for home consumption, and it is one of the occupations of the village women and girls to go out cotton-picking, each receiving in remuneration for her labor one-half of the
 Cotton and Sugarcane. quantity collected by her. Sugarcane is not much grown, the expense and outlay required for its cultivation being beyond the means of the villagers, and nearly all the sugar consumed in the district is brought in from Jhung and Mooltan, whence also Leia is provided with cloths, silks, and copper vessels. Before the establishment of the jail manufactories paper also was brought in from Jhung.

“ Previous to the annexation of the Punjab, the present system of land measurement by
 Local Land Measurements. Beegahs, Kunals, and Murlas was scarcely known. In Adokot only was it at all understood, until gradually introduced by us, when it be-

came, as it has since continued, the standard measurement of the District. The original method of measuring land was by reckoning the quantity of seed put into the ground; as for instance, a man asked how much land he possessed, would answer 10 or 12 maunds "Tookmee Zumeen," *i. e.*, ground in which that quantity of seed would be sown. In the Thul a still more primitive method existed by "Munnees," which signified the area commanded by a sling used from a Muchan or elevated bed for the purpose of searing birds. The Sikh measurement introduced by us, reduced into square yards, is as follows:—

1 Murla	=	30.25 square yards.
1 Kunal	= 20 Murlas	= 605.00 square yards.
1 Beegah	= 4 Kunals	= 2420.00 square yards.
1 Ghomao	= 2 Beegahs	= 4840.00 square yards, or one British Acre.

Population. "The population of the Leia District, according to the Census taken by order of the Punjab Government on the 1st January 1855, aggregated 3,09,696 souls, including those in the Mitta Toanah Illaqua; and by a more recent reckoning made by myself as the Survey passed through the District, the total number, exclusive of Mitta Toanah, amounted to 2,69,873 by actual enumeration of the occupants of the dwellings in each village and hamlet. Of these 90,144 were male and 1,79,729 female, including children. Assuming the latter to be more correct data, the total District area would give 30 inhabitants to the square mile, but the population is by no means equally dispersed over the face of the country; the Thul being almost deserted, while the Jhick or low lands have comparatively a full population. The inhabitants of the Thul proper, of which the aggregate area is 5566.24 square miles, number 79,773 souls, which gives an average of 14 to the square mile; while in the Jhick or demarcated area of the District the average per square mile is 56 souls.

The people are generally tall, well-made, and intelligent, with good features of a Jewish caste. The average height of the men is 5 feet 9 inches, and that of the women about 5 feet 6 inches. They are altogether ignorant of any sort of handiwork. The occupations of the women are confined to household duties, while the men are principally cultivators and herdsmen.

Rukhs or grazing tracts. There are twenty-three (23) Rukhs in the Thul, luxuriant in pasturage of every description, and which are consequently reserved exclusively for grazing purposes; they are—

In Adokot 2—Monda da Rukh and Mohummudpoor da Rukh.

In Leia 6—Futtehpoor da Rukh, Nuwakot, and Shergurh, Choubara Kheyrawala, Kullan Tibbee, and Jhirkil.

In Durya Khan 14—Jundawala da Rukh, Hurnowlee, Dinganah, Adi, Hito, Kuloor, Munkera, Hyderabad, Doollehwalla, Kunganh, Behul, Muhnee, Solumwalu, and Karloowala.

In Meeanwalee there is only one—Noorpoor da Rukh.

Salt Preventive Line. "The revenue for Zakat might be best collected at the Ferries on the Indus, and half the money realized laid out in the making and metalling of a new road for the Preventive Line. The present Line of the Salt Preventive Service is a continuation of the Torbela and Hoozroo Line in Huzara. That portion of it on which alone I am from personal knowledge able to report is very defective. The Chowkees are much too far apart to answer fully the purposes of prevention, and the Line, instead of connecting upon that of the Sutlej, which runs across the bottom of the Doab, terminates at the town of Leia, thus leaving 103 miles of country open to illicit trade with the large town of Derah Ghazee Khan, conveniently situated for its encouragement. The Native members of the establishment are provided with huts at Daood Khel, Tudanwalee, Zureefwalee, Rokree, Koondian, Allowalee, Jal, Knota, Kuloor, Oomurwalee, Kanjun, Durgakhan, Bukkur, Noutuk, Tibbee

Kulan, and Shahpoor, while the supervising Officers have six small Bungalows built for their accommodation when out patrolling at Judanwalee, Rokree, Jal, Kunjun, Noutuk, and Shahpoor. From Meanwallee southwards the Line is supervised by two Native Assistant Patrols, one posted at Jal, and the other at Noutuk; and northwards at Kalabagh, it is under the superintendence of the European Officer stationed at Maree.

“The object of this Preventive Line is to intercept the crossing of the salt of the Bunnoo and Kohat Districts into our Cis-Indus Territories. The two descriptions of salt are easily distinguished from each other; that of the Trans-Indus mines being impregnated with the blue indurated clay peculiar to the hills in which it is found, and from which it takes its color; while that of our mines has a reddish tinge imparted to it from the red marl in which it is embedded.

“For about 38 miles the Salt Range runs contiguously with the northern confines of the Leia District, in which there is one large Salt Depôt at the village of Maree. Here there is no necessity for mining, for the salt lies on the surface exposed in such large masses that the rocks have simply to be blasted and broken with hammers when it is ready for transportation. With one single exception, the salt is found only on the southern and most precipitous face of the range, where it abounds in such quantities, that, for its protection, it has been found necessary to establish Chowkees, in each of which are posted from 2 to 4 Jenadars and Chuprassees.

“Abundance of iron ore of superior quality is found in the Salt Range, also Lignite; but the former is lost to all useful purposes from the great difficulty of obtaining fuel and water necessary for smelting; and under any circumstances, the bad roads throughout the district, and the consequent heavy expense of carriage, would in itself be sufficient to preclude the possibility of transporting so heavy a commodity to any great distance.

The river affords a very limited outlet for the produce of the district, and the only mode of conveying goods from one locality to another is by means of camels. The best of the district roads are heavy and sandy; draft carriage is unknown, and under present circumstances quite impracticable. While the means of internal communication remain thus defective, there is neither field for enterprise nor incentive to industry; but if the road from Kalabagh to Mozuffurgurh, which should be made the main thoroughfare of the District, were metalled, and greater facility afforded for the conveyance of its agricultural products to the Mooltan market by the introduction of carts and other wheeled vehicles, the energy of the people would be roused, and a spirit of competition infused into them. This road runs along the high bank of the Thul, connecting with each other the principal towns of Meanwalee, Kulloor, Peepul, Bukkur, Kuror, Leia, Derah Deen, Punnuh, and Adokot, from which point it bifurcates, leading in one direction across a heavy belt of the Thul to Mooltan, *via* Bhookee and Lungur Surai; and in the other to Sunawa, where it again diverges eastward to Mozuffurgurh, and westward to Derah Ghazee Khan. That portion of it that lies between Leia and Meeanwallee is by far the heaviest and most trying to cattle; and consequently during the cold weather, after the waters of the Indus have subsided, it is altogether abandoned for the more practicable Line which winds immediately under the banks of the Thul, and forms a pleasant hard road, covered with grass and turf. This Kutchee Line leaves the main road at Behal, and falls into it again at a village called Mullana, 3 coss south of Kulloor. The following Table shows the number of marches and halting-stages from Kalabagh to Mozuffurgurh, with the distances between each:—

Number.	Names of Stages.	Distances between each stage in miles.	Number.	Names of Stages.	Distances between each stage in miles.
1	From Maree to Daod khel	Miles 6.4 furlongs.		From Behul to Kuror ...	Miles 12.6 furlongs.
	Thence to Moch ...	9		Thence to Leia ...	18
	„ to Meanwallee ...	12		„ to Kot Sultan ...	13
	„ to Koondean ...	8		„ to Derat Deen Punnuh	14
5	„ to Peepul ...	14	15	„ to Adokot... ..	7
	„ to Kuloor ...	10.6	0	„ across the Thul to Mooltan <i>viâ</i> Bhookkee	39
	„ to Kanjun ...	14	0	From Adokot to Sunawa ...	10
	„ to Durya Khan ...	13.5	18	„ to Meh-mood-kot ...	9
	„ to Burkur ...	12		„ to Mozuffurgurh ...	13.6
10	„ to Behul... ..	15		From Sunawa to Derah Ghazee Khan <i>viâ</i> Goojrat.	25

“The principal object in metalling this Line would be the introduction of carts in the District, thus securing an outlet for its produce, of which it now stands in much need. Shahpoor is sufficiently productive for all its requirements; the fertile valley of Murwut, in the Bunnoo District, is able to meet all the demands of the Town and Cantonment of Derah Ishmael Khan and its vicinity, and the lands in the Derajat on the right bank of the Indus are so lightly assessed, as effectually to debar the transit of grain across the river, except in occasional seasons of drought. Mooltan alone offers a remunerative market to Leia, and it is, therefore, of paramount importance to the prosperity of this District, that the road which connects it with that city should be good. The sandy nature of the soil precludes the possibility of this end being attained by any other means, but metalling stones for this purpose could easily be procured from the foot of the Salt Range and Keeree Kusor Hills, and would not require to be transported more than 12 miles to any point on the road between Kalabagh and Mybal, a short distance from Durya Khan, below which it could be floated down some of the innumerable arms or channels of the Indus.

“On this road the Preventive Line should be established, and the expense of its construction, which may be estimated at Rupees 2,500 per mile, or Rupees 5,22,500 from Maree to Mozuffurgurh, be defrayed, as has already been proposed, out of the Zukat.

“The other principal District roads are—

1. From Leia to Derah Futteh Khan in the Derajat ... 14 Miles.
2. „ „ „ Mooltan direct across the Thul *viâ* Rungpoor 69 „
3. „ „ „ Jhung *viâ* Nuwa Kot across the Thul ... 78 „
4. „ Bukkur „ Derah Ishmael Khan 18 „
5. „ Derah Ishmael Khan *viâ* Junda Walar Mitta Joanuh, and Khoshab, to Shahpoor (this is the Post Line) 104 „
6. „ Meanwallee to Mitta Toanah *viâ* Van Bushra ... 42 „
7. „ „ „ Moosa Khel thence to Nummul ... 14 „

“This last-mentioned road is good, and the Line over the hill through the Nummul Pass is well chosen.

“The ferries on the Indus are all under the Deputy Commissioners of Derah Ishmael and Derah Ghazee Khan, at which town the contracts are annually sold for the levying of the tolls. In Derah Ishmael Khan the toll receipts

Ferries.

average from 9 to 10,000 in the year. The terms of the contract are that, whosoever shall cross the river either by means of a Surnae or inflated sheep skin, or by any description of grass or reed raft, such as the Toolla, calculated to carry 2 or 3, or the Turkee, which carries from 3 to 20 persons, or by boats, shall pay a certain ferry toll; half of which is taken by the contractor, and the other half paid to the Mullahs or boatmen. The contractor on his part is required to furnish a certain number of boats, as shown in the Table below, at each ferry, varying according to the demand and the season of the year. It is also expected that he will be prepared to furnish any extra number of boats at the Derah Ishmael Ghât that may be required on urgent occasions:—

Numbers.	Names of Ferries from Kalabagh to Grang, opposite Leia Town.	NUMBER OF BOATS KEPT UP FROM		
		1st May to 1st September 1858.	1st September 1858 to 1st January 1859.	1st January to 1st May 1859.
1	Kalabagh	4 Boats ...	2 Boats ...	4 Boats.
	Eesa Khel	4 " ...	2 " ...	4 "
	Keree Kusor	2 " ...	2 " ...	2 "
	Billot	2 " ...	2 " ...	2 "
5	Jace	2 " ...	2 " ...	2 "
	Kanjun	2 " ...	1 " ...	2 "
	Derah Ishmael Khan	12 " ...	6 " ...	12 "
	Kuheeree	4 " ...	2 " ...	4 "
	Jumalee	2 " ...	2 " ...	2 "
10	Sookhee	2 " ...	2 " ...	2 "
	Futteh Khan	2 " ...	2 " ...	2 "
12	Grang	2 " ...	1 " ...	2 "
	Total	40 Boats ...	26 Boats ...	40 Boats.

“Owing to the fertilising influence of the canals, Adokot is the most luxuriant of the four Tehseels, and the facility of irrigation is in particular conducive to the cultivation of indigo, which forms one of its chief articles of manufacture and sale. It is usually sown in the soil called “Roog,” which has already been described as lying beyond the periodical inundations of the river. The seed is put into the ground about the end of April, when the Nullahs begin to fill. Before the middle of August the flowers assume a bright red hue, when the plants are cut down, thrown into vats of masonry four feet deep and nine feet in diameter, and immersed for 12 hours of the night; the water containing the extracted dye being passed through successive vats, and finally strained through cloth spread over sand, where it is allowed to cake, and then made into balls weighing one tolah each. Any considerable showers in March and April produce one and even two ratoon crops. The plant grows from three to four feet high, and is capable of yielding indigo of a superior quality, but from want of cleanliness and attention, the dye is full of earthy impurities, and inferior to that manufactured in Bengal.

“The Meanwallee Tehseel is also called “the kutchee,” by which term it was formerly known, the word being derived from “kutchu,” applied to it from the nature of the soil, and from the impossibility of building any permanent habitations upon it. Its principal town is properly called Bullo Khel, of which not less than one-fifth being inhabited by the Mecanas or Peerzadas, who also cultivate a few acres of

ground round it, the people, out of compliment to these, their resident priests, have given to the town the name of Meanwallee; the lands within the village boundary still retaining the official designation of Bullo Khel.

“In the northern part of this Tehseel are a few manufactories for Jumsao, or Sulphate of Potash, which is obtained by leaching the earth impregnated with the saltpetre. The earth, after being diluted in water, is strained through mats raised on four small posts about three feet high, and the fluid is poured into large iron pans 6 feet in diameter, and boiled till the water has entirely evaporated, leaving a sediment something of the consistency of dry lime, which is the Jumsao or Sulphate of Potash. In this state it is sent to Kalabagh, and there sold at 10 annas a maund for the manufacture of alum; the alumina or soft alum-stone being found in abundance in the Derajat Hills, within 12 miles of this town. The proprietors of Jumsao manufactories pay no land tax, and the ground occupied for the purpose is invariably waste land, and unfit for cultivation. Each iron pan turns out monthly about 40 maunds, which, sold at the rate of 10 annas per maund, brings in a return of Rupees 25 a month; out of which the proprietor has to pay about Rupees 16 a month to labourers, also camel hire to Kalabagh. Each pan costs from Rupees 40 to 50, and lasts about 5 years. When the manufactory is a day's march from Kalabagh, the profits on each iron pan do not exceed Rupees 5 annas 8, or Rupees 6 a month.”

180. The Hudbust or Demarcation Maps have all undergone a careful comparison with the Professional Village Plans, and with one exception, that of No. 28 Main Circuit, which was not demarcated, the assimilation is said to have been good. On the banks of the Indus River discrepancies were found, owing to the everchanging nature of its course. The demarcations in the Barh have been confined to the Survey Main Circuit Lines, which form the best boundaries when the triple junction points are made permanent. As before stated, all the Civil requirements of the Survey have been admirably carried out in the Punjab, and nothing has been left to desire on that point.

181. The Government of the Punjab having no further work remaining to be done, the Survey Establishment during the recess months at Murree finished the whole of the mapping and calculations connected with the Survey above described, and, having lodged the whole of the records appertaining to the Punjab in the Local Offices, left the above Station on the 13th October 1859, and proceeded down by Bullock Train, *viâ* Lahore and Delhi, to take up new ground in Oude, under the orders of the Government of India, Foreign Department, specified in the margin. The Revenue Surveyor himself having proceeded down by Dâk to concert preliminary measures with the Oude Authorities, carried out his arrangements so well as to be in a position to enter his new District of Pertabghur, in the Baiswarra Division, with the chief portion of his Party on the 16th December 1859.

No. 4853, dated the 8th August 1862.

182. By the 6th January 1860 a sufficient quantity of Demarcation Sketch Maps having been provided by the Settlement Department, fresh ground was broken in the Tehseel of Puttee Dulleppoor of the Pertabpoor District, and the operations for the Season 1859-60 were thus fairly commenced in a country differing altogether from that the Party had just left. The tract prepared for Survey was in the extreme south-eastern corner of the Oudh Province, on the Jounpoor and Allahabad Frontier, and lying between the Ganges River and the Sooltanpoor District, the River Goomtee flowing at its north-eastern extremity, and separating it at that point from the District of Fyzabad.

183. The area demarcated and properly adjusted for Survey was only small, owing to the short notice given of the intention of starting the Survey operations this Season. 467 square miles were effected in the two Pergunnahs of Puttee and Dulleppoor, comprising one Tehseel known by the combined name, with 822 Village Circuits, the average size of which is only 368 acres each. Of these villages 23 are inter-laced within the Tehseel, but belong to adjoining Districts and Pergunnahs. The Tehseel has likewise 21 outstanding villages within the Districts of Allahabad and Jounpoor, and it contains 10 villages of the latter, which do not appear to have been separately demarcated.

184. This out-turn was much below what might have been hoped for in a perfectly champaign and open country, but there are always many opposing influences against realizing full results the first season, when everything is new to the Local Authorities, and more especially to the people of the country, who cannot be made all at once to comprehend the absolute requirements of the Survey machinery passing through their district, and the more so in a very recently subjugated Province after the events of 1857 and 1858. The platform trijunction Village Boundary marks, which it is the most excellent practice of late years invariably to fix permanently, and which consequently, in all practicable cases, are used as Stations for the Professional Survey, were started in Oudh of mud only; and on this being represented, they were re-placed by masonry platforms, and, in shifting these, due care was not observed to make them identical, which caused serious disturbance of the calculations, and necessitated revised observations to a considerable extent; some delay consequently ensued, and the Field Parties were kept out very late in the Season.

185. Many impediments likewise occurred in bringing all the Survey Establishment, which was somewhat crippled down, from such a distance, and a portion of the Field Season was unavoidably lost thereby. The changes by resignations and transfers also, inseparable from a radical move of this sort,

all tend to a diminished out-turn in starting fresh operations, but this will soon be obviated by subsequent regular and steady work as each Season passes by, and the mean general average of the whole work will be found not to be materially affected.

186. The above, however, is not all that was effected by this energetic

Additional special Survey devolving on Captain Anderson.

and pains-taking Surveyor during the Season in question. After re-organising his Establishment, starting the new work on a proper footing, and providing for all wants, he left the Pertabghur District under the immediate charge of his Covenanted Assistant, but still retaining the general control and superintendence of the operations and of the

* *Vide* Chief Commissioner, Oude, to Foreign Department, No. 1213, dated 27th August 1860.

† Captain F. C. Anderson, Revenue Surveyor.
Captain J. F. McAndrew, Deputy Commissioner.

Establishment, in order to proceed to the Frontier under the special orders* of the Government of India, as one of the British Commissioners for the definement and settlement of the boundary between Oudh and Nipal. This Commission, composed of two British† and two Goorkha Officers, assembled at a place called Bhugora Tal, north of the Taptee River, on the 25th of January 1860, and the entire labor and responsibility of defining and laying down the Line of Boundary of the Territory lately ceded by the British Government to Nipal devolved on Captain Anderson, who was assisted by one Native Surveyor only.

187. The Survey of this new Line of Frontier commenced from the old

Definition of the new Frontier Line.

boundary at Bhugora Tal, near the Bhuchkewa Naka Pass, in the Doonrwa Range, and north of the well-known Fort of Bhinga, at the junction of the 3 Estates of Toolsepoor, Binga, and Bankee, where also terminated the original possessions of the Goorkhas to the westward. On the north high bank of this Tal or Dake was built a large platform of masonry, serving as the initial Azimuth or starting point from which all the Meridional and Latitudinal distances were calculated. From this point the Line runs in a north-westerly direction, crossing the Rivers Raptee, Sarjoo or Babai, Girwa, and Moila, from pillar No. 1 to pillar No. 98, built on the left bank of the Kounali River at its junction with the Mohan, from whence the deep stream of the Mohan forms the boundary, along the left or northern bank of which masonry pillars have been built up to number 170, all of which mark the Survey Stations. Thence the Line is defined by 41 more masonry pillars, and striking across the River Sardah, joins the Rohilkhund boundary at the village of Khujjoorea, District Shahjehanpoor, where the old pillars of Mr. Collector Buller are to be found. Thus the new Boundary Line, measuring in its sinuosities 152 miles, is permanently marked by 211 masonry pillars. A large slice of the Khyreghur Forest, containing very valuable saul timber, and highly appreciated as hunting-ground, has been thus made over to the Nipalese by the British Government for services rendered in 1857-58. It

was also an object to restore to the Nipal Durbar their old Sulyana possessions as they existed in 1811 and 1816, and this object has been duly attained.

188. The Boundary Line was connected at its two extremities with the Great Trigonometrical Tower Stations of "Newada" and "Dadaora" on the east, and "Shahgurh" on the west, which is sufficient to enable the geographer to fix this special and important Survey on the General Atlas. It would have conduced to the completeness of the connection of the Boundary Line if a greater number of the Stations or Towers of the North-East Longitudinal Series, passing parallel with it, could have been taken up; but with a very scanty population, the dense Saul Forest, and the great difficulty of supplying food and water, the cutting of the Lines became a work of much time and labor. The British Commissioners also were much hurried, and had to get over the ground as fast as possible.

189. In accordance with the decision of the Governor General of India in Council, by letter cited in the margin, the following specification of the

Decision of Government of India regarding the new boundary.

Foreign Department, No. 3686, dated 29th August 1860.

details of the boundary as fully agreed on and rectified were laid down for the guidance of all parties concerned:—

"Beds of streams in the dry weather shall be considered the boundary between the two States along the banks of the Raptée, the Mohan, and the Sarda, as long as the encroachments of these rivers on either side are only gradual, and in the ordinary course of alluvion and diluvion; but should any river suddenly quit its bed, and cut for itself a new channel, it shall cease to be the boundary, and the territory so cut off by the changes in the river's course shall not be considered as ceded to either State. Therefore, from the large pucka platform, Nos. 18 to 20, the deep stream of the Raptée is the boundary, and from Nos. 98 to 171 that of the Mohan."

190. In paragraph 52 of the Boundary Commissioners' Report they un-

Bad Boundary Pillars built as a temporary expedient.

hesitatingly state it as their opinion, that the masonry pillars, owing to the very inferior quality of the materials with which they are built, will not last more than a couple of years, and they, therefore, recommend that large pillars shall be substituted, built of stone, which can be procured from the neighbouring hills. This is so important a matter in a Survey point of view, in addition to its political bearings, that I deem it necessary to point to the fact in this place.

191. This duty having been completed by the Revenue Surveyor to the

Opinion of Chief Commissioner, Oude, as to the Surveyor's duty performed.

No. 156, dated 3rd May 1860.

entire satisfaction of the Chief Commissioner of Oudh, that Officer in his letter to the Government of India, marginally noted, speaks of the great judgment, firmness, and temper displayed by the

two Commissioners in carrying out the delicate task entrusted to them of laying down the boundary of the former Goorkha possessions, in conjunction with the Commissioners of that State. The Survey in the Pertabghur District having been brought to a close at the same time, Captain Anderson repaired to Nynee Tal for the recess, where he was joined by his whole Establishment, and Office opened at that place on the 31st May 1860.

192. The operations of this Division were renewed in the Pertabghur District in the following Season of 1860-61, the work effected comprising the two entire Tehseels of Pertabghur and Behar, together with a portion of the Selon Tehseel, and 28 contained villages of the Allahabad District, besides a belt of land about $1\frac{3}{4}$ miles in width, all along the right or southern bank of the Ganges River, containing 39 villages of Pergunnahs Nuwabgunge, Soraon, and Secundra of Allahabad, which were taken up for the purpose of effecting as good a connection with the old Survey of the Doab as possible, and to ensure both banks of the river being defined as they ought to be; this very necessary geographical feature having been neglected entirely at the time of the former Survey.

193. The area surveyed was 6,69,987 acres, or 1,047 square miles, containing 1,450 Village Circuits, the average size of which is 462 acres; of this area 45 square miles appertain to the Allahabad District, on the right bank of Ganges, as described in the preceding paragraph. This work was laid down Mouzawar, or village by village, and will prove of great value to the District Authorities, as showing the changes in the course of the river, depicted at the same time with the Oudh villages on the left bank. I took occasion to draw the special attention of the North-West Government to this important object of demarcating the villages along the river bank, knowing the great value of such information in settling disputes which are always so rife with newly-formed chur or alluvial lands.

General Results for 3 Seasons.

194. The following Tabular Statement gives a summary of the results for the years under review:—

Seasons.	No. of villages.	Average size of Village Circuits.	Area surveyed in square miles.	Total cost.	Average rate per square mile.	Average rate per Village Circuit.	
1858-59	82	...	1,560	43,105 0 0	27 10 0	...	} Punjab.
1859-60	822	368	467	32,742 0 0	70 2 0	30 13 0	
1860-61	1,450	462	1,047	39,254 0 0	37 8 0	27 2 0	} Oudh.
Total	2,354	...	3,074	1,15,101 0 0	37 7 0	* 31 11 0	* Of Oudh.

195. A total area of 3,074 square miles of the usual village by village Survey has been obtained, of which 1,560 square miles belong to the Punjab and 1,514 square miles to Oudh, giving a mean average out-turn of 1,024 square miles per Season.

The total expenditure for the same period amounts to Rupees 1,15,101, including both permanent and contingent charges, and on this outlay the average rate per square mile comes to Rupees 37-7 and on the Oudh Village Circuits to Rupees 31-11. The Punjab Village Circuits being largely affected by the tracts of waste jungle or Barh, have been omitted from the average. Were it not for the very small area of the regular Survey of 1859-60 caused by exceptional circumstances, over which the Surveyor had no control, his average out-turn and mileage cost would have been much better, and it is to be borne in mind likewise that the special Survey of the Frontier, in which Captain Anderson was personally engaged for a period of three months, embraces 379 Village sites, and is estimated to be equivalent to about 500 square miles of ordinary topographical work, although it cannot properly be set down as such in the Area Statements. The cost of the Frontier Survey is Rupees 1,997, including all charges, with a special deputation of Rupees 300 per mensem to the Surveyor. The mileage rate of the Pertabghur work is high, but it is in gradual course of diminishing as the operations proceed, and it is not so high as in some other Divisions.

196. The items of contingent expenses for the same period are as follows, distinguishing the Punjab from the Oudh charges:—

Description of Contingencies.	Punjab.	Oudh.		TOTAL.
	Season 1858-59.	Season 1859-60.	Season 1860-61.	
Travelling allowance	389 9	1,407 14	908 15	2,700 6
Muzkooree or Chuprassies	739 8	0 0	0 0	739 8
Camel hire	685 1	228 7	0 0	913 8
Bullock train for Government Stores ...	70 7	291 4	135 12	497 7
Line clearing	0 0	0 0	697 11	697 11
Total	1,878 9	1,927 9	1,742 6	5,548 8

These items are small and call for no special remark.

197. The system of Survey introduced into this fine and originally fertile Province is the same precisely as that carried out in the Punjab with so much

System of Survey for Oudh.

advantage and success. The Survey is conducted in the fullest detail as to all the specifications of land, and the Professional Village Maps on the same scale, viz., 20 chains to the inch, or 4 inches to the mile, are replete with every information in strict accordance with the principles now guiding this Department, viz., for the Survey to show all topographical features which the scale is capable of representing. The interior detail measurement of cultivation, waste, fallow, &c., is therefore carried out in all its integrity, and forms a standard or basis whereon the Native detail measurements of Fields for settlement purposes can be compared and checked; and it is by this rigorous system of making the Professional Survey complete and full in all its parts, that the Civil Establishments are kept in check and awe, and the revenue thus protected.

198. As usual in commencing all new Surveys, the principle on which the Professional detail Survey was to be executed was entered into by the Local Civil Authorities, and with a view to expedite the operations, the Chief Commissioner recommended that the Professional Survey should partake more of a skeleton character, omitting the interior detail Survey, which is not needed for the settlement purposes. To this my original objections, as frequently before given, discussed and decided by the Government of India, were again renewed, and the same principle again authoritatively pronounced in the letter marginally cited, and to the following effect:—"The Governor General in Council concurs in your opinion that it

Surveyor General to Foreign Department, No. 13C., dated the 6th February 1862.

Foreign Department to Surveyor General, No. 114, dated 5th March 1862.

No. 2174A., dated 2nd October 1855, from North-Western Government to Deputy Surveyor General, with enclosures.

No. 58, dated 3rd November 1855, from Deputy Surveyor General to North-Western Government, with enclosures.

would be unwise to limit the functions of the Survey in the manner suggested by the Officiating Chief Commissioner." The several Surveyors in Oudh have consequently received the most stringent orders on no account to alter the style of the Professional Survey from that directed to be pursued by this Department, and there can be no sort of question as to the wise policy of insisting on what is being done in the present day being done well and effectually for both present and future purposes.

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199. The Province of Oudh, on which we have now entered, may be estimated to contain about 24,000 square miles of as rich and splendid a country as can be found in Hindostan. By the last revision of boundaries it consists of the 4 Divisions and 12 Districts specified in the margin. These extensive and important Divisions will require additional Survey Parties to be attached to them, in order to make even a tolerable impression, and this the Government is now doing, as will appear hereafter.

Divisions.	Districts.
1st. Baiswarrah ...	{ Pertabgurh. Roy Baveilly. Sooltanpoor.
2nd. Lucknow ...	{ Oonao. Lucknow. Durriabad.
3rd. Fyzabad ...	{ Fyzabad. Gonda. Buracch.
4th. Khyrabnd ...	{ Mullaon. Sectanpoor. Mohundec.

200. On entering the Baiswarrah Division, the Revenue Surveyor very

Local specifications of Land and Land Measure.

properly obtained the Chief Commissioner's instructions regarding the classification of the soil, and the following

standard was furnished for the guidance of the Surveyors:—

Land out of cultivation for a period not exceeding two years to be ranked as "Fallow,"

Ditto ditto for a period of above two years and not exceeding eight years to be ranked as "lately thrown out of cultivation,"

Ditto ditto above eight years to be ranked as "fit for cultivation,"

and this rule has been uniformly observed in all the calculations of the detail area, each item of which has been converted into the local or Shahjehane Beegah, which is equivalent to 3,025 square yards, or $\frac{5}{8}$ of a British acre, the Land Measure being as follows:—

1 Kutchwansee	=	...	...	...	0.378125	square yards.
20 Kutchwansees	=	1 Biswansee	=	...	7.5625	"
20 Biswansees	=	1 Biswa	=	...	151.25	"
20 Biswas	=	1 Puckha beegah	=	...	3025	"

201. The Revenue Survey of Oudh has not only been established on

Basis of the Revenue Survey.

a sound basis, *per se*, but it has been closely connected with the Great Trian-

gulation which fortunately covers the whole of Oudh; no less than three separate Meridional Series, specified in the margin, passing from south to north, through the meridians of Fyzabad, Roy Bareilly, and Cawnpoor, respectively, together with the north-eastern Himalaya Series, traversing the foot of the hills from east to west, admirably cover the entire area, and furnish ample points for any number of Detail or Revenue Surveys. The Pertabgurh Survey has taken up the several principal and secondary Stations of the Gurwani and Karrara Series, nine in number, detailed in the annexed Tabular Statement, which gives the comparative distances as derived by both Surveys, the total difference, and the ratio of error per mile.

NAMES OF G. T. STATIONS.	From G. T. Survey.	From Revenue Survey.	Error of Revenue Survey.	Error per Mile.	REMARKS.
	Feet.	Feet.	Feet.	Feet.	
Newada T. S. to Saifabad T. S. ...	65636.2	65702.1	+ 65.9	+ 5.29	} Gurwani Meridional Series.
Saifabad T. S. to Paripura T. S. ...	67089.9	67091.6	+ 51.7	+ 4.07	
Paripura T. S. to Newada T. S. ...	53863.6	53923.5	+ 59.9	+ 5.87	
Newada T. S. to Marar or Maradi } T. S. ...	54891.6	54885.4	- 6.2	- 0.60	
Newada T. S. to Ramapura T. S. ...	61882.1	61918.1	+ 36.0	+ 3.07	
Ramapura T. S. to Marar or Maradi } T. S. ...	52260.1	52299.1	+ 39.0	+ 3.94	
Ramapura T. S. to Paripura T. S. ...	58631.8	58677.6	+ 45.8	+ 4.12	} Karrara Meridional Series.
Kurrah T. S. to Singroun T. S. ...	99863.4	99829.9	- 35.5	- 1.77	
Kurrah T. S. to Purriawan T. S. ...	49329.6	49310.3	- 19.3	- 2.07	
Average where the error is +	359313.7	359612.0	298.3	4.38	
„ where the error is -	201084.6	201025.6	59.0	1.53	

202. The error in excess distances is 4.38 feet per mile, and in defect distances only 1.53 feet. This is a highly

Ratio of error in comparison with Great Triangulation.

Anderson on his work, for which every credit is due to him. The country is of course exceedingly favorable for Chain Measurements, and the District under Survey especially is very open and level. With due precautions, therefore, in the execution of the Professional Survey, such as are now invariably observed by all Officers in this Department, the most favorable and close approximations to the Trigonometrical Survey may be expected. The error above noted I may observe is quite inappreciable on the Geographical Maps, on the $\frac{1}{4}$ inch scale, and therefore the amalgamation of the materials may be said to be perfect.

203. The Maps and Records furnished by this Surveyor, as detailed in the

Maps and Records furnished.

margin, for the Punjab and Oudh, respectively, are all of a very superior order, and got up in excellent style, as it is invariably Captain Anderson's practice

PUNJAB.

SIND SAUGOR DOAB.

Season 1858-59.

- 1 Index Map of Season's Operations.
- 3 Maps of Main Circuits Nos. 31 to 33.
- 1 Plan of City and Station of Leia, scale 10 chains = 1 inch.
- 1 Sketch Map showing revised boundary between District Leia and Shah-poor.
- 1 Sketch Map of District boundary in the Thul between Mozuffurgurh and Leia.
- 3 Volumes of Village Plans of Main Circuits Nos. 31 to 33.
- 1 Volume Main Circuit Traverse Computations of above Main Circuits.

OUDH.

DISTRICT PERTABGURH.

Season 1859-60.

- 1 Index Map of Season's Operations.
- 3 Maps of Main Circuits Nos. 1 to 3.
- 1 Volume Congregated Village Plans of Main Circuits Nos. 1 to 3.
- 1 Volume Village Traverse Computations of Main Circuits Nos. 1 to 3.
- 1 Volume Main Circuit Traverses of above Main Circuits.

Season 1860-61.

- 1 Index Map of Season's Operations.
- 4 Maps of Main Circuits Nos. 4 to 7.
- 1 Plan of Civil Cantonments of Bela, scale 10 chains = 1 inch.
- 1 Volume Atlas of Congregated Village Plans of Main Circuits Nos. 4 and 5.
- 1 Ditto ditto ditto of ditto Nos. 6 and 7.
- 1 Volume Main Circuit Traverse Computations of Main Circuits Nos. 4 to 7.
- 2 Volumes Village Registers and Traverse Computations of above Main Circuits.

to do. The Main Circuit Maps of the plains of the Sind Saugor Doab, combine well with the Topographical Survey of Kohistan or Salt Range, and from the pains bestowed in fixing a portion of the topography of the adjoining Districts, and the complete Survey of the Indus River, the value of the Maps is greatly enhanced, and the Surveyor has fully maintained the reputation he has deservedly enjoyed for the accuracy and completeness with

which all his Records are deposited in this Office.

204. The ground surveyed in Oudh is totally different from that of the

Opinion of Oudh Maps.

Sind Saugor Doab, but the Surveyor has treated his Pertabgurh Maps of the two latter Seasons with equal effect; they are all admirably executed, both as to coloring, printing, and drawing. The style in which Captain Anderson turns

out his work, especially in respect to the minuteness of detail, and general finish of his one inch maps, go far to place his Establishment in the front rank of the Revenue Surveys. The Village Plan Sheets and Village Registers and Computations are likewise rendered in a most satisfactory manner, alike creditable to the Surveyor, whose professional skill and ability is only equalled by his zeal and devotedness to the public service.

205. In January last I proceeded on a tour of inspection of certain Surveys, and was on my way to Captain Anderson's Camp, then at Roy Bareilly, when that Officer kindly rode in to meet me at the Railway Station at Futtehpoor, and I much regret to state that, in doing so, he met with a severe accident by his horse falling with him, and breaking the small bone of his leg, which produced great inflammation and rendered his moving back to Camp quite impracticable. I, however, had the satisfaction of spending the day with Captain Anderson at Futtehpoor, and discussing with him all particulars regarding the state of the Survey operations in Oudh, and concerted measures for future proceedings; and I trust some slight improvements may be effected from the result of our deliberations. It was a great disappointment to me not to be able to inspect the Surveyor's Office as I intended, but I hope to have another early opportunity of visiting his Party in the Field. I was most favorably impressed with all I saw of this energetic Surveyor, and with all I heard from him.

206. During the current Season of 1861-62, the District of Pertabgurh has been prosecuted to completion, by the Survey of Tehseels Selon and Behar, containing 310 square miles, together with two Tehseels, Dulmoh and part of Roy Bareilly, containing 900 square miles of the adjoining District of Roy Bareilly, making a total of 1,210 square miles for the Season. In this area 1,378 Village Circuits have been laid down. This is a very favorable out-turn, and shows the progressive increase which I anticipated would ensue. The Village Circuits are small, averaging under the square mile each, and this adds materially to the labor of the Surveyors both in Field and Office. There are two more Tehseels in the Roy Bareilly District to be taken up next cold Season; these will be finished by the end of December next, when it is proposed to enter on the Sooltanpoor District. The cost and mileage rate of the work effected during the present Season will be given in the next Report.

207. These important documents, on which the entire progress and accuracy of the boundary Survey depends, are spoken of by the Surveyor in terms of high commendation. He states that they are superior to anything he has ever yet seen, the Village Maps being

Hudbust or Demarcation Sketch Maps.

all combined into one general rough sketch of the Pergunnah or Tehseel, which proved of the utmost use to the Surveyors. The Professional Maps have all been carefully compared with these Demarcation or Hudbust Maps, and were found to agree remarkably well, the few cases of discrepant boundaries being at once adjusted. These Records of the preparatory investigations are stated to reflect the greatest credit on Mr. E. O. Bradford, the Settlement Officer, who bestowed much care and pains on their preparation, whose hearty co-operation and able assistance at all times is fully acknowledged by this Department.

208. The "Khusrah," or Detail Native Measurement of Fields, and the interior specifications and qualities of the land, is conducted entirely by the Civil Department, the results of which are unknown to this Office. The operation was only commenced at the commencement of the cold Season of 1860-61, and Captain Anderson reports that he is informed the detail areas have been found to agree well with the Professional results. This will prove the case in proportion as the two operations are conducted simultaneously, or at long intervals from each other, but, in either case, the Native Agency conducting the Field Measurement is always kept somewhat in check and under control, when he knows the Settlement Officer has Professional Survey data to guide him, and whereby gross frauds must be immediately detected.

209. In entering on so important an operation as a detailed Revenue Survey, in a recently turbulent country like Oudh, it was to be expected with such a machinery passing over every inch of the country, and from which nothing could be hid or concealed, which was liable to the demand of the Government revenue, that some difficulties and complaints would be met with at first, but by the excellent arrangements made by the Surveyor, and his ever prompt action and personal activity, a good understanding was soon arrived at with the zemindars and ryots, and the Survey Establishment kept well in hand, from which the best results have appeared. The Surveyor thus alludes to this subject in his Annual Report for 1860-61, dated 8th November 1861 :—

EXTRACT.

"25. In reviewing the operations of the past Season, it is satisfactory to be able to report upon the uninterrupted progress of our work in the Field, as contrasted with the numerous vexatious circumstances of the preceding year; collisions with villagers, detention of Native Surveyors by Civil Authorities, displacing of trijunctional pillars, and other hindrances which impeded work, inconvenienced all parties concerned, and caused pecuniary loss to Government. When we first took the Field, appearances seemed to justify the expectation that the experiences of the past Season would be renewed in the present. Complaints poured in on every side, and the great difficulty to the Surveyor seemed to be less how to survey the

country than how to obtain peaceably the assent and assistance of the Native population. I have not, however, to mention one single instance of a fracas with the people worthy of notice. Whenever any complaint was sent in by a Native Surveyor, that his work was at a stand-still, for want of the necessary local assistance, I rode to the spot, accompanied by the Tehseeldar immediately on receipt of his Urzee, and personally investigated the case. If on inquiry it was found that the Native Surveyor had made a groundless complaint, he was at once punished by myself; but if, on the other hand, it was proved that the villagers had refused to give the assistance that was required of them, depositions were taken by the Tehseeldar, and the delinquents were sent for trial to the Civil Authorities. Under this system of prompt personal inquiry, complaints gradually ceased. Native Surveyors, finding that their representations of inability to proceed for want of assistance brought them no opportunity of resting on their oars for days, while a correspondence was carried on with the Civil Authorities, and seeing that the Revenue Surveyor himself appeared to ascertain whether they had stopped work with or without cause, were careful not to send in charges of impediments thrown in their way, which, in many instances, are only excuses to cover their own idleness; and the villagers were careful not to repeat offences which were met with prompt investigation and punishment. My best thanks are due to the Officiating Deputy Commissioner, Captain MacAndrew, and his Assistant, Mr. W. C. Wood, for their hearty co-operation and unfailing endeavours to lend us every assistance in their power, to which, in a great measure, may be attributed the uninterrupted progress of our Field work and its satisfactory termination.

“26. The Recess Season which has just closed has been the most laborious of my experience, and much credit is due to the whole Establishment for bringing up the work so nearly to completion that we can now count upon a good out-turn of work in November. The only break in the daily routine of Office occurred on the anniversary of Her Majesty the Queen's birth-day, when a general holiday was given.”

210. The latter paragraph of the above extract fairly exhibits the working habits of Survey Establishments; the duties of the Recess are as onerous as those in the Field, and it is often impracticable to bring up the entire quantity of work executed in a successful Field Season. The Establishment under Captain Anderson is an excellent one, of long practical experience. The several members composing the Subordinate Staff deserving of honorable mention for zeal and proficiency are as follows:—

211. Lieutenant Penton Thompson is reported to have worked well both in Field and Office, and to have acquired the experience and professional knowledge necessary for the efficient discharge of the duties of a full Surveyor. This Assistant surveyed two Main Circuits, took the observations for Azimuths at three Stations, and ably conducted the separate charge of a camp. The general one inch Maps done by himself also show that he has acquitted himself in the Recess duties with equal credit.

Mr. A. Foy, Assistant Surveyor, joined this Party on his return from sick leave to Europe on the 2nd April 1860, and resigned his situation on the 4th November 1861.

Mr. W. H. Patterson, Senior Sub-Assistant, was transferred from the Derajat Survey in lieu of Mr. Housden. He is reported to have performed both his Field and Office duties equally to the satisfaction of his immediate superior, and to have taken a large share of each. I had, therefore, much satisfaction in submitting his name for promotion to Assistant Surveyor on Rupees 250 from the 1st January 1862, which was sanctioned in G. O. G. G. No. 218, dated 14th February 1862.

Mr. C. W. Campbell is a very efficient Sub-Assistant, and reported to have maintained the high character he has always borne for perseverance and steadiness, accuracy of work, and neatness of execution. Messrs. W. S. Buttress and J. Swyny joined this Establishment as Junior Sub-Assistants to fill vacancies, on the 1st October 1860 and 13th February 1862 respectively, as Probationary Sub-Assistants, the former promoted by letter, No. 216, dated 14th February 1862, and the latter appointed by G. O. G. G. No. 1330, dated 27th June 1862.

Mr. Corrie Thompson, appointed on the 19th November 1859, resigned on the 27th June 1860, and paid the forfeit of half the salary he had received, in accordance with the bond of agreement he had entered into to serve 3 years.

Several of the Native Surveyors are reported as very deserving men, who have received a small increase to their salaries.

212. None of the Maps of the Oudh Districts have as yet been published, as the complete materials of no single District have reached this Office as yet, for compilation purposes, and the Maps of other Districts previously surveyed still await the power of the Lithographic Department to undertake such a superabundance of work.

Oudh District and Pergunnah Maps.

213. By the orders of the Government of India, in the Foreign Department, cited marginally, another new Survey Party was directed to be raised for employment in Oudh, during the ensuing Season of 1862-63. For this duty, Lieutenant Penton Thompson, the Senior and most experienced Assistant in the Department, was recommended and approved by G. O. G. G. No. 300, dated the 30th May 1862. This Officer will, therefore, immediately commence recruiting for his new Establishment, which will be posted to the Fyzabad Division, and enter on the District of Fyzabad at the commencement of the ensuing cold weather. The resources of the entire Department are now being strained towards contributing competent Sub-Assistants, Native Surveyors, Tindals, and Measurers, to form the nucleus of

the new Party, so that there may be some prospect of a fair start and tolerable progress in this 3rd Commissionership or Division, next Season. It will be only with much difficulty that I shall be able to provide a sufficient staff of Sub-Assistants for this new Party, owing to the great drain on the Department of late.

214. The vacancy on the 1st Division Establishment, caused by Lieutenant Penton Thompson's promotion, has been duly provided for by the appointment of Lieutenant A. D. Butter, of the 107th Foot, lately doing duty with the Sirmoor Rifles, in General Orders cited in the margin. Lieutenant Butter was recommended to my notice by his superior talents as a draftsman; he was educated at Addiscombe, and, I believe, is likely to turn out well under Captain Anderson's instruction. Lieutenant Butter joined his appointment at Nynee Tal on the 17th of July 1862.

G. O. G. G. No. 1332, dated the 27th June 1862.

215. Mr. J. P. McKeever, Sub-Assistant, 2nd Class, left the Department without leave in September 1859, and Mr. W. Reilly, Jr. Sub-Assistant, 3rd Class, received from the Bundelkhund Survey in 1859, was again transferred to the 2nd Division of Oudh, on the 5th October 1860, for the formation of the new Party.

216. In confirmation of the opinion expressed above, as to the completion of the Sindh Saugor Doab Survey, and the merits of Captain Anderson and his Establishment, I have much pleasure in giving the following Extract from the Report of the Financial Commissioner to the Punjab Government, recommending that the thanks of the Government should be given to the Surveyor and the Assistants named in his Report, which was duly accorded:—

EXTRACTS.

No. 1530, dated 30th November 1859, Punjab Government to Deputy Surveyor General, paragraphs 2 and 3, with enclosure from Financial Commissioner, paragraphs 4 and 5.

"2. The progress both in the Derajat and the Sindh Saugor Surveys is considered by the Hon'ble the Lieutenant-Governor to be satisfactory and very creditable to the Surveyors, Captain Johnstone and Lieutenant Anderson, and to the Assistants named in the Report; and His Honor's acknowledgments have been communicated to those Officers through the Financial Commissioner.

"3. With regard to the promotion of Messrs. Patterson, Campbell, and Buttress, as proposed by Lieutenant Anderson, the Lieutenant-Governor considers that it has been merited and should be given, but he refrains from passing any orders in regard to a Survey which has left these Provinces, and desires me to commend these Officers to your favorable notice."

ENCLOSURE.

"4. In turning to the Sindh Saugor Survey, I have much satisfaction in congratulating the Hon'ble the Lieutenant-Governor on its completion. The Season's operations were the

Survey of a tract of country lying between the Indus and Jhelum, and bounded to the north by the Salt Range and to the south by previously surveyed territory. It includes the northern portion of the Leia District and the western part of Shahpoo, covering 1560·61 square miles. Lieutenant Anderson has had serious difficulties to contend with in his Survey of the hills. His Establishments were not used to surveying uneven ground, and this explains the expensiveness of the work. For further details I beg to refer His Honor to Lieutenant Anderson's Report. Of course no comparison can be made between the expenses of the Derajat and the Sindh Saugor Surveys; the former being rather a Topographical Survey by Main Circuits and large triangles, while the latter is a detailed Revenue Survey of every village.

"5. I am sure His Honor will agree with me that the thanks of Government should be given to Lieutenant Anderson and his Party, for the successful completion of their duties here, and the ability shown in carrying them on. The Survey has now been ordered down to Oudh, and is on its way thither. The following Officers are recommended for promotion in it:—

Mr. C. W. Campbell from Rs. 150 to Rs. 175
 Mr. G. Buttress from „ 100 to „ 125

I beg to second these recommendations cordially, and to support Lieutenant Anderson in proposing that they be allowed to take effect from the commencement of the present Survey year, *viz.*, 1st October. Mr. W. Patterson, who has recently joined this Party by exchange from Captain Johnstone's, is recommended for an increase from Rupees 200 to 225, from the same date. This proposal likewise has my entire support, as Captain Johnstone speaks in the highest terms of Mr. Patterson's industry, zeal, and success."

SECOND, OR LUCKNOW DIVISION, OUDH.

217. By the orders of the Government of India, in the Foreign Department, as cited in the margin, another

Lieutenant-Colonel D. C. Vanrenen, Revenue Surveyor, transferred from the Jubbulpore Survey, *vide* G. O. G. G. No. 4568, dated 2nd October 1860.

Assistants.

Lieutenant F. Coddington, appointed by G. O. G. G. No. 90, dated 17th January 1862.

Mr. W. A. Wilson (Senior), 1st Class, transferred from the Nagpore Survey, *vide* G. O. G. G. No. 4626, dated 5th October 1860.

Sub-Assistants.

Mr. F. W. Kelly, 1st Class, transferred from the Bundelkhand Survey, *vide* G. O. G. G. No. 1536, dated 2nd April 1861.

Mr. W. Ward, 3rd Class, transferred from the Bundelkhand Survey, *vide* G. O. G. G. No. 4626, dated 5th October 1860.

Mr. W. Reilly, 3rd Class, transferred from the 1st or Baiswarn Division of Oudh, *vide* G. O. G. G. No. 4626, dated 5th October 1860.

Mr. C. Sheridan, 3rd Class, appointed by G. O. G. G. No. 4626, dated 5th October 1860.

Mr. W. A. Wilson (Junior), 3rd Class, appointed by G. O. G. G. No. 535, dated 6th February 1861.

36 Native Surveyors.

General average rate per square mile 48 5 0

No. 319, dated 27th January 1860.

was directed to

be raised for

employment in Oudh, and the necessary

estimate was consequently included in

the Budget for the Financial year 1861-62,

amounting to

Rupces 41,524,

as detailed in

the margin. It

was intended to

have entrusted the raising and equipping

of this new Party to Captain Edward

Willoughby, who was transferred from

the 1st Nagpore Division for the purpose,

but the death of that promising Officer

in England, as announced in the *Government Gazette* of the 12th September 1860, prevented this from being carried out.

218. Consequently, the duty in question devolved on Lieutenant-Colonel D. C. Vanrenen, of the 2nd Nagpore Division, who, happening to return from sick leave of absence in Europe in May 1860, was directed by the instructions conveyed in Foreign Department letter, No. 1907, dated the 12th June 1860, to repair to Lucknow, and there to organize and collect a suitable Establishment, with a view to breaking ground in the Lucknow Division in the following Season of 1860-61. Lieutenant-Colonel Vanrenen, being an old and experienced Surveyor, was well acquainted with the special requirements of the duty he was entrusted with, and with the aid freely rendered him by the Department generally, a very fair Establishment was collected in time to commence on the Survey of the Oonao District in October 1860.

219. Four Uncovenanted Assistants and Sub-Assistants, of various degrees of experience, as detailed in paragraph 215, were transferred to this Party by my orders, and two new young Junior Sub-Assistants were entertained specially. In like manner 22 old Native Surveyors, Tindals, and Measurers, were contributed from the existing Survey Parties, to form the nucleus of the new Establishment, which was filled up gradually as suitable candidates were found, and which in Lucknow it is not difficult to find.

220. The post of Covenanted Assistant was filled up by the nomination of Lieutenant Sir R. St. George, Bart., of Artillery (as per margin), a most promising young Officer, brought up at Addiscombe, who joined at Lucknow on the 24th October 1860. Thus the Revenue Surveyor was in a position to start his operations, under the most favorable circumstances, in one of the best and most fertile parts of the new Province so lately annexed to British rule.

221. By personal communication with the Settlement Officer appointed to prepare the country for Survey by the demarcation of the Village Boundaries and adjustment of disputes ahead of the Survey, a sufficient tract of the District of Oonao, situated east of the Ganges River, and lying between the Districts of Cawnpore, Lucknow, and Roy Bareilly, was made over for Survey, and the several Pergunnahs, as per margin, containing 800 Village Circuits and 5,92,867 acres, or 926 square miles, were accomplished in the usual manner as described for other Divisions. The Village Circuits were highly favorable, averaging $1\frac{1}{4}$ square mile each.

Poorwa.
Murawun.
Surwun.
Hurha.
Oonao.
Sekunderpoor.
Pursundum Asoha.
Jhulotur Ajgren.
Russoolabad Asewun.

222. In addition to the above, a very careful Survey of both banks of the Ganges River and the conterminous villages was made. I took the precaution of addressing the North-West Government, on the subject of demarcating the entire village all along the river bank within the Cawnpore District, but I regret to say the Board of Revenue reported that the advantages to be thus derived from such a complete Survey of Village Boundaries, liable to change by the fluctuations of a large river, were not commensurate with the expense to be incurred for the mere demarcation only, and consequently the Survey on the right, or Cawnpore bank, is topographical only. I have, however, caused this to be as minute as possible. The value of these River Surveys showing all lands of accretion and decretion is not to be over-estimated for both Revenue and Magisterial cases, and in the present instance the cost of the Survey would have been nothing. A similar Survey in Rohilkhund of the Ramgunga and Ganges Rivers and adjoining villages in 1852, 1853, and 1854 was highly appreciated, and is a most valuable record for the Local Offices.

223. The origin of this new Survey was the triple junction Station of Pergunnah Hurha and Poorwa with the District of Roy Bareilly, the initial Azimuths having been carefully observed there. It was desirable that the starting points of the Revenue Survey should have been the two Great Trigonometrical Survey Principal Stations of "Jajmao" and "Mawa" on the right bank of Ganges in the Cawnpore District, but the Surveyor reports, the notoriously unhealthy character of this locality, so early in the Season, induced him to adopt a higher level, and to connect afterwards with the above Trigonometrical Towers.

224. The Amna Meridional Series of the Great Triangulation passes directly through the Oonao District, dividing it into two equal parts, and thus afforded great facilities for a due connection. Seven Principal Stations have been identified and laid down, affording nine independent distances for comparison, the results of which, as shown in the following Table, are highly satisfactory, giving a mean average ratio of error of 2·90 feet per mile on the excess quantities, and 2·70 feet on those in defect. The District being perfectly level and open is most favorable for the Revenue Survey system, and the Surveyor has succeeded well in obtaining a very close approximation to the triangulated distances which are viewed as errorless :—

NAMES OF G. T. STATIONS.				From Revenue Survey.	From G. T. Survey.	Error of Revenue Survey.	Error per mile.
Mawa	to Jajmao	δ	...	69834·7	69766·3	+ 68·4	5·17
Mawa	to Niwanuh	"	...	78620·8	78616·8	+ 4·0	0·27
Niwanuh	to Jajmao	"	...	65141·0	65081·2	+ 59·8	4·85
Niwanuh	to Rao	"	...	81161·3	81123·7	+ 37·6	2·45
Rao	to Jajmao	"	...	79026·1	78990·5	+ 35·6	2·38
Rao	to Jhulotur	"	...	61827·0	61852·2	- 25·2	2·15
Jhulotur	to Niwanuh	"	...	82004·4	82017·0	- 12·6	0·81
Jhulotur	to Bukseria	"	...	72926·7	72929·4	- 2·7	0·20
Bukseria	to Rao	"	...	74683·2	74791·8	- 108·6	7·68
Average where the error is +				373783·9	373578·5	+ 205·4	+ 2·90
" where the error is -				291441·3	291590·4	- 149·1	- 2·70

225. The Survey having only extended over this one Season of 1860-61,

Area, Cost, and Rates.

Contingent Charges.	Rs.	A.	P.
New Camp Equipage ...	2,921	2	0
Special Travelling allowance ...	131	9	7
Conveyance of Government property from Presidency to Lucknow ...	398	13	0
Carriage Dak for Sub-Assistant ...	329	6	5
Sundries ...	203	11	0
Total ...	3,974	10	0

out of the three under review, there are no aggregate results to be compared with those obtained in other Divisions under other Surveyors. The area, cost, and rate for this Season, and the preliminary expenditure entailed in 1859-60, in the organization of the Party, is as follows:— The Contingent Charges for the Season which include part of the new equipment necessary when first organizing a Party are as detailed in the margin:—

SEASONS.	Number of Village Circuits.	Average size of Village Circuits in Acres.	Area Surveyed in Square Miles.	Cost.	Average rate per Square Mile.	Average rate per Village Circuit.
1859-60 ... ..	.....	.....	.....	3,761 0 0	0 0 0	0 0 0
1860-61	800	741	926	40,975 0 0	44 4 0	51 3 0
Total	800	741	926	44,736 0 0	48 5 11	55 14 0

226. These are certainly high rates for the description of country and

Cause of high rates.

the large average size of the villages under Survey, but there are many points to be considered in starting a new Survey with a newly-raised Establishment, which has to be trained and taught. This Season's out-turn I believe to have been attained only by the utmost exertions on the part of the Surveyor, on

whom devolved great additional labor, owing to the want of skilled computers and other useful members composing a really efficient Survey Establishment. I have every hope that, as he advances, Lieutenant-Colonel Vanrenen will, year by year, improve his rates materially, and so effect a better average.

227. The Maps received are of the usual character, and are specified in the margin. The detail of the Survey, as carried out by this Surveyor, is excellent : he has fully acted up to the instructions issued to him for guidance in this respect, which were precisely similar to those furnished to the 1st Division as before described. The Maps show distinctly the careful manner in which the features of the

- DISTRICT OONAO.
Season 1860-61.
- 1 Index Map of Season's operations.
 - 1 Map of Main Circuits Nos. 1 to 3.
 - 1 Ditto ditto Nos. 4 to 7.
 - 1 Volume Atlas of Congregated Village Plans of Main Circuits Nos. 1 to 7.
 - 1 Volume Village Traverses of Main Circuits Nos. 1 to 7.
 - 1 Volume Main Circuit Traverses of above Main Circuits.

Balance.
Volume of Register Headings.

country have been delineated. The one inch Pergunnah Maps are rather too highly colored, but this will easily be remedied.

228. On the 23rd of January last I visited Lieutenant-Colonel Vanrenen's Camp in the Lucknow District, and had the satisfaction of consulting him as to the nature of the operations in progress in Oudh, and inspecting such work as was then in hand. The Settlement Officer, Mr. Kavanagh, also kindly met me there, and I derived much gratification and instruction from all I then heard as to the civil portion of the work. Mr. Kavanagh, as an old Surveyor attached to this Department for many years, and of whom my former Reports speak in high terms, is thoroughly acquainted with all the requirements of the Professional operations, and I need hardly add how greatly these operations have benefited by his able and hearty co-operation. My visit to the Revenue Surveyor's Camp, I am sure, will not be without its good results, and I retain a very lively recollection of all I saw there and of the cordial reception I met with.

229. Regarding the demarcations and the "Khusrah" or "Kistwar" Native Detail Measurements, the Revenue Surveyor thus speaks in his Annual Report :—

Demarcation Maps.

EXTRACT FROM ANNUAL REPORT OF SEASON 1860-61.

"37. The comparisons of the Hudbust with the Professional Survey brought to light many discrepant boundaries, of which a re-survey had to be made; the Hudbusts in such cases being generally, though not always, incorrect. This is due partly to the extraordinary rapidity with which the work of demarcation was done, and partly to the fact of the zemindars having failed to rebuild some of the boundary marks, which, having been washed down during the rains, had not been replaced. In some instances, too, they had been wantonly destroyed. The work of

Boundary Demarcation and Survey was undertaken on the 17th April, and completed in the end of June, at a most trying period of the Season, and in less than three months.

“38. The Superintendent, Mr. Bradford, is himself aware of this, and lost no time in detaching extra Ameens for the purpose of rectifying the Hudbust Maps, or of correcting the Boundary Pillars, where they had been fraudulently or carelessly rebuilt, directly the discrepancies were brought to his notice.

“39. I have mentioned the very short time taken in the Demarcation and Native Survey of Oonao District, since I am given to understand that this work turned out extremely correct in the Pertabghur District. There the cost of Demarcation and Native Survey was nearly double what it was here, the Superintendent in this District having to work against time.

“40. Comparisons again of our interior or Detail Survey with the Native Kistwar Measurements are much nearer than I expected to find them. As a rule the Professional Survey gives more cultivation than the Native Survey, but less waste land. With regard to the unculturable wastes we have both shown more than in reality exists. A great deal of what is commonly accepted by the Native community as waste and unculturable is culturable; though to bring it under cultivation, some expense in the way of digging wells and of making tanks must be incurred.

“41. I have to acknowledge with thanks the very great assistance I have at all times received from the Deputy Commissioner, Mr. Clifford, and from Mr. Bradford, who is superintending the demarcation and adjustment of boundaries. Harmony and cordiality have happily existed between us, and this has greatly facilitated the work in hand.”

230. This additional new Survey Party having been ordered somewhat unexpectedly, the Settlement Department had to make great exertions to get a sufficient area ready for the Professional Survey, and of course some discrepancies naturally presented themselves; but the close comparison always entered into between the two operations after completion must inevitably bring all defects to light, and this being done, and the erroneous boundaries adjusted, nothing more can be wished for. The Demarcation Maps supplied are as good a guide to the Surveyor as could be expected or desired. With such an understanding as exists between the Professional and the Civil branches, the very best results are to be expected, and I hope I may be allowed to add my own cordial thanks and acknowledgments to Mr. Bradford, the energetic Superintendent of Settlements in Oudh, for the admirable manner in which he keeps the Survey Parties employed without interruption or hindrance of any kind. Indeed, the subject seems thoroughly to be understood and appreciated by the Civil Authorities in Oudh, and consequently the Professional operations enjoy an advantage as to their economical working which I beg to say we highly prize.

231. Whilst at the Revenue Surveyor's Camp, that Officer pointed out to me the backward state of the (“Khusrah” or “Kistwar”) Native interior Detail Measurement of Fields in Oudh. According to established principles which always guided this Department, when the combined operations were under the Professional Surveyor, simultaneous procedure was always aimed at, because the closer two measurements are conducted toge-

Method of conducting combined operations.

ther, the greater the check of one over the other, and the more likely are the detail areas of the various specifications of the land to assimilate than if they are conducted in different Seasons. I took occasion, therefore, to address the Chief Commissioner on this subject, and pointed out to him the importance of keeping the Civil Measurements well up to and abreast of the Professional if possible, and that Officer fully appreciating the advantage of such a system, has, I believe, urged it on the notice of the Settlement Officers engaged in the different Divisions.

232. From a long personal experience in this description of work, I am

Necessity of simultaneous procedure.

strongly persuaded of the necessity of conducting the combined operations in the above manner. My own convictions have always been, that all measurements of whatever kind should be under the sole superintendence of the Professional Surveyor, but of late years this principle has been set aside, and divided jurisdiction and responsibility set up by the Civil Department. Having fully exemplified all the bearings of this subject, in the *Part IV., page 532, London Edition.* "Manual of Surveying for India," published some years ago for the guidance of the Department under the auspices of the Government of India, I need not dwell further on it in this place; my object being merely to inculcate rigorous procedure, in a difficult and laborious duty, on the part of those entrusted with its superintendence.

233. The District of Oonao has again formed the scene of the

Work performed in current Season of 1861-62.

present Season's operations. The Establishment, having recessed at Landour, resumed work at the usual period, prosecuted this District to completion, and then entered on the adjoining District of Lucknow, on which a good impression has been made. An approximate area of 1,001 square miles has been returned in 1,082 Village Circuits, averaging 592 acres each. Of this area 596 square miles belong to the Lucknow District, seven Pergunnahs of which have been completed. The remaining portion of this District will be brought to a close in the ensuing Season, and the next District of Durriabad taken up. The entire Division may be expected to be got out of hand in 1863-64.

234. It was my painful duty to report some time back the death of the

Death of Covenanted Assistant.

Covenanted Assistant, on this Survey, Lieutenant Sir R. St. George, Bart., whose loss has been deeply regretted. The Revenue Surveyor pays the following tribute to the worth of this most promising and excellent young Officer, in which I have great reason to concur:—

"Of the late Sir Richard St. George, who died of jungle fever at Landour on the 14th October 1861, I cannot speak too highly. He was active, industrious, and most indefatigable

in the discharge of his duties. But for his active co-operation, I could not have accomplished even what has been done. In him the Government has lost a valuable, energetic Officer, and the Department a most promising Assistant."

235. The vacancy thus caused has been filled up by the appointment of Lieutenant F. Coddington, of Artillery, by the orders of Government, cited in the margin. This young Officer was recommended on account of the high place he took at Addiscombe, having passed the Engineer examination; and from what I saw of him when visiting this Survey, I believe he is remarkably well adapted for the arduous duties of this Department, which demand not only certain mental qualifications, but very strong physical powers, all of which are possessed by this Officer.

236. The Staff of this Party having only so recently been brought together, their labors require to be more developed. Mr. W. Ward, Sub-Assistant, 3rd Class, transferred from the Bundelkhund Survey, was permitted to resign his situation from the 1st November last, his retention being inexpedient owing to the deficiency in the necessary qualifications to make a good Surveyor. Messrs. W. Wilson, Assistant Surveyor, and F. W. Kelly, Senior Sub-Assistant, are reported to have given satisfaction. Messrs. C. Sheridan and A. Wilson, qualified and passed Candidates, were admitted into the Department on the dates specified in the margin. Mr. W. Reilly, Junior Sub-Assistant, was re-transferred to the Bundelkhund Survey on the 1st May 1861 in lieu of Mr. Kelly.

237. The Native Surveyors generally have worked well, and those specified in the margin are pronounced old, experienced men. In another Season Lieutenant-Colonel Vanrenen will doubtless have his Establishment thoroughly efficient in all its branches; every credit is due to this Officer for the manner in which he has thus raised and worked his Party for a couple of Field Seasons. The duties have of course been more irksome than if he had been assisted by an old and thoroughly efficient party.

DIVISION PUNJAB.

The Derajat or Trans-Indus Survey.

238. The operations which have been in progress in the Derajat Trans-Indus since the year 1855 are of a peculiar character, partaking more of the Topographical than of the Revenue system of Survey, as fully described in my two last Printed Reports for 1856-57 and 1857-58.

Major H. C. Johnstone, Staff Corps, Revenue Surveyor.

Assistants.

Lieutenant C. J. Griffiths, late 72nd Regiment, Native Infantry.

Mr. George Housden, 2nd Class.

Sub-Assistants.

Mr. E. Foy	...	1st Class.
" H. Meany	...	3rd "
" R. R. Green	...	" "
Pundit Hurree Singh	...	" "
Mr. R. B. Green	...	" "
20 Native Surveyors.		
General average rate per square mile	...	9 10 0

In the Plains and portions of the Derah Ghazee Khan District, subtending the Indus River bank, although no village boundaries have been laid down and separately defined, yet the details of the several specifications of the land have

been most minutely extracted and shown on the scale of 2 inches to the mile, with as much care as the usual Village Revenue Survey, and the Maps of Blocks or Main Circuits on the above scale are declared sufficient for all purposes of Local Revenue Administration, Trans-Indus. The hilly tracts and uninhabited portions of the District further removed from the River, as well as the features beyond the actual British Frontier, have of course been taken up topographically only, on the usual standard one inch scale.

239. Major Johnstone, the Surveyor who initiated the Survey from the

District under Survey in 1858-59.

extreme south of the District on the Jacobabad Sind Frontier, with the Establishment as noted, resumed his labors

in the Season 1858-59, by taking up the two large Pergunnahs, Derah Ghazee Khan and Sunghur, which completed the District of the former name, after which Pergunnah Kolachee, of the Derah Ishmael Khan District, coming next in succession, fell under Survey, which, together with the independent hilly territory skirting the extent of frontier thus laid down, and the Indus River dividing these two Districts from Leia of the Sind Saugor Doab, formed a very large out-turn of work.

240. The area actually falling within the Main Circuits in the plains, as

Area accomplished.

	<i>Square Miles.</i>
Pergunnah Ghazee Khan	... 820
" Sunghur	... 890
District Derah Ghazee Khan	... 1,710
Pergunnah Kolachee (part of), District Ishmael Khan	... 542
	<hr/> 2,252
Indus River of District Leia	... 160
	<hr/> Total Plains ... 2,412
Independent Hills	... 1,625
	<hr/> Grand Total ... 4,037

as detailed in the margin, added to which an area of 1,625 square miles is recorded as obtained from the portion of independent hills beyond British boundary, but reconnoitred and mapped as far as it was possible to do so from the base of operations within our own territory, and as will be presently described in the Surveyor's own words, thus making a grand

total of 4,037 square miles of general area.

241. The Survey in the Plains brought up from the origin, the Dome of

Basis of Survey.

Pir Aquil Mahomed's Tomb at Mittun Kote, is based throughout the entire

length of the Frontier on the Great Indus Series Triangulation, of which eleven principal Stations were met with in this Season, the co-ordinate dis-

tances being computed, as well as all Main Circuit triple junction Stations, principal Towns, Villages, Hill Peaks, and conspicuous objects from the above point of departure. The Solyman Range Peaks having been fixed by the superior instruments of the Great Trigonometrical Survey, the points formed a sure guide for the Topographical Surveyor, and the combined work is therefore the more to be relied on.

242. In continuation of the above, the same Party, after recessing at Murree, re-entered the Derah Ishmael Khan District early in October 1859, and prosecuted the Survey of that District by taking up the Pergunnahs as per margin, which, together with the small Illaqua of Tonk, the River Indus, and the Independent Hills subtending the Frontier Line, constituted a very large Return for the Season, aggregating 4,738 square miles, of which 2,427 appertain to the Derah Ishmael Khan District, the same Principal Triangulation of the Great Indus Series affording the fullest means of connection, which was taken due advantage of.

	<i>Square Miles.</i>
Pergunnah Kolachee ...	... 1,068
" Ishmael Khan ...	... 1,278
" Lukkee (portion of) ...	... 81
	<hr style="width: 100px; margin-left: auto; margin-right: 0;"/> 2,427
Illaqua of Tonk ...	... 486
River Indus ...	... 292
Independent Hills...	... 1,533
Total ...	<hr style="width: 100px; margin-left: auto; margin-right: 0;"/> 4,738

243. Again this Establishment returned to the same District of Derah Ishmael Khan in October 1860, and completed it during the Field Season of 1860-61. After which, still progressing northward, the District of Bunnoo was entered, and the whole of it brought under Survey as far as the Kuttuk Hills, which separate it from the Kohat District, or up to the parallel of Kalabagh in 33° North Latitude. The Peshawur and Kohat Survey made by Major Walker, Bombay Engineers, in 1849, embraced all the country down to Sheek Booddeen Hill and Tonk, including the Murwut Valley. During this Season the Surveyor was employed for nearly four months with the Military expedition into the Mahsood Wuzeree country, under Brigadier General Chamberlain, as explained in the extracts which follow, but the conduct of the Survey devolved on Major Walker, of the Great Trigonometrical Survey, the Senior Officer present.

244. The Survey of the entire Trans-Indus Territory was thus brought to a conclusion, the work brought up from the south by Major Johnstone overlapping that executed by Major Walker sufficiently to provide for all Revenue requirements, and to derive better topographical information of the extreme limits of the latter Officer's operations in the Plains of Bunnoo and Murwut, which various circumstances at the time prevented him from obtaining, and which he was desirous should be re-placed, as more fully explained in paragraphs 202 and 203 of my last Report.

245. The area surveyed this Season, as reported by the Surveyor, amounts to 4,217 square miles, as detailed in the margin, giving 3,255 of Plains, and 962 of the Kabul Kheyl Wuzeree Independent Hills. The last named Pergunnah belongs to the Derah Ishmael Khan District, but the three first have been transferred to form the new District of Bunnoo in conjunction with the Meanwallee Tehseel of the old Leia District in the Sind Saugor Doab. The extreme length of this portion of Derah Ishmael Khan with Bunnoo is 137 miles, and the breadth, varying from 13 to 40, averages 25 miles, and a small portion from the Shahpoor District still undefined. The Kuttuk Hills having been well delineated by Major Walker, it was not necessary to

	Square Miles.
* Pergunnah Esakheyl ...	444
" Lukkee ...	1,084
" Bunnoo ...	523
District Bunnoo ...	2,051
Pergunnah Derah Ishmael Khan ...	512
River Indus ...	355
District Derah Ishmael Khan ...	867
Illaqua Khwaja Mahomed Khan Kuttuk ...	230
Revised Boudarics, &c. ...	107
	337
Total Plains ...	3,255
Independent Hills ...	962
Total ...	4,217

attempt any further investigations in that quarter. Ample Trigonometrical points were also found for the work of this Season.

246. The relative progress for the three Seasons under review, together with the total cost and average rate per square mile, will be seen from the following Statement :—

General area, cost, and rate for three Seasons.

SEASONS.	Area Surveyed in Square Miles.	Total cost, including Contingent Charges.	Average rate per Square Mile.
		Rs. A. P.	Rs. A. P.
1858-59	4,037	43,465 0 0	10 12 0
1859-60	4,738	41,435 0 0	8 12 0
1860-61	4,217	40,510 0 0	9 10 0
Total	12,992	1,25,410 0 0	9 10 0

The average annual area obtained is 4,331 square miles, an out-turn caused chiefly by the style of country affording large areas of extensive tracts of grazing and other waste lands, besides the Independent Hills beyond the British Frontier, which could be little more than reconnoitred or penetrated at different points, as described in the Extracts from the Surveyor's Reports which

follow. The total cost is Rupees 1,25,410, or Rupees 41,803 annual average, including all contingent charges, on which the mileage rate comes to Rupees 9 10 annas only, which, considering the very arduous nature of the work, and the various difficulties, physical and political, attending the steps of the Surveyors employed, must be considered as highly satisfactory and extremely moderate.

247. The Derajat Survey was commenced in 1855-56; the entire work has therefore occupied six Seasons. The Establishment at the commencement was only on a small scale, but increased to

Final results. Completed District or Frontier.

full strength, the same as all other Survey Parties in 1858-59, *viz.*, from Rupees 33,076 to Rupees 37,524 per annum for permanent charges. Thus the rate of progress during the last 3 years is greatly in excess of 3 previous years, and each Season the out-turn has improved, thus confirming the principle that full and efficient Establishments with Native Agency in due proportion to the amount of superintendence is more economical than small Parties with an excess of European Agency.

248. The total area of this tract, including the Lower and Upper

	Square miles.	Cost.
From 1855 to 1858 ...	6,234	89,843
„ 1858 to 1861 ...	12,992	1,25,409
Total ...	19,226	2,14,252
Mean annual average ...	3,204½	35,708½

Derajat, embraced in this Surveyor's operations, and measuring in a direct line 341 miles, comes to 19,226 square miles, which has been executed at a total cost, including charges of every nature, permanent as well as contingent, of Rupees 2,14,252, as per margin, yielding a mean average rate per square miles of Rupees 11 2 annas, a sum for which such a minute and excellent Survey for all purposes, Revenue as well as Military, may be deemed well worth the money. The general mileage rate has thus been brought down from Rupees 17 (nearly) as given in the last Report to the above figure, or one-fourth less, and it is satisfactory to find that the anticipations I then expressed have been fully realized.

Seasons.	Cost.	Rate.	
	Rupees.	Rs.	As.
1855-56 ...	19,272	28	7
1856-57 ...	33,030	11	4
1857-58 ...	29,587	11	4
1858-59 ...	37,104	9	3
1859-60 ...	37,361	7	14
1860-61 ...	36,429	8	10
	1,92,783	10	0
	21,469		
	2,14,252	11	2

249. The probable estimate for this Survey anticipated by Sir John Lawrence at its commencement, *viz.*, Rupees 10 per square mile, has thus been very nearly attained. On the permanent charges only the rate comes to 5 pie only above that sum, and with all the additional contingent and extraneous charges, such as extra Batta to every member of the Establishment and other items unknown in other Surveys, as enumerated in the following

paragraph, the actual cost is only 1 Rupee 2 annas above the late Lieutenant-Governor's expectations. Looking to the events which occurred during the period these operations were in progress, and all the circumstances attending the Surveyor's labors, the financial result speaks most highly for his good management.

250. The contingent charges on this Survey, conducted in so peculiar a country, amidst border tribes difficult to deal with, and always requiring a Frontier strong Military Force to watch their movements, have been necessarily larger than on most other Surveys, and also of an exceptional character. The extra guards and arms necessary for the due protection of every individual was covered by a fixed allowance of Rupees 100 per mensem, as directed by Sir John Lawrence. The camel hire for the conveyance of water, food, &c., for every Sub-Party, is high, but unavoidable; whilst the sums laid out as presents to the bordering chiefs were necessarily expended by the advice of the Political Authorities. The jungle-clearing is very moderate. The total expenditure under these heads amounts to Rupees 14,515, or an average of Rupees 4,835 per annum for the three Seasons under review, as follows :—

Description of Contingencies.	Season 1858-59.	Season 1859-60.	Season 1860-61.	Total.
Presents of Chiefs	1,103 0	221 0	204 0	1,528 0
Travelling allowance to subordinates	578 14	463 0	429 1	1,470 15
Line-clearing	817 14	626 11	342 4	1,786 13
Camel hire for carrying water, &c., for each Survey Party	1,986 13	1,308 0	1,254 0	4,548 13
Chupprassies for securing attendance	410 0	380 0	330 0	1,120 0
Repairs of Instruments, Bullock Train (for Government Stores), and Sundries	264 3	75 2	321 13	661 2
Guards, Arms, &c.	1,200 0	1,000 0	1,200 0	3,400 0
Totals	6,360 12	4,073 13	4,081 2	14,515 11

251. The following list gives 45 Stations of the Great Triangulation, which have been identified and connected with the Topographical Survey, during the 3 Seasons under review. On a comparison of the distances as derived from the two Surveys, the results are found to be extremely good, the mean error ranging from 2.91 feet to 3.74 feet per mile; the former being in excess and the latter in defect. A few of the lines differ a little beyond the usual approved ratio which is not surprising, with chaining over some of the rough parts of the ground in which they occur :—

NAMES OF G. T. STATIONS.		From Revenue Survey.	From G. T. Survey.	Error of Revenue Survey.	Error per mile.
		Feet.	Feet.	Feet.	Feet.
1	Dara Deen Pina ... to Gadi ...	55613.7	55461.5	+ 152.2	14.45
	Dara Deen Pina ... to Toori ...	63075.4	62961.6	+ 113.8	9.53
	Toori ... to Gadi ...	61015.3	61027.4	- 12.1	1.05
	Toori ... to Towsa ...	66236.3	66263.5	- 27.2	2.17
5	Towsa ... to Gadi ...	54355.9	54388.6	- 32.7	3.18
	Towsa ... to Langawala ...	62269.4	62320.5	- 51.1	4.33
	Langawala ... to Toori ...	63911.6	63969.0	- 57.4	4.74
	Langawala ... to Farowala ...	66927.9	66997.0	- 69.1	5.45
	Farowala ... to Toori ...	44692.8	44727.4	- 34.6	4.09
10	Farowala ... to Sukhiwala ...	49245.6	49310.8	- 65.2	6.99
	Sukhiwala ... to Aliani ...	44265.1	44315.9	- 50.8	6.06
	Aliani ... to Farowala ...	61803.8	61941.7	- 137.9	11.78
	Aliani ... to Langawala ...	54186.1	54200.2	- 14.1	1.37
	Aliani ... to Tibbi ...	51965.4	51936.1	+ 29.3	2.98
15	Tibbi ... to Langawala ...	53333.9	53364.7	- 30.8	3.05
	Tibbi ... to Futteh Khan ...	50534.8	50555.7	- 20.9	2.18
	Futteh Khan ... to Aliani ...	59478.3	59507.3	- 29.0	2.57
	Futteh Khan ... to Shahpoor ...	65518.2	65553.6	- 35.4	2.85
	Futteh Khan ... to Chooni ...	55126.8	55137.1	- 10.3	0.99
20	Shahpoor ... to Aliani ...	56432.6	56457.6	- 25.0	2.34
	Shahpoor ... to Sukhiwala ...	47883.4	47923.3	- 39.9	4.40
	Shahpoor ... to Mahomed Shah ...	50406.6	50357.7	+ 48.9	5.12
	Mahomed Shah ... to Jhirkil ...	48695.9	48693.4	+ 2.5	0.27
	Jhirkil ... to Jalwala ...	71864.7	71982.7	- 118.0	8.67
25	Jalwala ... to Chooni ...	61761.4	61765.7	- 4.3	0.37
	Jalwala ... to Purwa ...	53047.0	53115.7	- 68.7	6.84
	Jalwala ... to Burmi ...	60272.0	60311.8	- 39.8	3.49
	Burmi ... to Purwa ...	49439.3	49538.2	- 98.9	10.56
	Burmi ... to Jhirkil ...	66416.8	66468.9	- 52.1	4.14
30	Burmi ... to Kasain ...	50728.5	50761.7	- 33.2	3.46
	Kasain ... to Jhirkil ...	43140.7	43144.6	- 3.9	0.48
	Kasain ... to Bukkur ...	61791.1	61850.1	- 59.0	5.04
	Bukkur ... to Burmi ...	57830.9	57854.4	- 23.5	2.15
	Bukkur ... to Segra ...	46367.7	46424.0	- 56.3	6.41
35	Segra ... to Mandra ...	78192.1	78263.0	- 70.9	4.79
	Segra ... to Muriali ...	62758.5	62861.7	- 103.2	8.68
	Murali ... to Mandra ...	52968.7	52911.8	+ 56.9	5.67
	Bukkur ... to Murali ...	77443.5	77549.1	- 105.6	7.20
	Mandra ... to Sandi ...	72800.8	72848.0	- 47.2	3.42
40	Mandra ... to Sheikhboodeen ...	141248.8	141166.5	+ 82.3	3.08
	Sheikhboodeen ... to Umerkhel ...	146614.8	146609.1	+ 5.7	0.21
	Sheikhboodeen ... to Sandi ...	154872.6	154873.6	- 1.00	0.03
	Umerkhel ... to Maidain ...	159348.1	159340.2	+ 7.9	0.26
	Umerkhel ... to Sandi ...	151814.4	151807.1	+ 7.3	0.25
45	Maidain ... to Sheikhboodeen ...	226162.5	226171.3	- 8.8	0.21
	Average where the error is +	921751.8	921245.0	+ 506.8	2.91
	„ where the error is -	2312107.9	2313745.8	- 1637.9	3.74

252. In addition to the above long list of points, the lower section of the Indus Series Triangulation, which happened to pass over the Derah Ghazze Khan District, subsequent to the Topographical Survey made prior to the Season 1858-59, was carefully re-observed, and all the Stations taken up by Major Johnstone. The comparison of these distances is as follows, showing a mean error of 3.54 feet per mile where the difference is in excess, and 3.33 where in defect. Every credit is due to the Surveyor for going back over this

part of the ground for such a purpose, and the good result is a sufficient reward for the labor entailed :—

NAMES OF G. T. STATIONS.	From Revenue Survey.	From G. T. Survey.	Error of Revenue Survey.	Error per mile.
	Feet.	Feet.	Feet.	Feet.
Dara Deen Pina ... to Abbaswala ...	68087.7	68122.9	— 35.2	2.73
Abbaswala ... to Mohana ...	60737.0	60682.7	+ 54.3	4.72
Abbaswala ... to Mahiwala ...	51723.6	51684.8	+ 38.8	3.96
Mahiwala ... to Mohana ...	45497.9	45519.9	— 22.0	2.55
Mohana ... to Guhman ...	64428.1	64450.8	— 22.7	1.86
Guhman ... to Hotwala ...	55817.9	55838.0	— 20.1	1.90
Hotwala ... to Mohana ...	62160.7	62198.3	— 37.6	3.19
Mohana ... to Khemwala ...	48918.6	48940.4	— 21.8	2.35
Mahiwala ... to Khemwala ...	47362.9	47383.2	— 20.3	2.26
Hotwala ... to Khemwala ...	65125.6	65182.5	— 56.9	4.61
Hotwala ... to Ilwala ...	54995.2	54939.5	+ 55.7	5.35
Hotwala ... to Dorutta ...	56918.8	56926.8	— 8.0	0.74
Khemwala ... to Dorutta ...	64138.6	64152.3	— 13.7	1.13
Khemwala ... to Mara ...	49029.9	49016.3	+ 13.6	1.16
Ilwala ... to Dorutta ...	50369.7	50316.6	+ 53.1	5.57
Dorutta ... to Mara ...	49753.8	49833.4	— 79.6	8.45
Ilwala ... to Naharwala ...	48429.3	48388.1	+ 41.2	4.49
Naharwala ... to Tobwala ...	51163.9	51212.0	— 48.1	4.96
Tobwala ... to Jhakar ...	50164.7	50225.3	— 60.6	6.38
Narwala ... to Jhakar ...	60375.1	60427.7	— 52.6	4.60
Tobwala ... to Dalura ...	67465.3	67439.9	+ 25.4	1.99
Jhakar ... to Dalura ...	72411.9	72388.7	+ 23.2	1.69
Average where the error is +	455161.9	454856.6	+ 305.3	3.54
„ where the error is —	789914.3	790413.5	— 499.2	3.33

Maps and Records furnished.

253. The Maps rendered by this Surveyor, of which a detailed list is marginally given, are of a very superior order; they are all executed in a masterly manner, and fully

evinced the pride and care taken in turning out his work. The Topographical details are shown in the utmost minuteness, whilst the coloring, printing, and finish leave nothing to be desired. The block plans on the 2 inch scale, as well as several plans of Cantonnments and Civil Stations on the large scale, are well-drawn and valuable records. The full explanatory notes, geogra-

Season 1858-59.

- 1 Index Map of Season's operations.
- 7 Maps of Main Circuits Nos. 17 and 19 to 24.
- 23 Sub-Division Maps of above Main Circuits.
- 1 Plan of Cantonnments and City of Derah Ghazee Khan.
- 1 Map of Hill portion No. 4, scale 1 mile = 1 inch.
- 1 Ditto of Skeleton Map of ditto.
- 1 Volume Main Circuit Traverse Computations.

Season 1859-60.

- 1 Index Map of Season's operations.
- 9 Maps of Main Circuits Nos. 25 to 32.
- 23 Sub-Division Maps of above.
- 1 Plan of Cantonnments of Derah Ishmael Khan.
- 1 Map of Hill portion Derah Ishmael Khan, scale 1 mile = 1 inch.
- 1 Skeleton Map of ditto.
- 1 Volume Main Circuit Traverse Computations.

Season 1860-61.

- 1 Index Map of Season's operations.
- 10 Maps of Main Circuits Nos. 34 to 43.
- 28 Sub-Division Maps of above.
- 1 Map of Frontier Hills, scale 2 miles = 1 inch.
- 1 Skeleton Map of ditto.
- 1 Plan of Station and City of Bunnoo.
- 1 Volume Main Circuit Traverse Computations.

phical and statistical, form valuable additions to the one inch Maps. Several of these Maps, describing the difficult features of the Solyman Range and the lower hills connected therewith all along the frontier, showing also the several Passes with great clearness and perspicuity, demanded special care and ingenuity in the handling, and the measure of success achieved is as great as could possibly have been expected from the time and means bestowed, and the capabilities permitted to the Surveyor.

254. The above materials have formed the means of reducing and compiling the General District Map of Derah

Lower Derajat Map.

Ghazee Khan of the Lower Derajat, on

the quarter inch = 1 mile scale. This District, stretching from the Kusmore Post on the Jacobabad Frontier below Mittunkote, measures 204 miles in length south to north, extending as far as Derah Futteh Khan, a little above the parallel of the Station of Leia, and varying from 10 to 45 miles in breadth east and west, between the Indus and the Solyman Range. The preparation of this Map has been a tedious job, but, I am happy to say, it is now lithographed and issued in a style which, I believe, has never before been arrived at in India. By the system of double printing, the hills, which are of a very intricate character, have been drawn in chalk, by which a very good and soft effect is attained, and the whole appearance of the Map rendered more readable and exceedingly pleasing to the eye. This Map, measuring 5 feet by 3 feet, is a great addition to the Geography of the Punjab, and will no doubt be highly prized by all Frontier Officers and Officials; it does full justice to the labors of the Surveyor and is alike creditable to all concerned.

255. In like manner, the Map of the Upper Derajat, embracing the Derah Ishmael Khan and Bunnoo Dis-

Upper Derajat Map.

tricts, is under compilation on the re-

duced geographical scale. With this will be combined the independent Kabul Kheyl Wuzeree Hills, reconnoitred by Major Johnstone, and such portions of the Kuttuk Hills of Major Walker's Survey as are contained in the Bunnoo District. The Leia Tehseels, Cis-Indus, having recently been annexed to Derah Islmael Khan, this portion of the Sind Saugor Doab has necessarily been added to complete the Division. This Map is not yet ready, and will take some time before it can be lithographed in a similar style to the former one; but I am using every exertion to bring it out, and I shall be well satisfied if the execution of the lithograph equals the one above commented on.

256. The peculiar difficulties and hardships encountered by the whole of

Difficulties encountered.

this Establishment in penetrating to every part of this Frontier, and frequently be-

yond it, amongst tribes always ready to take advantage of isolated Europeans, has already been dwelt on in my last Report, paragraph 192. The way in which these hazardous operations have been prosecuted during the last few

years will be best explained in the Surveyor's own words, which follow, taken from his several Annual Reports. The opinion I before offered as to the special fitness of Major Johnstone for this description of duty, requiring all the qualities of the Soldier, the Administrator, and the Surveyor, has been more than fully confirmed and realized in the period under review :—

EXTRACT FROM ANNUAL REPORT OF SEASON 1858-59.

“9. The Plains presented no unusually difficult features; desert tracts with bad water were met with as before; the population was, if anything, wilder than in the southern portion of the Derajat; it certainly was more fanatical. That the Season's work was again got through without any direct collision with the people of the country, I venture to consider as creditable.

“10. The hills, however, presented unusually great difficulties. In many respects they differed from the hills of past Seasons. Formerly I found them, with but a scanty population, comparatively easy of ascent, and the distance from the Plains to the peaks of the Soleiman not more on an average than twelve (12) miles. During the past Season I found large, powerful, and lawless clans (the Bozdars alone muster upwards of three (3,000) thousand fighting men) who had scarcely ever seen an European, except at the head of troops sent for their chastisement, and were consequently extremely jealous of my entry into their country; the hills much higher, more rugged, and difficult of ascent, and the Soleiman on an average twenty-five (25) miles from the Plains. By paying the Chiefs and rewarding guides and villagers, I got a sulky admittance into the mountains; on several occasions the clans assembled in force and were with difficulty quieted, but details of all these operations are fully given in my general District Report. I may here, however, mention that in another way too the work fell heavy. Having no Military Assistant to aid, all the hills had to be surveyed by me alone.”

EXTRACT FROM ANNUAL REPORT OF SEASON 1859-60.

“9. The hills adjoining the Plains of the past Season's operations are inhabited throughout by hostile tribes, who are perpetually disturbing the border. The Commissioner very kindly and properly recommended regular Military Guards for all Survey Parties, European or Native, working in front of or even near the Frontier road. The most dangerous part was the line from the Goomul Valley northwards. Though Buthunnees, a friendly tribe, inhabit the low hills lying between the Mahsood Wuzerees and Plains, still the former, weak in numbers, and really subdued by the latter, have neither the power nor the inclination to prevent them from making use of their Passes as a means of egress to the Plains for marauding purposes. Our Survey Parties were fortunate enough to escape molestation. My own presence, moving up and down close under the hills with a strong guard, was some additional protection.

“10. I was unable to go about among the hills, as I had done during former years; an Officer at Derah Ghazee Khan desirous of finding a good spot for a Sanatorium, arranged with some of the Chiefs to ascend a peak in the Soleiman Range. He succeeded in reaching the point, and made a report of his trip. In consequence, strict orders were issued that no European was to cross the Frontier line, the base of the first range of hills. Both General Chamberlain and the Commissioner, Major Reynell Taylor, wished that an exception should be made in my favor, and that I should be allowed to act according to my own judgment as in past years in surveying these independent hills, but the Supreme Government would sanction nothing of the kind. I was obliged to content myself, therefore, with ascending peaks in near ranges. The country in consequence near the

Soleiman Mountains is not so correctly laid down as in past years. Sketching from distant points, aided, however, by numerous intersections, was the method pursued. The actual labor was, if anything, greater than in past years, for the number of ascents of hills was very much greater.

“ 15. From my own regular work my attention was a good deal distracted during the past Season. In November 1859 Captain Mecham, of the Bengal Artillery, was murdered near Bunnoo by a party of Wuzerees; the murderers were sheltered by the Kabul Kheyl Section of that clan. Our demands for them to be given up were treated with contempt. A Military expedition was organized under General Chamberlain, and I was ordered to accompany. I mapped the country we went through, but to make the Survey complete a few points are wanted, which I could not get at last Season, but which I shall visit during the ensuing winter. The Map will be finished and furnished next year. Again, in March 1860 the Mahsood Wuzerees, some three thousand (3,000) in number, who have long troubled the Tonk border, made an attack on that town; they were met by a small party of our Cavalry, who defeated and pursued them to the mouths of the Passes with very heavy loss. An expedition was decided on against them and marched from Tonk on the 15th April. The Mahsood Wuzeree country, hitherto unknown, was now completely explored. The Survey was done by Major Walker of the G. T. Survey, the Senior Departmental Officer present. I got back to Recess quarters at the end of May, and this was only effected by riding up the frontier from Bunnoo, mailcarting from Peshawur to Rawul Pindee, and riding up the hill to Murree. Thus nearly four (4) months of my time was taken up with duties other than my regular work. I trust that it will be considered creditable to the Establishment, that, notwithstanding the comparative stoppage of Field work, a good area was turned out, and all Maps and Returns furnished by the 1st October.

“ 16. The Civil and Military Authorities gave me every assistance in the prosecution of the work; in fact, without their cordial co-operation, I could not have succeeded as I did.”

Thanks to Civil and Military Authorities.

EXTRACT FROM ANNUAL REPORT OF SEASON 1860-61.

“ 10. When the Derajat Survey was ordered by Sir John Lawrence, he expressed a hope that the expense would not exceed Rupees (10) ten per mile. The rate on Professional expenditure is but five (5) pie above that. Including every expense, it has exceeded by but Rupees 1-2-4 per mile. Considering that many expenses incurred in this Frontier Survey are almost unknown in operations carried on Cis-Indus, and considering too the sums charged on the maximum under the head of Derajat Batta (each Uncovenanted Assistant receiving a sum equal to one-fifth of his salary, each Native Surveyor Rupees (5) five, and each Measurer and member of the Guard one Rupee monthly during the Field Season in addition to pay), the whole of these *extra* charges in no year being under Rupees (6,000) six thousand, I trust the rates will be thought favorable and not excessive.

Survey ordered.

“ 11. The Plains were divided into ten (10) Main Circuits enclosing the whole Bunnoo Valley. Three (3) ranges of hills which run into the valley it was found impossible to take in hand; so, as they had been sketched by Major Walker some years, their Survey was dispensed with by the Surveyor General. To the west and south especially of the Bunnoo Valley the operations were conducted under great difficulties; large Military Guards were attached to the Survey, at one time amounting to four hundred (400) Infantry, two hundred (200) Irregular Cavalry, and fifty (50) Police Horse under three (3) European Officers. The danger of attack or molestation arose chiefly from the neighbourhood of the Mahsood Wuzerees, a clan which had been chastised by a Force under General Chamberlain in April and May 1860, but had not given in to our demands. The precautions taken rendered

Plains.

any attempts on the part of the Hill tribes futile, and we were fortunate to complete our work without any collision; stragglers from camp at night were, however, on a few occasions attacked; one Police Officer in command of a small party of Horse, attached to the camp, was wounded in capturing a couple of murderers; another was cut down by a fanatic while seated in his tent. Towards the south-west of the valley the hills were not entered. The orders prohibiting this were most stringent, and no doubt necessary, though I could not help regretting being unable to try even and lay down some of the unknown Wuzereee Passes. The Map,

Hills.

commenced in December 1859, on the Cabul Kheyl Wuzereee expedition, was completed as far as possible. Some of the Passes to the north-west of the Bunnoo Valley were entered, and sketches made from adjoining peaks. Beyond an unsuccessful pursuit after a party of men headed by a couple of well-known

Dour Valley.

Wuzereee marauders, nothing occurred in these hills of any importance. The Dour Valley was visited, and some information regarding localities in it gained. Nominally it is the property of the Ameer of Cabul, but for years he has had no revenue from it. Its inhabitants once petitioned that the British Government should take possession of their country. Its annexation would check the surrounding tribes more than any number of outposts, and the inhabitants of this beautiful valley would be brought under some degree at least of civilization.

“ 15. As my Frontier Survey is completed, I would, before concluding this Report, wish

Thanks to Authorities.

to record my sincere thanks to all the Derajat Authorities, Military and Civil, for the cordial aid given me from first to last. For the first five years of the Survey my Military escorts were invariably placed under my orders; being a Military man and always the senior, the Guards were under my command. The success of the Survey operations during those five years is of itself a sufficient proof that matters were properly managed.”

257. The above extracts fully describe the Surveyor's own impressions of the state of the country under Survey, and the difficulties of no ordinary description under which himself and Assistants had daily to work. The opinion of His Honor the Lieutenant-Governor, as well as of the Financial Commissioner of the Punjab, as to how these duties were performed and the measure of success attending them, will no doubt carry more weight than anything I can urge. I have therefore the highest satisfaction in recording following extracts of correspondence from the Punjab Government, which redound so much to the credit of Major Johnstone and his excellent staff of Assistants, who contributed so largely towards the results described in this Report.

EXTRACT.

No. 885, DATED 19TH NOVEMBER 1859.—FROM FINANCIAL COMMISSIONER, TO PUNJAB GOVERNMENT.

Paragraphs 2 (part of) and 3.

“ 2. To notice first the Derajat Survey, I would call the attention of the Hon'ble the Lieutenant-Governor to the gratifying fact recorded by Captain Johnstone, under whose charge the Survey has been, that no collision took place between any of the parties employed under him and the wild tribes of the frontier. The necessity for purchasing the good-will of the inhabitants by money payments, and the necessity which lay upon every party to be complete in itself and independent of aid from villages every where precarious, and in the

Derajat hopeless, caused the entertainment of large marching establishments, and has thus increased the costliness of this Survey, insomuch that the expenditure, including contingent charges and Military pay, has fallen at the rate of Rupees 12-8-9½, or, calculated on the maximum alone, at Rupees 9-3-0½ per square mile surveyed. But under the circumstances, and bearing in mind that, while 4037-45 square miles have been surveyed, of which a large portion has been in the difficult country of the hills, still the expense has been Rupees 409-10-2 less than the sanctioned annual maximum. I believe His Honor will agree with me in viewing the expense as not inordinate, and will concur in thinking Captain Johnstone and all his subordinates entitled to much credit for what they have accomplished. They were in the Field from 1st November 1858 till the 10th of April 1859, and during the Recess since the latter date, have been busily engaged in completing Maps, Plans, &c., which are shown *in extenso* in column 19 of the accompanying General Statement, so that recapitulation of them here is needless.

“ 3. I consider the thanks of the Government to be eminently due to Captain Johnstone for the zeal, determination, and activity he has evinced in conquering serious obstacles and performing a large amount of work, and for the judgment and conciliatory demeanour which has kept quiet the turbulent spirits on our Frontier; to Lieutenant Griffiths for his industry in the Office work; to Messrs. Patterson, Foy, and Meany, especially the first-named gentleman, for the general activity, intelligence, and pains-taking earnestness they have shown in their work. Captain Johnstone’s Return of Assistants recommended for promotion has not been received in this Office.”

258. The above opinion was concurred in by the Lieutenant-Governor of the Punjab, as already quoted in the Extract recorded in paragraph 216 of the Sind Saugor Doab Survey. In the following Season the Financial Commissioner and the Lieutenant-Governor again reviewed these operations, and expressed themselves as follows:—

EXTRACT.

No. 931, DATED 24TH OCTOBER 1860.—FROM FINANCIAL COMMISSIONER, TO PUNJAB GOVERNMENT.

Paragraphs 5th, 6th, 7th, and 8th (part of).

“ 5. For nearly 4 months during the year, Captain Johnstone’s attention was occupied with duties other than his regular work. He was obliged to accompany the Forces organized under General Chamberlain, to avenge the death of Captain Meham of the Bengal Artillery, and to quell the late disturbances on the Tonk border, and did not return to Recess quarters till the end of May; yet he trusts that it will be considered creditable to the Establishment that, notwithstanding the comparative stoppage of Field work, a good area was turned out and all Maps and Returns furnished by the 1st October.

“ 6. I take this opportunity of forwarding for His Honor’s perusal a Report by Captain Johnstone on the Survey of the Derah Ghazee Khan District, and beg to suggest that it be printed in the same manner as Captain F. C. Anderson’s Report on the Leia District. The present Report contains a good account of the habits, customs, and general character of the numerous border tribes of the Derah Ghazee Khan District, and will prove both useful and interesting.

“ 7. The thanks of Government are again due to Captain Johnstone for the zeal and energy evinced by him in the performance of his important duties, and for the beneficial results of his kind and conciliatory demeanour

Captain Johnstone’s absence from Head Quarters.

Survey Report of the Derah Ghazee Khan District.

Notice of Officers.

towards the border tribes with whom he has had any connection; to Lieutenant Griffiths for the able assistance afforded by him to Captain Johnstone on all occasions; and to Messrs. Housden, Foy, Meany, R. Green, and Baboo Hurree Singh, for the general assistance rendered by them and for the interest taken by them in the performance of their duties.

"8. In conclusion, I beg to forward copy of a letter, No. , dated 10th current, from Promotion of Messrs. Housden and Foy. Captain Johnstone, recommending the promotion of Mr. Housden from Rupees 250 to 300, and of Mr. Foy from 175 to 200 per mensem, with effect from the 1st idem. As the expenditure will be met out of the sanctioned maximum, I support the recommendation."

EXTRACT.

No. 1677, DATED 5TH NOVEMBER 1860.—FROM GOVERNMENT, PUNJAB, TO DEPUTY SURVEYOR GENERAL.

Paragraphs 1st and 2nd (part of).

"1. I am directed to forward, for your information, copy of a letter from the Financial Commissioner, No. 931, dated 24th ultimo, reporting on the operations of the Derajat Survey, and to say that the Hon'ble the Lieutenant-Governor considers the progress made to be satisfactory and creditable to Captain Johnstone and his Establishments. Accordingly the thanks of Government have been conveyed to Captain Johnstone and his subordinates, in a separate communication.

"2. His Honor is of opinion that the promotions recommended in favor of Messrs. Housden and Foy are well merited by those gentlemen."

259. The successful termination of this Survey after six years' indefatigable and arduous labor, in such a wild country, amidst hostile tribes, is a matter for great congratulation, and will no doubt be fully appreciated by the Government of India. The greatest credit is due to Major Johnstone, for the very able manner in which the delicate duties connected with his operations were carried out, and which have resulted so happily and peacefully in a political point of view. In the printed Report by Major Pollock, Deputy Commissioner of the Derah Ghazee Khan District (Vol. IV., No. 4 of Punjab Selections), he expresses his opinion in the words as per margin.

Completion of the Derajat.

"Captain Johnstone conducted the border portion of the Survey with such tact and judgment as to become quite popular with the people; and few Officers, I believe, could have collected so much information of our Frontier and its vicinity without coming in contact with our neighbours beyond the Frontier Line."

260. Major Johnstone's merits as a Frontier Officer have frequently been expatiated on and acknowledged by the Punjab Government, and it affords me

Merits of Surveyor.

sincere pleasure to bring his services thus prominently before the Government of India. As a Departmental Officer I entertain the highest opinion of this Surveyor, whose cordial and energetic co-operation with this Office has always been a source of great satisfaction to me personally. My hearty thanks are, therefore, due to Major Johnstone for all that he has so well performed in a Professional point of view.

261. On the conclusion of the Derajat Survey, and the completion of all the Maps and records during the Recess at Murree, this Establishment was transferred, by the orders of the Foreign

Employment in Current Season of 1861-62.

Department, No. 4833, dated the 16th October 1860, to the Delhi and Hissar Divisions, for the Revenue Survey of the confiscated estates retained by Government, and for a Topographical Survey of those jagheers transferred to the Puttiala and Jheend Rajahs for their services in 1857. Under the orders of the Punjab Government, No. 1193, dated the 25th July 1861, Major Johnstone brought the chief portion of his Party down from Murree to Delhi, on the 1st October 1861, by Bullock Train, arriving at that place on the 29th idem. The Detail Revenue Survey of Bullubgurh, attached to the Delhi District, was

Pergunnahs of District Rohtuk.	Pergunnahs of District Goorgaon.	Jagheers.
Buhadergurb, Badlee, and Jhujjer.	Jharsee.	Doojana, Nahur, and Putaodee.

commenced on the 1st November, and the several Pergunnahs of the Rohtuk and Goorgaon Districts, together with the jagheers specified in the

margin, were also taken up ; 408 Village Circuits embracing an area of 880 square miles of Revenue Detail work and 231 square miles of Topographical work, with 19 square miles of the Jumna River, aggregating 1,130 square miles, formed the out-turn of the Season's operations in this Division. This Survey will materially improve Sheet No. 49 of the Atlas, of which a revised edition is much needed.

262. In addition to the above, however, the Senior Assistant Surveyor, Mr. George Housden, was detached with

Detached Sub-Party on Revisions of Boundaries.

a small Party to revise the District and Tehseel boundaries in the Rawul Pindee

Division. No Revenue Survey having been made of the Kohistan of the Sind Saugor Doab, but merely a Topographical Survey, in which the boundaries of the Jhelum and Rawul Pindee Districts and internal Tehseels could not properly be laid down, on account of the uncertainty then prevailing, and the constant changes recommended by the Local Authorities, it became necessary to provide for this duty during the current Season. The Assistant Surveyor has thus been employed during whole of the cold weather, in endeavouring to lay down new boundaries and interpolating them into Captain Robinson's Topographical Survey. A considerable amount of work of a peculiar and difficult character has thus been effected, which cannot be estimated at present, but this will duly appear when the current Season's results come to be reviewed.

263. There remains for Survey, in the ensuing Season, sufficient area of the confiscated estates in the Hissar

Remaining for Survey under Punjab Government.

Division to occupy this Establishment for about 3 months, or half the Establish-

ment for the six months. On a reference being made to the Punjab Government to dispense with its further services, with a view of meeting the urgent calls for fresh Surveys in Oudh, more work has been found, and a minute Village Survey of Mumdot in the Ferozepore District called for; the area of this is only 371 square miles, but other desultory Surveys of the Sanatoria of Dalhousie in the Chamba Hills and Murree are required, besides some remaining boundaries in the Sind Saugor Doab. All these detached requirements will, I fear, effectually prevent the services of this Party being rendered available for Oudh during the ensuing Season of 1862-63.

264. It was with a view of getting a proper insight into these various questions that I repaired to Delhi and personally conferred with the Surveyor on the 29th March last, and inspected the work of the Delhi and Hissar Divisions. I had previously consulted with His Honor the Lieutenant-Governor and the Financial Commissioner of the Punjab at Lahore on the subject. The arrangements made by the Surveyor for the two descriptions of Survey, Revenue and Topographical, were in accordance with the instructions he had received from this Office, and the Field Maps submitted for my inspection were fully up to my expectation. It was, therefore, very satisfactory to me to be able to express my approval of all I saw connected with this Surveyor's management, and especially with the Village Plan Sheets, which were as full and as well got up as any I had seen. This is the more creditable to Major Johnstone, as it is the first Season in which he has been employed in charge on a regular detailed Village Revenue Survey.

265. The opportunity thus afforded of a free intercourse with the Executive Officers of my Department will, I trust, prove of great value; it undoubtedly facilitates business and renders correspondence easier; the niceties of professional procedure are discussed and arranged, and all matters of mutual interest talked over, fully understood, and agreed on, from which the best results may be expected. I experienced great gratification from thus, for the first time, becoming personally known to this Surveyor, with whom I have corresponded so many years, and with whom it is always a real pleasure to act.

266. Lieutenant C. J. Griffiths, of the late 72nd Native Infantry, was appointed an Assistant Surveyor on this Establishment in the room of Captain J. L. Sherwill, on the 9th March 1859, promoted to the charge of a Party in the Lower Provinces, and he continued to do duty with it until the month of January last, when he tendered his resignation, which was accepted under orders from the Foreign Department cited in the margin. This vacancy has

now been filled up by the appointment of Lieutenant W. Barron, Royal Artillery, by G. O. G. No. 1332, dated the 27th June 1862, who, I trust, will prove an acquisition.

267. The services of the Subordinate Staff of this Party have been most favorably dwelt on by the Surveyor, and

Subordinate Staff.

the mention of the names of the Assistants in the Punjab Government Despatches, as quoted above, has been a great stimulant. Mr. George Housden, Assistant Surveyor, is described as "hard-working, steady, and attentive to his duties, the performance of which

Names.	From	To	Date.
	Rupees.	Rupees.	
Mr. G. Housden	250	300	1st October 1860.
" E. Foy	175	200	Ditto.
Pundit Hurree Singh	75	100	1st January 1860.
Mr. D. H. Reynolds	75	100	1st January 1862.
" H. Walsh	75	100	Ditto.
" A. J. Gibson	75	100	Ditto.
" R. R. Green	75	100	1st October 1861.

is always his first thought, and a first-rate Assistant." Mr. E. Foy, Senior Sub-Assistant, "continues to merit approval of his work and general conduct as much as ever." Both these

Assistants received the promotion specified in the margin. Mr. Meany, Sub-Assistant, 3rd Class, resigned his situation on the 1st October 1860 after completing 3 years' service according to the agreement entered into by all candidates on first joining, a very necessary Departmental rule to protect it in some measure from the heavy loss sustained by training fresh hands. Baboo Pundit Hurree Singh, Sub-Assistant, 3rd Class, is likewise commended. Messrs. Reynolds and Walsh, Junior Sub-Assistants, were selected from the Lawrence Asylum, after satisfying me on the points of qualification laid down by the Departmental test, and Mr. A. J. Gibson, a passed candidate, also joined at the same time, viz., on the 14th March 1861. Mr. R. B. Green, Junior Sub-Assistant, was permitted to resign on the 1st October last, and Mr. R. R. Green, Junior Sub-Assistant, likewise being found inefficient, has resigned from the 1st August 1862.

268. The whole of the above Assistants and Sub-Assistants have performed excellent service, and proved themselves well adapted for the hard sort of life on the Frontier. Every credit is due to them for so well supporting their leader, and retiring from the scene of their labors without a single drawback.

269. The Native Assistants have likewise earned good report; they have ably seconded the European Assistants

Native Assistants.

and shown an excellent spirit throughout, and several have received slight increase to their pay, from time to time, within the sanctioned allowance.

270. The Surveyor, I am glad to find, gracefully acknowledges the cordial support and assistance he received at all times from the Civil and Military Authorities. Indeed, it would be impossible to work or have any connection with the Punjab Officials without appreciating the value and advantage of being associated with such earnest and admirable Officers. My own feelings go entirely with Major Johnstone on this subject, and I trust the expression of my warm and grateful thanks for all the numerous favors we have received may not be out of place.

271. A separate Geographical and Statistical Report of the Ghazee Khan District has been furnished by Major Johnstone to the Punjab Government, which the Financial Commissioner, in his letter above quoted, considered both useful and interesting, and recommends it should be printed. Another Report of Derah Ishmael Khan and Bunnoo is in course of preparation, and may shortly be expected. These elaborate Reports entail a considerable amount of extra labor on Surveyors, and prove very valuable records of the history of the District at the time of Survey, and much credit is due to Surveyors who thus add so materially to the knowledge of the country, and leave the results of their investigations behind them in a tangible form.

SINDH DIVISION.

272. In the 234th paragraph of my last Report, the proposed operations of the Sindh Survey Party for the Season of 1858-59 were briefly alluded to, and a rough approximation given of what was done in the Field. The particular requirements of that Season consisted of work to be executed both in Upper and Lower Sindh simultaneously, both declared equally urgent, and consequently entailing the necessity of dividing the Establishment for the purpose.

Captain John Macdonald, Revenue Surveyor,
late 18th Regiment, Bengal Native Infantry, now
Staff Corps.

Assistants.

Mr. W. Lane, 1st Class.
„ W. Bolton, 2nd Class.
„ E. Loftic, 3rd Class.

Sub-Assistants.

Mr. J. Todd, 2nd Class (resigned).
„ J. Hodgson, 2nd Class.
„ J. Harris, 3rd Class.

32 Native Surveyors.
General average rate per square mile... 12 5 0

273. Fortunately the Party was strong enough to admit of independent operations being thus carried on, in two distant parts of the Province, and it was determined that the Frontier tract under the administration of the late Brigadier General Sir John Jacob, K. C. B., known now as the District of Jacobabad, should be prosecuted by the Head Quarter Division of the Establishment, under the personal direction of the Revenue Surveyor, Captain Macdonald, whilst the other half of the Party, under his Senior Assistant, Mr. W. Lane, provided

for the Survey of the Kurrachee Collectorate, or as much of it between Kur-rachee and Kotree on the Indus as was necessary for Railway Survey purposes, and as would be practicable to accomplish within the Season.

274. The Jacobabad District lies between the meridians of $67^{\circ} 59'$ and $69^{\circ} 49'$ East Longitude, and Parallels of $27^{\circ} 56'$ and $28^{\circ} 27'$ North Latitude, and is bounded on the north and west by the Territory of Khelat and the Derah Ghazee Khan District of the Punjab, on the south by the Districts of Shikarpoor and Larkhana of the Larkhana Collectorate. The River Indus, running in a south-westerly direction, divides it on its eastern limits from Bhawalpoor and the Rohree District. The Survey of the Jacobabad District was intended to embrace greater minuteness of detail than is usual in a purely Topographical Survey, and although the nature of the Divisions of the soil did not admit of the usual Village separate definition, it was resolved that the estate boundaries where existing should be shown, the details of cultivation and soil being fully entered into. This Survey was, therefore, made on a scale of 40 chains to the inch, or two inches to the mile.

275. Scarcely had the necessary preparations been made, and the Survey commenced on the 28th November 1858, when the death of General Jacob was felt as a severe blow to the work he had so earnestly desired to see completed; such a loss, says Captain Macdonald emphatically in his Annual Report, may never be replaced.

276. In Upper Sindh the interior details were surveyed on the scale above mentioned, with the same minuteness as when a rigorous comparison of results is made with Revenue Settlement records. A very large proportion of the area surveyed, consisting of the Pergunnahs as per margin, amounting to 2,009 square miles, is almost desert, and it was not worth while to survey such a country on the larger scale usually employed in rich and paying Districts. A complete

	<i>Square miles.</i>
Pergunnah Jacobabad	... 455
" Meerpoor	... 622
" Meerpoor Kushmoor	... 577
" Kushmoor with River	... 355
Total	... <u>2,009</u>

Map has been made, and the present Survey, inclusive of all mapping expenses, has, the Revenue Surveyor states, cost less than the Towers originally built, I believe, by General Jacob himself, to carry out a system of Triangulation, which was never completed, and which, when done, would still have required a similar Topographical delineation as now executed, to have rendered the results of the Triangulation of any practical use.

277. These Towers, called and well known in the District as "Jacob's Towers," were intended to have been used for the present Survey, in order to save

Jacob's Watch-Towers.

line-cutting expenses ; but when the Surveyor commenced at the Cross Roads Tower, "Meer-ka-koe," and the Tower at the Bigaree Canal, on the Larkana Road, he found that the Platforms and Towers were so faulty in construction, that it was in vain to expect good work, and this was subsequently proved by the operations of the Great Trigonometrical Survey, when passing down the Indus, as every Tower used had to be rebuilt, before it was rendered useful. Moreover, the Towers, even had they been well built, would have been unsuited for Professional purposes, the proper conditions in laying them out not having been attended to for symmetrical Triangles ; some contained angles of 120° , others less than 20° ; consequently, the Surveyor exercised a wise determination to survey the District by the usual mode of traversing. This was based on the Great Indus Series of Triangulation, which formed a most convenient connection, and obviated all the otherwise objectionable system of carrying on detached Surveys.

278. The District is poor and but slightly populated. Exclusive of the Jacobabad Cantonment, the total population scattered over the whole area amounts to only 21,703 souls, or under 11 to the square mile. The Town of Jacobabad contains about 8,000 souls, exclusive of the Military Camp and followers, estimated at about 7,000 more. This gives 36,703 as the total population, or 18 to the square mile, on the total area 2,009 square miles.

279. The results of the Season show 82 square miles only as under cultivation, and 115 square miles fallow, or which had been under cultivation during the two previous years. This, in Captain Macdonald's opinion, is high average, and shows that the proportion of adult laborers is very large amongst the total population. The cultivation, which is 150 per cent. greater in Upper than in Lower Sindh is generally of an inferior kind. Of land fit for cultivation there are 184 square miles, and of barren waste, bush jungle, and forest, square miles 1,437, which, with 191 square miles of the River Indus, make up a total of 2,009 square miles as the true area of the District.

280. The tract Surveyed in Lower Sindh, lying between the meridians of $66^\circ 59'$ and $68^\circ 14'$ East Longitude, and the parallels of $24^\circ 44'$ and $25^\circ 29'$ North Latitude, is comprised in the Kurrachee Collectorate, and was taken up at the special request of the late Chief Commissioner of Sindh, Sir Bartle Frere, as likely to afford valuable information regarding the detail and capabilities of the soil through which the line of Railway between Kurrachee and Kotree passes. This Survey, being in continuation of that executed in Season 1855-56, was based on the Great Triangulation of the Indus Meridional Series. It is bounded on the north by the River Barin and the Kotree District, on the south by that portion of the Kurrachee

District surveyed in Season 1855-56, as well as by the low Indus Delta lands, on the east by the Khardarites (Tehseeldarees) of Jhiruk and Tatta, on the west by the River Hubb, which divides British Territories from Lus Beila, and the unsurveyed portion of the Kohistan or Hill District of Kurrachee.

281. The Surveyor reports, with reference to this Survey, that every hillock, ravine, spur, the smallest water-course, and the least bit of drift sand, have

Nature of Survey.

all been carefully entered on the Maps, as well as the varieties of bushes and cactus which grow on those arid tracts; great difficulty was experienced in obtaining the necessary Topographical information, even when paying men 6 annas per diem to afford it. The scale of the Survey, giving full details and every variety of soil separately classed, is 40 chains to the inch, or 2 inches to the mile. The area effected in this Division in the Pergunnahs as per margin, amounts to 2,059 square miles, nearly the whole of which is a desert, only 1,433 acres, or $2\frac{1}{4}$ square miles, being under

	<i>Square miles.</i>
Pergunnah Kurrachee ...	753
" Kurrachee Jherruck ...	386
" Kohistan of ditto ...	349
" Jherruck ...	384
" Kohistan of ditto ...	187
Total ..	2,059

cultivation, and 617 acres, barely one square mile, showing traces of having been cultivated during the previous year. About 65 square miles is classed as fit for cultivation. Supposing therefore, observes Captain Macdonald, that at some future period, every mile of ground available for the support of life is taken up, the population of the valley through which the Sindh Railway passes between Kurrachee and Kotree will never exceed 35,000 souls. It is at present supposed to number 2,000 only, all miserably poor, and contented with the barest necessaries, the coarsest food, and the commonest raiment.

282. The aggregate area performed during the Season is 4,068 square

	Acres.	Sqr. miles.
In Upper Sindh ...	12,85,649	2,009
„ Lower Sindh ...	13,17,871	2,059
Total ...	26,03,520	4,068

miles as per margin, as minute in all details as the regular Village Survey on double the scale, but which is quite unnecessary for this description of country; the half scale employed is, therefore, suffi-

cient and more economical, as admitting of greater progress.

283. The Field prepared for Survey this Season was in the District of

Season 1859-60.

Larkhana or Chandookah in Upper Sindh, a Deputy Collectorate on the right bank of the Indus River, contiguous to the Survey of the two preceding Seasons of the Districts of Shikarpoor and Jacobabad, and bounded on the west by Khelat, and on the east by the River Indus and the Khyrpoor Illaqua of Meer Alli Morad. The Establishment recessing at Kurrachee left for Upper Sindh by the middle of October, but owing to various delays and difficulties in reaching the District, and in getting back the men on leave from the Pro-

vinces, it was found impracticable to break ground before the middle of November. Experience, however, has amply shown that the Survey Party remains healthier by commencing late and finishing late in Sindh, 16 men having died in a previous Season by commencing too early in November.

284. Captain Macdonald conducted the Field work, throughout this Season up to the 22nd April 1860, when, suffering severely from the effects of the Sindh climate, and especially in his eyes, it was deemed necessary by his Medical attendant that he should take a change to Europe, and he obtained a Furlough under Medical Certificate for 15 months, and left Bombay on 11th May of the same year, making over charge of his Establishment to Mr. W. Lane, his Senior Assistant, an Officer well qualified to undertake the duties, and who was appointed to officiate as Revenue Surveyor, from the 23rd April 1860, from which date the continuation of the Field duties and the entire Recess duties devolved on the latter Officer for the rest of the Season.

G. O. G. No. 2557, dated 10th July 1860.

285. The six Talooquas, as per margin, of the above District, together with one Jagheer and portions of the River Indus, make up a total area of 2,241 square miles as the out-turn of the Season. The Talooquas, aggregating 1,624 square miles, were surveyed, village by village, with full revenue details, and contain 584 Circuits on the usual scale of 20 chains to the inch, whilst 89 square miles were laid down on half the above scale, but every detail as rigorously entered. The Jagheer or 489 square miles were taken up Topographically only, on the one inch scale, the greater portion of it being waste land. This District, possessing great advantages for the prosecution of Canal cultivation in its most economical form, is favored by having the first supply of water from the two largest natural courses which fertilize Upper Sindh. "The Gharra," although not the largest, is the most important of these, as it supplies a perennial flow of water. "The Narra" is of far larger section, but does not produce more revenue than the Gharra. The Survey was based on the same Series of the Great Triangulation as in the last Season, every point met with in the District being regularly connected.

	<i>Square miles.</i>
Larkhana	... 290
Kumbur	... 504
Lubdariya	... 207
Rutleh Derah	... 169
Soojawul	... 250
Nusseerabad	... 343
Seer and Guibeh Derah	... 220
Guibeh Khan Chandia Jagheer	... 220
	<hr/>
	2,203
3 River Circuits	... 38
	<hr/>
Total	... 2,241

286. It being an object to work continuously down from north to south, the Territory of Meer Alli Morad Khan Talpoor was selected for Survey this year. The Khyrpoor Estate (Illaqua) lies on the left or east bank of the Indus, south of the Rohree District, and between Jeysulmeer and the Now-

shera and Thurr Parkur Districts. The Government of India, in correspondence with the Bombay Government, directed that a Topographical Survey of this Illaqua should be carried out, and the Meer Alli Morad having fully entered into the Government views, the Officiating Revenue Surveyor, Mr. Lane, with his Establishment reached Khyrpoor on the 16th November 1860, and after the usual delays attendant on the necessary references and explanations with a Native Chief, the Field work was allowed to commence about the middle of the following month; and after the Meer once fairly understood the object, by personal explanation on the part of the Surveyor, and received definite orders from the Chief Commissioner, he entered cordially into the duty, and rendered the fullest and most satisfactory assistance, which is duly acknowledged by the Officiating Surveyor.

287. After a full Field Season, extending up to the 15th June 1861, Mr. Lane managed to retire with the entire Estate (Illaqua) finished, embracing the large area of 6,190 square miles. This was effected on the usual scale for purely Topographical Surveys of one inch to the mile. The larger proportion of this area, *viz.*, 4,093 square miles, is made up of sandy Desert, the whole of which has been carefully explored, and the remainder high cultivated or alluvial lands on the river bank. In addition to which, 474 square miles, inclusive of 2 River Circuits, were accomplished in the adjoining Talooquas of Kundara and Salutee of the Nowshera District, Hyderabad Collectorate, according to revenue detail system of Survey, on the 20 inch to the mile scale, making a total of combined Topographical and Revenue work of 6,665 square miles, thus affording a most satisfactory Season's work highly creditable to the Officiating Revenue Surveyor, the more so as it was his first season of executive charge. Great promptness and energy was displayed by Mr. Lane, in starting the Khyrpoor Survey under various difficulties, and bringing it to a close by the middle of April 1861. No Triangulation had extended on this side of the Indus.

288. The relative results obtained during the three Seasons under review are affected by the proportion of Topographical and Revenue description of Survey, or according to scale employed; the cost of Revenue being generally three times greater than that of Topographical work; the rate of 1859-60, when the entire work was sub-divided village by village, being greatly in excess of that of either of the other Seasons, as shown in the following Table:—

Area, cost, and rate for 3 Seasons.

Seasons.	No. of Village Circuits.	Area Surveyed in Square Miles.	Cost.	Average rate per Square Mile.
1858-59	87	4,068	54,989 0 0	13 8 0
1859-60	592	2,242	54,910 0 0	24 15 0
1860-61	241	{ 474 M. 6,191 T. 6,665 }	50,176 0 0	7 8 0
Total	920	12,975	1,60,075 0 0	12 5 0

289. Thus 12,975 square miles have been executed at a total cost, including all contingent charges, of Rupees 1,60,075, which gives the very moderate rate of Rupees 12-5 per square mile, and for which sum we now possess the best Survey of all this part of Sindh ever yet obtained, although a good deal appears to have been spent in previous years for special Surveys. The average annual expenditure has been Rupees 53,358, the original grant for the Sindh Party having been larger than that of other Surveys.

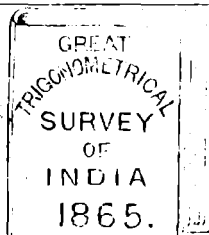
290. In Sindh there are several heavy contingent charges not known in the Provinces on this side, owing to the peculiar nature of that country and which are indispensable. The total expenses incurred on this account for the same period are as follows, making Rupees 17,661 in the aggregate included in the total cost given in the preceding paragraph:—

Description of Contingencies.	Season 1858-59.		Season 1859-60.		Season 1860-61.		Total.	
	Rs.	A.	Rs.	A.	Rs.	A.	Rs.	As.
Line-clearing and Jungle-cutting ...	7,507	6	1,767	10	817	0	2,584	10
Building Masonry Pillars			22	8	19	15	42	7
Travelling allowances to European Establishment, and Camel and Cart hire for Native Establishment, carrying water and provisions in the Desert, &c.}			3,836	5	3,552	6	7,388	11
Chupprassies ... ..			.....	.....	138	0	138	0
			Season 1858-59.....		7,507	6		
Totals	7,507	6	5,626	7	4,527	5	17,661	2

291. The extent to which the Topographical and Revenue Operations have been connected with the Great Connection with G. T. Survey. Triangulation of the Indus Meridional Series, between the terminal Base Lines at Kurrachee and in the Chuch Valley near Attock, as well as with the Western Section of the Calcutta Longitudinal Series, will be understood from the following comparative Statements of the direct distances from both measurements. This method of testing the accuracy of the Topographical Revenue Operations is highly advantageous in every point of view; it not only exhibits beyond all question or doubt the precise ratio of error met with, and consequent value of the Survey, by the most rigorous test that can be employed, but it ensures the perfect combination of the materials into the Atlas of India, and enforces such care and caution, on the part of Executive Surveyors, as to place an additional value on the materials rendered.

Revenue Survey Operations, District Kurrachee, compared with the G. T. Survey, Great Longitudinal Series, Western Section.

NAMES OF G. T. STATIONS.	From Revenue Survey.	From G. T. Survey.	Error of Revenue Survey.	Error per mile.
	Feet.	Feet.	Feet.	Feet.
Myo ... to N. end of Base ...	83377.4	83353.7	+ 23.7	1.50
Myo ... to Muggur Peer ...	73841.3	73846.6	- 5.3	0.37
Muggur Peer ... to N. end of Base ...	60520.6	60481.3	+ 39.3	3.43
N. end of Base ... to Bole ...	52235.9	52292.4	- 56.5	5.71
N. end of Base ... to Bolalio ...	79250.2	79204.1	+ 46.1	3.07
Bole ... to Bolalio ...	86857.0	86856.5	+ 0.5	0.03
Bole ... to Sahijie ...	87164.3	87107.8	+ 56.5	3.42
Kara ... to Bole ...	111544.6	111451.1	+ 93.5	4.43
Kara ... to Sahijie ...	67509.0	67500.9	+ 8.1	0.63
Karothal ... to Sahijie ...	98417.2	98410.7	+ 6.5	0.35
Karothal ... to Kara ...	92044.7	92052.1	- 7.4	0.42
Ghotana ... to Karothal ...	67559.9	67578.1	- 18.2	1.41
Ghotana ... to Kara ...	107005.3	107021.0	- 15.7	0.77
Konie ... to Ghotana ...	81668.1	81673.0	- 4.9	0.32
Konie ... to Kara ...	64580.2	64576.6	+ 3.6	0.29
Sawajie ... to Konie ...	84988.9	84980.6	+ 8.3	0.52
Sawajie ... to Kara ...	85990.3	86015.2	- 24.9	1.53
Bolalio ... to Kara ...	107993.5	107982.7	+ 10.8	0.52
Bolalio ... to Sawajie ...	57879.7	57878.6	+ 1.1	0.10
Bolalio ... to Myo ...	89332.6	89288.3	+ 44.3	2.62
Average where the error is +	1079415.2	1079072.9	+ 342.3	1.67
„ where the error is -	560345.5	560478.4	- 132.9	1.25



Revenue Survey Operations, District Larkhana, compared with the G. T. Survey (Great Indus Series).

NAMES OF G. T. STATIONS.	From Revenue Survey.	From G. T. Survey.	Error of Revenue Survey.	Error per mile.
	Feet.	Feet.	Feet.	Feet.
Maru Pir ... to Gazi Kohawar ...	56451.6	56308.3	+ 143.3	13.40*
Maru Pir ... to Karohar ...	73557.9	73439.3	+ 118.6	8.51
Karohar ... to Gazi Kohawar ...	62461.3	62291.3	+ 170.0	14.37*
Karohar ... to Teba ...	66094.4	66106.4	- 12.0	0.96
Teba ... to Gazi Kohawar ...	54986.9	55013.0	- 26.1	2.51
Teba ... to Sojra ...	62094.5	62040.8	+ 53.7	4.57
Sojra ... to Kharko ...	80159.7	80584.9	- 425.2	28.01*
Sojra ... to Karohar ...	54905.0	54975.9	- 70.9	6.82
Karohar ... to Kharka ...	55903.9	55718.9	+ 185.0	17.47*
Sojra ... to Bairam ...	54292.6	54252.3	+ 40.3	3.92
Sojra ... to Lukha ...	59636.8	59626.8	+ 10.0	0.89
Lukha ... to Bairam ...	54445.9	54439.2	+ 6.7	0.65
Lukha ... to Teba ...	54645.0	54675.4	- 30.4	2.94
Lukha ... to Goghara ...	50537.1	50542.0	- 4.9	0.51
Goghara ... to Teba ...	40617.1	40619.7	- 2.6	0.34
Goghara ... to Jhukur ...	41282.3	41314.0	- 31.7	4.05
Jhukur ... to Chundia Khan ...	53845.4	53916.6	- 71.2	6.98
Jhukur ... to Lukha ...	52016.7	52070.6	- 53.9	5.47
Chundia Khan ... to Bairam ...	65117.0	65104.8	+ 12.2	0.99
Chundia Khan ... to Lukha ...	46952.5	47010.5	- 58.0	6.52
Chundia Khan ... to Dhamraha ...	57576.5	57594.3	- 17.8	1.63
Dhamraha ... to Jhukur ...	54754.7	54819.4	- 64.7	6.24
Dhamraha ... to Toonia ...	50474.3	50501.1	- 26.8	2.80
Toonia ... to Jhukur ...	50706.2	50647.5	+ 58.7	6.11
Dhamraha ... to Julpani ...	60972.9	60949.7	+ 23.2	2.01
Julpani ... to Chandia Khan ...	61548.8	61578.0	- 30.0	2.57
Chandia Khan ... to Bai (Secondary Station)	66939.6	67020.8	- 81.2	6.40
Sojra ... to Bai (Secondary Station)	75489.2	75525.3	- 36.1	2.52
Average where the error is +	655640.6	654818.9	+ 821.7	6.62
„ where the error is -	962824.4	963867.9	- 1043.5	5.72

292. The mean average error in the work in Lower Sindh is foot 1.67 per mile, where the Revenue Survey measurement is in excess, and foot 1.25

Ratio of Error.

where in defect. This is extremely favorable, and brings the work up fully to the standard of accuracy looked for in the present day. The error in the Survey of Upper Sindh is somewhat larger, although still within moderate limits, being 6.62 and 5.72 feet per mile respectively, on excess and defect distances. This is caused by four discrepant points marked,* which are so much beyond the usual allowance of error, as to leave great doubt as to the identity of the Stations, or else the accuracy of the Revenue Survey co-ordinates, which are now undergoing further examination. Another cause of doubt is, that these large differences are in defect of the true distances, a fact which will engage the careful attention of the Surveyor.

293. The several Maps, Plans, and other records, as detailed in the margin, deposited in this Office by Captain Macdonald and Mr. Lane respectively,

Maps and Records rendered.

exhibit a high degree of excellence and finish, affording fair criterion of the abilities of the Surveyors and their Assistants, who have contributed to the preparation of the Maps. The whole of these records are of great merit and value, affording me the utmost satisfaction. The Maps drawn by Mr. Lane are especially admirable productions, the features of the country being well delineated, and the tone and style of the Hill shading very effective and pleasing, and to all appearances true to nature.

Season 1858-59.

- 1 Index Map of the Season's Operations.
 - 6 Maps of Main Circuits Nos. 5 to 10, scale 1 mile = 1 inch.
 - 1 Atlas volume containing Sub-Division Maps of Main Circuits Nos. 5 to 10, scale 40 chains = 1 inch.
 - 1 Volume Main Circuit Traverses of above Main Circuits.
- } District Kurrachee.

- 1 Index Map of the Season's Operations.
 - 7 Maps of Main Circuits Nos. 1 to 7, scale 1 mile = 1 inch.
 - 1 Plan of Town and Cantonments of Jacobabad, scale 10 chains = 1 inch.
 - 1 Volume Atlas of Sub-Division Plans of Main Circuits Nos. 1 to 7, scale 40 chains = 1 inch.
 - 1 Volume Main Circuit Traverses of Main Circuits Nos. 1 to 7 and their Sub-Circuits.
- } District Jacobabad.

Season 1859-60.

- 1 Index Map of the Season's Operations.
 - 5 Maps of Main Circuits Nos. 1 to 5.
 - 3 Atlas volumes containing Sub-Division Plans of above, scale 40 chains = 1 inch.
 - 1 Volume Main Circuit Traverses of above.
 - 3 Volumes Village Registers and Village Traverses of ditto.
 - 5 Maps of Main Circuits Nos. 1 to 5.
 - 2 Atlas Volumes containing Sub-Division Plan of above, scale 40 chains = 1 inch.
 - 1 Volume Main Circuit Traverses of above.
 - 2 Volumes Village Registers and Traverses of ditto.
 - 7 Field Books.
- } District Larkhana.

Season 1860-61.

- 1 Index Map of Season's Operations.
 - 25 Maps of Main Circuits Nos. 1 to 40, scale 1 mile = 1 inch.
- } District Khyrpoor.

I had the satisfaction of showing the Maps of the Kurrachee Collectorate to the late Chief Commissioner of Sindh, Sir Bartle Frere, who, from his intimate knowledge of the country and appreciation of a really good Map, was pleased to express his admiration of them.

294. The Maps of Upper Sindh are likewise very clear and excellent records, reflecting much credit on Mr. W. Bolton and Mr. E. Loftie, Assistant Surveyors, who executed them. The records of Khyrpoor and Nowshera of the past Season, very recently received, are got up in the first style of excellence, and are highly appreciated; they are 23 in number, and prove the extent of the Surveyor's labors. They exhibit the details full and complete up to scale, and nothing seems to have been omitted to make them as useful as possible.

295. The Plans of Towns and Stations on the larger scale are all well drawn and replete with information, some forming vignettes to the Pergunnah Maps, and produced in an artistic style not often equalled. A very good general Map of the entire Khyrpoor State has been furnished by the Surveyor, on the 1/4 inch to the mile scale, on which the desert is well represented. This will be lithographed with all practicable dispatch.

296. The leading features and peculiarities of the different Districts which have come under Survey, and the local obstacles met with, are best described in the Surveyor's own words, as extracted from their respective Reports, which are replete with interesting and useful information of a varied character, but are too bulky to give entire in this place.

EXTRACT FROM CAPTAIN MACDONALD'S ANNUAL REPORT FOR
SEASON 1858-59.

“ 23. The Frontier Districts present a more than usual barren and uninhabited appearance than is common even in the more remote parts of Sindh. The Description of the Districts, Upper Sindh. average population of the Province may be considered at 30 to the square mile; in the Frontier Districts it is only 10·80; around Jacobabad there is a good deal of cultivation, and also in the Boordekee tract resumed from Meer Ali Morad in 1852.

“ The culturable soil of the District is mainly argillaceous, weakened here and there by the drift sand and dust which sometimes effectually poisons it. The general characteristic of the appearance of the District is a dead level of clay, covered here and there with heavy sand drifts, which move along in vast billows, overpowering cultivation and choking up canals and watercuts, as the winds move its mischievous masses. From the Tower Lunganee, about 12 miles north of Jacobabad, the Frontier Line separates in two distinct directions, the one nearly due east at a bearing of nearly 90 degrees to the river at Mitree, and the other Line on a south-western direction at a bearing of about 230 degrees, passing the Sindh Horse Post at Rojawn, till it reaches the old and important village of Khyree Gurhee on the Larkhana Frontier. This latter Frontier Line crosses a country intersected with sandy tracts varied with clay and salt soils, covered with Kharee Lanee (a *Salsola*), which grows freely to a height of 5 or 6 feet: the sandy tracts are marked by stunted *acacias* and thorn-bushes, capers, and kep (*Leplodania Jacquemont*). This portion is marked here and there with decayed sites of old villages, and is cultivated from the Bigaree Canal. If we proceed along the Frontier Towers eastward from Lunganee above mentioned, a totally different country is to be met with; spaces of hard dark-colored clay, which scarcely produces a single weed, weary the eye as we approach; the eastern portion, a horny-looking grass and a kind of wild millet, marks a vegetation which gradually deepens into bush and thickens into Forest of Peloo (*Salvadora*) and Tamarisk, as the river is approached. The space between the Line of out-posts marked by Hossein Ka Gurree Tungwanee Kund Kot, Koomree and Kusmore, and the Frontier Line of boundary, though not a desert, is interspersed with unculturable tracts of sand and clay and salt, which are almost destitute of inhabitants, and but for the out-posts and the requirements of forage, &c., for the 3 or 4 hundred horses posted along the Line, would be wholly desert. The country along the river from Kusmore downwards, skirting Budarree, Gobla, and Dhuree, is full of dense jungle and tall timber trees, where the annual floods repay the cultivators who clear the forest. Amongst these hollows and dunds there are several thousand acres of cultivation, and in this part of the country it is chiefly wheat which springs fruitfully near the well-moistened land enriched by the decaying vegetation, and soaked by the previous summer's flood. The main cultivation of the District is of the Joaree, whose coarse flour forms the staple of the food consumed in these parts, and its stalk and leaves are entirely used as forage. I have said that on Jacobabad itself depends nearly all the cultivation of the District, and so it does; it is the only market the cultivators have for their produce which is entirely suited to the requirements of a body of 3,000 Horse. Considering the vast amount of money spent at Jacobabad, which must amount to upwards of 20 lakhs per annum, merely for the pay of the Military and the Police, it is astonishing that more does not find its way back to the Government Treasury from the cultivators' fields. However, it must be remembered, a very large proportion of the forage consumed in the Jacobabad Lines is raised in the Shikapoor District south of the Begaree, and nearly all the grain used is imported chiefly from the Ferozepoor District; comparatively speaking, very little grain or pulse is grown in Upper Sindh, and for the enormous consumption of the Frontier Cavalry Brigade, which on the lowest computation would require at least 560 maunds per diem, or 2,05,000 maunds per annum, being the produce of about 41,000 acres of gram cultivation, there is no corresponding growth. Any one at all acquainted with the cultivation of the Upper Sindh Districts would know that the whole of the pulse cultivation in the

Deputy Collectorates does not amount to 10,000 acres. The above figures do not include forage for riding camels and a host of other animals necessary to a large Cavalry Force.

“No description of the Jacobabad Districts would be complete without mention of the
 Description of Jacobabad. Town and Camp which gives its name to the Districts, and which were named after their illustrious founder, under orders from Government in October 1852.

“Early in 1847, when Major Jacob and the 1st Regiment of the Sindh Horse first arrived at Khanghur, the original name of the present town of Jacobabad, a small fort, and a few huts erected near to a brackish well, marked the Station. The desert immediately surrounded it. No vestige of cultivation could be seen for miles around, and, save in the vicinity of the few Belooch villagers, and in the Boordek Country near Murpoor, there was none; what there was was seldom peaceably reaped; the country was a scene of anarchy and confusion where no law existed; and blood feuds and cattle-liftings kept the Frontier in a state of turmoil and excitement.

“Ere the first year had elapsed, the scene had greatly changed; most of the robber bands had been attacked and dispersed by men who could march as well and fight better than themselves. The great robber clan of the Boogtus had been almost destroyed by a party of the Sindh Horse, numbering barely a fifth of their own strength, led by Merewether. It became dangerous to plunder, and Major Jacob turned his attention to the improvement of the District. Soon the Begaree Canal poured its floods on tracts hitherto barren, and the enlargement of the Meerwah, Noorwah, and Sonewah reclaimed large areas from land hitherto always considered barren and desert, whilst these canals, *as antennæ* of civilization, were stretching their long length into the desert. There arose simultaneously at Khanghur the vast proportions of the house which might well strike with astonishment the rude Beloochees, who were accustomed to see even their greatest Chiefs satisfied with the meanest shelter. Besides this, large tanks were excavated, pukka wells were sunk, the sweet waters of the Indus were tasted by men who had hitherto seen only foul, brackish pools, beautiful gardens were planted, avenues of trees marked the roads. Khanghur was fast becoming a spot of green beauty. All the Beloochees thought and talked of the change, and marvelled at the man who could outdo them in their raids, ride under a May or June sun from sunrise to sunset, to pursue a robber band, had power and magnificence utterly beyond their wildest dreams, and who altered the face of the country at his will. All this, as well as the unceasing activity of the Sindh Horse Troopers, helped to conquer them and hold their minds subject. Everything about Major Jacob awed and astonished them. His splendid battlemented house, where the bell of his great clock, the work of his own hands, tolled forth the hours, the magnificence of his furniture, the noble stud of horses in his stables, his studious habits, and, as they believed, his knowledge of all things, had the effect of making them all think that it was hopeless to resist the man who even made guns which could strike and kill objects at a distance of nearly a mile and a quarter; all his influence of power and will brought them under subjection, and they soon willingly felt the guidance and influence of his iron hand and kind, gentle heart. At present Jacobabad looks as flourishing and well-kept a town as any in Upper India. Every road is planted with trees. The Troopers' Lines are thickly sheltered. The gardens are beautiful, and the whole Station is filled with trees from 30 to 40 feet high, all bearing testimony to the strength and fruitfulness of the virgin soil, which, until Jacobabad became British, had ever been desert. In front of the parade stretch away the line of butts, which erected at distances from 300 to 2,000 yards, proved the accuracy and force of the formidable weapons and missiles Jacob had invented. The original Force has now been greatly increased; the first Regiment became two, and again a third Regiment of Cavalry was added. Last year the Force was strengthened by two Regiments of Rifles, named after the late General Jacob, and armed with the weapon he had hoped to see used by the whole Army. There are vacant lines to be hereafter filled by two Sillidar Troops of Horse Artillery, the whole form-

ing a Force capable of holding the Frontier, overawing the hill tribes, and, if necessary, to seize and hold the Bolan against all comers.

“ 25. The tract in question is traversed by five ranges of Hills, the Myo, the Bolaree, the Oont Pulan, the Karro, and the Soorjana; they vary in height from 1,200 to 1,500 feet: these ranges nearly all run in a due southerly direction; the Nullahs, Muller and Sookheere, receive the drainage of the four former ranges; the shed of the Soorjana tends in an easterly course to run into the barrier which forms the northern boundary of the work in Main Circuits Nos. 9 and 10. The Nullahs, Muller and Sookheere, are noticeable as being spanned by the viaducts which form the heaviest works on the line of Railway between Kurrachee and Kotree of the Hills; the general aspect is a precipitous face on the eastern and northern sides, whence the fall runs at gradients from 16 to 10 degrees. Towards the west and south these Hills are of limestone; they are covered with petrifications of the *Nereifolia*, and in their pebbles are to be found traces of Zoophytes and corals. Mr. Lane mentions 13 fossil shells to be seen commonly, but of these specimens only two have been received by me, *Conus concinnus* and *Paludina elongata*. The different streams are as follows: the Baron takes its source in a mountain named Kurten, and falls into the Indus a few miles north of Jheruck; the Lyaree, which falls into the Kurrachee Harbour; the Muller into the Ghizree Creek; the Runpatleeanee into the Gharra Creek; the Logachwaree, Rodh, Joongshailee, Hindostoo, Gungzara, Pipra, Gugga, Khogut, Thuddeyjee, Sookun, Bajar, Mohree, Deson, Mole, &c., are all minor hill streams which intersect the Hills and fall into the larger torrents. However the Pub and Halla ranges have yet to be finished, the portion hitherto completed is but small compared with the remainder, which probably covers an area of 9 or 10 thousand miles. When this work is undertaken a correct Report of their Geology, Mineralogy, together with their fossils and Botany, almost unexplored hitherto, will add much to their interest. The Hills surveyed during the past year have the remarkable gum resin tree which yields the substance called myrrh; it is called Guggar in the Vernacular (*Balsamo dendron Roxburghii*). The wild cotton (*Gossypium Obtusifolium*) grows profusely over these limestone Hills; the other vegetation consists of the common indigo, soda plants, tamarisk, uk, and hatorra jund, the large *Cuphorbia Nereifolia* or Thuhur, grows over the Plains and Hills. I regret that I am able only to give this imperfect account of the Hills surveyed during the past year. The inhabitants are, as would be supposed, almost entirely pastoral, and during certain seasons of the year, after the Monsoon showers have fallen, their numbers are increased by people from the Plains, who drive up large herds of cattle and flocks of sheep and goats to pasture on the wild herbage of the valleys. The Hill people own immense herds of camels, and it is to them that the contractors and traders chiefly look for carriage: they are divided into two tribes, the Jokheas and the Noomreeas; these are both subdivided into numerous branches; the Jam of the Jokheas resides at Bajar. The tribe is of Rajpoot origin: about 160 years ago they migrated from Kungara to their present locality, over the valleys between the Hubb and Mullar Rivers.

“ 28. Only the Indus, which at present is making most mischievous inroads on the right bank, the whole of the Town, Lines, Tower, and Bungalow, which
 Rivers. I saw at Kusmore in 1856, have long since been swept into the river, which now rolls nearly a mile to the westward of its former course; as the right bank is thus being worn away, large deposits are made on the left or eastern banks; in some cases upwards of a 1,000 acres are deposited in a single Season's flood. If the river continues its present action much longer, it will probably break into the hollow which passes near Koomree, and, skirting the present Line of out-posts, will pass close to Jacobabad, and through Rojaun Khyree Gurhee, find its way into the western Nara; another portion will break into the Sinde hollow and flood Shikarpoor. Some such change must undoubtedly take place. The Mittree Tower was in 1856 upwards of a mile from the river bank, where I took my readings from it in March of the present year; it was then about 15 yards from the river's bank. It has since

been swept away. This alteration in the river's course will produce some confusion when the Maps of the Province are compiled into one General Map, as it will be apparently difficult to reconcile the difference in distance between the right and left banks according to the Surveys made in the 3 Seasons from 1856 to 1858. During the Season of the floods, the country from Kusmore downwards to the mouth of the Begaree Canal, a distance of 60 miles, is almost entirely inundated for a space varying from 6 to 10 miles, which is intersected with numerous watercuts, nullahs, and hollows, forming a complete net-work of detail, as shown in the Maps, and owing to the density of the jungle, it was most laborious work to complete its interior Survey."

EXTRACT FROM CAPTAIN MACDONALD'S ANNUAL REPORT FOR
SEASON 1859-60.

"4. The Larkhana, or Chandookah Districts, so named from their having been the Head Quarters of the great Chandial tribe, are the richest in Sindh, possessing great advantages for the prosecution of canal cultivation in its most economical form; they are favored by having the first supply of water from the two largest natural courses which fertilize Upper Sindh. The Gharra, though not the largest, is the most important of these, as it supplies a perennial flow of water; the tortuous Narra (so called from Narra, a snake in the Sindhee Vernacular) is of far larger section, but does not produce more revenue than the Gharra. These two channels are united at "Dowlut" and "Duria Khan Samptia" by the "Fordwah." The result of this work has been to raise the level of the Ghar by about four feet, to the immense advantage of all cultivators on the Ghar, and the channels fed therefrom, below the "Fordwah." There is no doubt but that the cultivation off the Ghar water has increased most extraordinarily, since this large supply of water has been given it, but it is also certain that the Narra supply has suffered, and as the velocity of its current has been much lessened, there is now a greater deposit of silt along its course below the "Fordwah" cutting, and the finest natural watercourse in the country is deteriorating. The subject is one of interest.

"Some years ago, the floods from the Narra proved to be almost mischievous in their overwhelming quantities on the Mehur Districts, which, at the southern portion of Larkhana, received the Narra drainage. Some intelligent Zemindars of the Larkhana District, alive to their own interest, and confident that the Ghar could receive water from the Narra, proposed to Lieutenant St. Clair Ford, the Deputy Collector of Larkhana, that he should unite the two channels at an indicated point; and to show their certainty regarding the feasibility of their scheme, they offered to pay half the cost of the work. St. Clair Ford warmly seconded their cause and argument. Scientific men considered that, as the mouth of the Ghar received the river water from mouths 5 to 10 miles higher up the stream than the mouth of the Narra, it was scarcely probable there would be a sufficient fall in the proposed channel between the two streams. After some opposition it was resolved that correct data should be obtained, as levels are better than moral certainties. The result was satisfactory; the "Fordwah" was excavated on the original proposal, and the next year its section was doubled at the entire cost of the Zemindars. The Fordwah is a complete success, as far as the interests of the Ghar cultivators are concerned.

"5. I will now make some remarks regarding the Narra, and how its course has been affected by the loss of water through the "Fordwah." The Narra, which has a far larger section than the Ghar, had always a less rapid course. The cut which united the two streams had a fall of thrice that of the Ghar, and nearly four times that of the Narra; consequently, the rush into the Ghar from the great head it received from the Narra, abstracted in proportion to its section upwards of thrice the volume of water which flowed through a corresponding space of the Narra water, whose stream, deprived of the momentum thrown into the Ghar, has of

course lost much of its velocity under the inferior pressure it now bears; there is more silt, and the lower portion of the Narra receives its supply of water later, and loses it earlier in the Season. It is, however, certain that the Larkhana District has gained more than the Mehur District loses, and though it is to be feared some individual interests have suffered amongst the cultivators on the Narra, this can scarcely be considered in comparison with the fact that the Ghar cultivation has quadrupled the losses on the Narra. Still the Narra should be helped, and I think much future loss may be avoided, if its section from its mouth to the opening of the Fordwah is increased to the same extent as the section area of the Fordwah; further, a regulating head should be placed at the head of the Fordwah, and no water should be admitted into the Ghar, through the "Fordwah," from the Narra, until the Deputy Collectors of Sehwan and Mehur are satisfied that the first wants of their Zemindars are supplied, and the early sowings of their autumn crops, dependent on the Narra water, completed. I make the above remarks with the greatest diffidence, but will only add that a thorough removal of the deposit now in the bed of the Narra is essential. The whole District of Larkhana is well watered. Talooka Ruttah Derah is cultivated from the "*Nusruh wah*," called the "*Muksoodah wah*;" from the point whereat it is crossed by a cut which unites it to the Sindh, the water from this canal reaches Khyree Gurhee, the large village situated at the tail of the "Bigaree" canal which was mentioned in my Report on Jacobabad: besides this, the "Soojawul" talooka also is watered from the "*Muksoodah wah*."

"6. Talooka "Kumber" is flooded almost entirely from the "Ghar," which below Larkhana is called the "*Nowrungwah*." Three large channels, the "*Shah-ka-koon*," the "*Data*," and the "*Noorwah*" convey water in a north-westerly direction to the lands of the large villages, "*Shahoo Jumalee*," "*Shadadpoor*," and "*Dost Allee*." Lately, under the action of Captain Ford, a new canal, called the "*Edenwah*," has been cut, in order to carry off the water from the tail of the Beegaree; this canal runs nearly due south towards Beiram Biron. All the cultivation in this direction owes its origin to Captain Ford's intelligent vigour and heartfelt energy in the improvement of these districts; he has given out the lands at half the rates obtaining elsewhere, which chiefly accounts for this improved state of affairs. Peer Buksh Kohawur is the chief zemindar on the "Eden" Wah, which he intends to lengthen by 7 miles at his own expense. Ten years ago, this man was almost penniless; unable to turn his large lands to account, he skulked in obscurity, in order to hide the poverty he was ashamed to show. An advance from Government judiciously applied gave him a fair start, and he is now, if not wealthy, at least prosperous, conscious also that he owes most of his advantages to the kind care of an English gentleman. Proceeding south we enter the "Nusseerabad" Talooka, which receives the last of the fertilizing waters of the "Ghar," as well as all the aid it can draw from the great deep "Narra." As may be supposed, this is a very fertile talooka, and its rice cultivation, like that of Kumber, is famous over the whole Province; a settlement has been made of this talooka, but I think it will not stand good. *Lano Khan Kohawur* is the principal man of this District. A good idea may be formed of the prosperity of this talooka from the fact that, out of the 53 villages or Dehs it contains, 20 pay more than Rupees 2,000 a year. The small talooka of Lub Duriya is the next; situated on the banks of the Indus, and having the Narra supply also, it is very prosperous. *Alla Buksh Oonur* and *Mahomed Khan Loonujoo* are rich, influential men, each paying nearly Rupees 3,000 a year to Government, for their individual cultivation. The Larkhana Talooka, lying between Lub Duriya and the Shikarpoor Deputy Collectorate, has, in addition to the facilities for irrigation, mentioned for Lub Duriya, the further advantage of the Ghar in its first strength. Other talookas pay more in the aggregate, but Larkhana contains the richest men of the District; *Futteh Mahomed Lahooree*, *Mahomed Punna Kehur*, and *Nubbie Bux*, Chief of the Abra tribe, also *Mahomed Kero* and *Mahomed Esran* are all men who pay Government upwards of Rupees 2,000 per annum, on their own cultivation; I found that, in the

whole District of Larkhana there are 12 Zemindars who pay more than Rupees 2,000 on their individual cultivation, and 62 Dehs, each paying in the aggregate more than Rupees 2,000 per annum. These facts prove great prosperity.

" 7. It will not be out of place to record the public spirit displayed on various occasions by the Larkhana Zemindars ; since the year 1855-56 up to the 1st January 1860, 99 miles of new canals have been excavated, and 297 miles of old canal and channels have been enlarged and improved : altogether Rupees 4,09,081 have been spent on these works. Of this sum the Government have advanced Rupees 2,20,140, and the Zemindars have given Rupees 1,88,941. Great improvements have been made, and within the last 8 years the revenue of the district has increased from 3½ lakhs of Rupees to Rupees 5 lakhs in 1859. This continued improvement is mainly due to the personal influence of Captain Ford, who was Deputy Collector of the District for 7 years, and possessed in an extraordinary degree the confidence of the District cultivators : he had an advantage certainly in finding well-to-do men, able to carry out the advice he could give them for improving their lands, but he would also consider their proposals, generally shrewd and practical, and, if required, use his influence and aid to get assistance from Government to help their plans into execution. Too much credit cannot be given to Captain Ford for his very successful administration, which is stamped on Larkhana to the present day.

Besides the works above mentioned, constructed for the purpose of bringing *in* water, there have been completed, within the same dates, 123 miles of new embankments and 37½ miles of old embankments : these works are to exclude water from places subject to floods. Their total cost amounts to Rupees 1,33,527, of which the Government have paid Rupees 25,611, and the Zemindars have given Rupees 1,08,016. These figures show that the Zemindars have spent on public works Rupees 2,96,957, and the Government have given Rupees 2,45,751 towards the works. The revenue of the District may be considered as having averaged 4½ lakhs during the past 5 years. I question if any District in India could show a greater spirit of improvement amongst its agricultural class.

" 8. There are three Government schools in the District, one at Larkhana, attended by 210 scholars, another at Kumber, where 90 children are being educated ; in Bukraanee 60 boys attend. Bukraanee is the chief place of the Lub Duriya Talooka. Another school is being organized at Ruttah Derah.

" 9. Of roads upwards of 460 miles have been completed, and 280 miles have been bridged throughout the Main Roads, and communications with the Talooka and District Head Quarters are all bridged throughout. The bridge over the Narra at Radun is a splendid work, which cost Rupees 13,000, and the bridge across the Ghar is tastefully built. There are District Bungalows at Larkhana, Nusseerabad, and Nyadera, and excellent Dhurmsallas at Larkhana, Kumber, Bakraanee, Dokree, Ruttah Derah, Akil, Khaleel, Bungul Derah, Chowsool, and Bungul Kulhora, &c., in all 18 in number. Some of these are very comfortable, and have doors and windows. One hundred and twenty-four public wells have been constructed for the benefit of travellers : these wells are pukka, and have cost in the aggregate Rupees 28,272, of which amount Rupees 24,285 were given by the Zemindars of the District. Twelve Tanks have been excavated at a cost of Rupees 5,400 ; some of these retain water throughout the year. The Jails, Kutcheries, and Police Stations complete the Public Works of the District, all admirably kept.

" 10. There is an appearance of vitality in the Larkhana Districts peculiarly gratifying. In the talooka towns there are more signs of wealth : local improvements are energetically pushed on ; drains are cut so as to fill tanks, instead of forming swamps ; dung heaps are removed for manuring ; litter is removed and cut up to lay over the roads ; new streets are built of uniform appearance ; intelligent direction is seen everywhere. On Larkhana itself much has been spent in beautifying the place. A new Native town has been added to the old city, and " Ford-gunge," as it may appropriately be called, wears quite a different appearance to any other Native town I have seen : laid out in rectangles, enclosed with low battlemented walls, its wide streets

bordered with slender bushes and trees, it looks as clean as a model farm; several public gardens ornament the Stations, and much taste and effect is shown, in the way all the principal buildings and their approaches are ornamented."

EXTRACT FROM MR. LANE'S ANNUAL REPORT FOR SEASON 1859-60.

"1. This District is divided into six talookas, *viz.*, Larkhana, Kumber, Nusseerabad, Ruttadera, Poojawul, and Lubdhurya, each administered by a Mookh-
District Larkhana, Local Divi-
 sions. teearkar, Kardar or Naib Kardar, vested with small Magisterial powers, supervised by the Deputy Collector of the District. Each talooka is sub-divided into Tuppas, or circles, 42 in all; each circle is in charge of a Tuppedar, and the tuppas are again divided into Dehs, or Mouzahs, altogether 584 in number. Before the conquest, and for some time afterwards, this District seems to have borne the name "Chandooka," from the greater portion of it having, at one time, been occupied by the tribe of Chandias.

"2. Its value caused it frequently to change masters; and in common with the rest of Sindh, it has been the scene of many a bloody conflict. Its fields of corn have been trampled under by the invading hordes, and its plains saturated with the blood of hundreds. As each succeeding dynasty won and held the throne by the sword alone, we can see in Sindh but one battlefield, the scene of usurpation, tyranny, and bloodshed. The steel of Damascus has glittered on its plains, the miraculous club of the Kulhoras placed the descendants of mendicants on its throne, the matchlock of the Talpoor, in avenging a series of diabolical murders, gave it a dynasty of shepherd Princes, till finally the British bayonet gave the worn-out country peace in 1842-43.

"3. Possessing great facilities for irrigation, the District of Larkhana has not been aptly styled the garden of Sindh. As regards those means, the "Ghar" and the "Narra" are the principal sources whence the canals derive their supply. The Ghar receives its waters from the Indus by several mouths, and by a recent cut called the "Ford wah" from the Narra. From its source till it approaches Larkhana, its course is very winding; from Larkhana it proceeds in a westerly direction for 10 miles, when it strikes off into two branches, that running to the north-western taking the name of the "Noorwah," after "Noor Mahomed Kulhora," in whose reign it was dug, the other running to the south for about 12 miles, bearing the name of "Nowrung," which, after flowing for about seven miles in a southerly direction, throws out a branch to the west called the "Gutta," and, after advancing a little further, assumes the name of the "Cheela," which passes under the town of Nusseerabad. It has been asserted by some that the "Ghar" throughout its whole length is an artificial canal, and that its numerous turns were caused by its having been carried through lands suitable for cultivation, but the absence of the usual embankments through a great portion of its course, its great width and depth, have led others to the belief that, from its source to some distance below "Larkhana," it is a natural river. Until the new cut, the "Ford wah," was made under the auspices of the able Officer whose name it bears, the "Ghar" used to be dry during some months of the year (between November and April), but the additional volume of water which this new channel conveys to it, now keeps up a running stream in it throughout the year, much to the benefit of the District, the greatest part of which derives its means of irrigation from this river or grand canal.

"4. The "Narra" waters the Lubdhuria Talooka, and the westerly portions of Larkhana and Ruttadera; this is a natural "river" which derives its name from the Sindee term ("Narra") for a snake, on account of its tortuous course. Its mouths lie a short way to the south of those of the "Ghar," with which for some miles its course is nearly parallel. Whilst the "Ghar" takes a westerly direction from the town

of Larkhana, the "Narra" continues to flow on in a south-westerly direction, till, passing through the District of Mehur and the Kardarates of Dadoo and Johee of Sehwan, it empties itself into the Munchur Lake. It is said, the "Narra" used to overflow its banks and cause much mischief to the crops in Mehur; but since the "Ford wah" relieves it of a large portion of its waters, the cry has been reversed, the supply being considered insufficient. However, what the Larkhana District has gained by an increase of cultivation, is vastly in excess of what has been sacrificed in the Deputy Collectorate of Mehur. A new cut from the Indus of little better than a mile in length, in the northern portion of the Deh of Salianee of Talooka Lubdhuria, would perhaps amply compensate for the deficiency caused by the abstraction through the "Ford wah." The "Narra" is navigable for all sized

Navigation of the Narra. boats between the months of May and September, and this route is much adopted, though a more circuitous one, in preference to the Indus during the height of the floods. About the latter part of July the inundation generally reaches its greatest height. The other principal canals are the following, *viz.*—

Canals. "5. The Khyrawah, the Beerawah, and the Kadawah, issuing from the Sindwah, Wahs Mithha or Muksoodah, Humeerjee, Shahjo-koor, Datta-jo-koor, Bairam, Nala Alee Khan, Ibrahim, Mohubut-jo-koor, Futtoohul, Mohobut, Koso, Nudam, Meer, Nusseer, Cheela, Nowrung, with their subordinate streams, all supplied by the Ghar; the Ford wah, which adds to the supply of the Ghar and the "Eden," to bring the surplus waters of the Begaree.

Facilities of communication. "8. As regards means of communication, perhaps no District could cope with this, either in respect to natural facilities, or the extent of its roads. The River Indus to the east is available at all times of the year; the Narra and the Ghar between May and September, and all the larger canals during the inundation, being accessible to boats of burthen. By means of boats, from the very heart of the District, its much esteemed rice and other cereals are exported to Kurrachee and other distant places.

Roads. "9. The roads aggregate upwards of 400 miles, and connect all the principal villages in the Deputy Collectorate; none of them are metalled, but most of them are bridged. However, the primitive construction of the carts employed, and their consequent inadaptability to carry much weight, causes them to be but little used as transports for traffic, for which the camel is invariably employed in the fine Season; the carts (which prove highly destructive to the unmetalled roads) being restricted to convey home produce from the fields and passengers from place to place. The donkey, however, is in great request, but it is not uncommon to see trotting bullocks mounted by men, women, and children, constantly traversing all the better frequented roads."

EXTRACT FROM MR. LANE'S ANNUAL REPORT FOR SEASON 1860-61.

Geographical position of Khyrpoor. "24. The state of Khyrpoor lies between the parallels of North Latitude $26^{\circ} 11'$ and $27^{\circ} 15'$, and meridians of East Longitude $68^{\circ} 7'$ and $70^{\circ} 11' 30''$.

Boundaries. "It is bounded on the north by Talooka Roree, of the District of the same name, to the north-east and east by the Independent State of Jeysulmeer, to the south by Talooka Narra of the Thurr and Parkur Political Superintendency, Talooka Saugur of the Holla Deputy Collectorate, and Talookas Sahitee and Kundiarra of the Nowshera Deputy Collectorate, to the west by the River Indus, across which are situated the Districts of Larkhana and Sukkur. At the south-eastern extremity the State of Jodhpoor just touches and forms a quadruple junction point, and in like manner, at the south-western corner across the River Indus, the District of Mehur touches in a point only.

"25. The area of Khyrpoor, with the portion lately made over to His Highness Meer Ali Moorad, from the Thurr and Parkur Districts, amounts to
 Area of Khyrpoor. acres 39,10,046.68 = 6,109.44 square miles of territory.

"26. The portion of Khyrpoor first taken up was the tract lying to the eastward of the River Narra, but before proceeding to describe it, it is perhaps necessary to explain some of the terms prevailing in the Desert, which would not perhaps be generally understood, and which have been extensively used in the Maps.

Bhil.—A sand hill or ridge covered with grass or brushwood.

Chowrah.—A village composed of huts, conical in shape, built of brushwood, grass, and branches of trees, and covered over with a netting of grass ropes to bind the whole together; the door-way of these dwellings being just large enough for a man to creep through.

Draeen or Dreon.—Tract of drifting sand hills, perfectly barren.

Durra or Murree.—A high sand hill with an extensive surface.

Doobha or Tuss.—Plot of ground where a spring of sweet water lies close to the surface.

Jhok or Jhoom.—A collection of four or five Kunder trees.

Gool.—A cowshed.

Got.—A large village.

Kooa.—A pukka well.

Kooce.—A narrow kutch well.

Kochur.—A spring of water surrounded with luxuriant reeds, forming an oasis in the desert to be met with in the Draeens only.

Khurul.—Ditto ditto when very limited in extent.

Noon.—A narrow saucer-shaped valley.

Par or Ch'hilree.—A hollow where water is collected for a short while after rain.

Thull.—A narrow flat valley.

Rinnu.—A tract destitute of water.

Phoollee.—Saline efflorescence.

Toor.—A peak.

Turr.—A kutch well where cattle are watered.

Thulla.—A hamlet temporarily deserted.

"27. The general aspect of the Desert tract, when removed a short way from the Narra, is most dreary. Nothing meets the eye but a vast wilderness, as
 General aspect of the Great Desert. ridge after ridge of sand hills covered with stunted brushwood or bare is seen stretching away to the very horizon.

"28. On the right bank, as also on the left bank, of the "Narra," the sand hills trend in all directions, but, after advancing a short way to the eastward of that river, they assume a more regular outline, running in parallel ridges north and south, interrupted occasionally by miles of Draeens or drifting fields of sand of ever-varying features, where the traveller would be bewildered and lost without a guide.

"29. Desert as the tract is, it is inhabited by nomadic tribes, the largest of which is the
 Inhabitants of the Desert. "Rajur," divided into several families. With the exception of the "Sodha" Thakours or Rajpoots (Hindoos) inhabiting the portion furthest east, or from "Wurreeboo," "Lutheearoo," "Soortnahoo," and "Soomrahoo" eastward, the tribes are all Mussulman. They are all a well-built, sturdy race of people, possessing a frank, manly bearing about them, not to be commonly seen amongst the dwellers of the Indus Valley.

"30. Away from the Narra to its east the soil being sandy, no grain is grown except
 Cultivation in the Desert. in some valleys, where Joaree is sown broadcast, whenever a highly favorable rainy season occurs, but this is exceedingly seldom.

“ 31. The wells or Turrs are distant apart ; and though the water of a few is tolerably good, the generality of the wells are brackish, intensely so about the confines of the Jeysulmeer boundary, where even the natives seldom use the water in a pure state, invariably adding to it buttermilk or milk. Whilst the wells amongst the Bhits are more or less brackish, the springs in and about the Draeens are found to contain good water.

Wells.

“ 32. Here and there will be found in the Maps parts noted as “ Ruins,” to mark the belts of arid tracts where no water is obtainable, but where, nevertheless, flocks and herds are taken in the colder months to graze, it being a characteristic with the cattle of the Desert that they can endure thirst for three or four days together. Whether this arises from the peculiar nature of the nutriment, I am unable to say, but am inclined to the belief that it does.

“ 35. The Desert is not without its value to the Meer, for, besides being a nomadic District from which he derives a tax of one per every 100 head of cattle, it possesses several natron pits, known as “ Simms” and “ Fith’hs,” from which are carried away annually thousands of camel-loads of the unrefined carbonate of soda, to the south to be exported by sea, and to the east through the States of Jeysulmeer and Jodhpoor to Northern and Central India. Each camel-load is taxed at 2½ Rupees.

Minerals.

A Transit Duty is also levied on all goods crossing this Desert.

Transit Duty.

“ 37. Next and to the west of the portion of the Desert just described, lies the valley of the Narra, bounded to its west by another sandy desert tract. The belt through which this river meanders is composed of a rich alluvial soil, covered with thick brushwood and jungle almost wholly uncultivated, requiring but the hand of the husbandman to render it highly fruitful ; but which at present is only the nursery of the wild boar and deer.

“ 38. The Eastern Narra is a stream of no magnitude, except in the inundation season, when it spreads out in a wide sheet of water in many parts. In the winter the stream is broken into sluggish, apparently stagnant, pools intercepted by beds of sand, through which, however, the water is constantly percolating from one pool to another. In 1859 a new channel was opened from north of the tower of Roree, connecting the Indus with the head of this river, by which the Thurr and Parkur Districts are said to have derived considerable benefit, but which Meer Ali Moorad looks upon as having proved detrimental to his interests, from having converted some of his natron pits into sweet water-pools. The injury sustained, I suspect, has not been much, but only sufficient to give color to the grievance, and I have little doubt, were he to extend the cultivation of indigo to the many spots that have been rendered fit for it, since the opening of the new cut, it would more than repay considerably any loss caused to him by the ingress of sweet water into a few natron pits.

River Narra.

“ 39. To the westward of the belt of the Narra, the District is covered with sand hills even more desolate than those to the east. To the north, these yield to hills of conglomerate limestone and flint. There are several ruins or waterless tracts amongst the Bhits on this side.

“ 40. The “ Meerwah,” the principal canal of the District, comes next. Both its banks are highly cultivated, and the indigo crops are very extensive about them. From Thurrerec to the southern boundary of Khyrpoor, below Laloo-jo-kot, several cuts from it are carried deep into the valleys of the sand hill ranges, where the crops must be good, as the soil appeared to be very excellent, and to have been extensively cultivated with the Khureef crops “ Bajree” and “ Joaree.”

“ 41. The alluvial Plains which form the District between the Indus and the Meerwah are the richest portion of the Meer’s possessions. This tract is completely intersected by water-courses, natural as well as artificial, but the cultivation, in comparison with the area lying

waste, bears but a small proportion. Some of the finest lands near the river and elsewhere are fenced in as "Moharees," or game preserves.

"42. I understand that in the time of Meer Shorab Khan, the father of the present ruler of Khyrpoor, the Plains were better populated and very extensively tilled; but now, look where you will, except in the tract west of the main road, extending from the confines of Roree to the village of Pipree, neglect is visibly marked everywhere; so great is this to form a striking contrast with the adjoining District of Nowshera, that it needs no enquiry to ascertain whether you have passed the boundary between Khyrpoor and the British Districts, for the busy population, the smiling fields, and better regulated roads and public buildings, &c., all betoken that you have left the native rule behind.

"43. The soil of the alluvial Plains, extending from the river to the "Bhits" (sand hills) is generally good; but there are parts where sand predominates and renders it poor, or where the saline efflorescence renders it barren.

Soil.

"44. Khyrpoor is the Chief Town in the State, founded by Meer Sorab Khan Talpoor, the father of the present ruler. It is said to have been in a very flourishing condition in the time of the founder; but now it is greatly

Towns.

deserted and partly in ruins.

To the south of the town, across the Meerwah, are still standing the walls of a bungalow that used to be occupied as the British Residency, when the Meer held possession from the Bahwulpoor Frontier to the south of Nowshera.

"45. Kot Dejee is the favorite seat of the present Meer; the town is situated at the foot of the hill on which stands the fort that during the native rule was considered impregnable, but which would not withstand a day's siege if opposed to European troops and science. This fort is now used as the chief prison. The town itself appeared to be in better order than Khyrpoor.

"46. At some distance from the town, His Highness Meer Ali Morad has his chief palace surrounded by an extensive garden; he, however, seldom occupies it, preferring a shed made of the boughs of trees to dwell in during the day, and a tent at night; and never on any account has he been known to spend a night under a pukka or a mud roof, having a superstitious fear of being buried under it if he did so.

"47. Raneepoor, Khora, Gumbut, Hinjorja, Deparja, are all considerable towns possessing a good many brick houses, founded years before the Talpoors gained the ascendancy in Sindh. Like Khyrpoor, they appear to be rather deserted; the trading classes having emigrated to Sukkur and other British towns.

"48. Besides Kot Dejee there are a few forts, such as "Laloo-jo-Kot," "Emamjish," "Bardarwalli Kot," "Kot Jeeboh," and a few others of less note (all shown on the Maps) lying dismantled and incapable of any defence.

"49. There are only two roads worthy the name; these are the new main road coming from Roree, and leading by Nowshera and Halla to Hyderabad, very heavy in most parts; and the old road from Roree, passing by Lalla-jo-Kot to Hyderabad, which, to save distance, is still traversed by the Post.

Roads.

"50. The population is chiefly Mussulman, of the same tribes as those inhabiting the Roree District. Of the Hindoos, the "Vamo" or "Bunia" tribe is only inferior in numbers to the Mussulman. In Sindh the Bunia readily accommodates himself to circumstances, not, like his brother of the Punjab or the Provinces, adhering to trade as the only means of obtaining a livelihood open to him, but taking to the plough or any other occupation for a subsistence.

Population.

"52. The crops are the same as those of Roree in the Rubbee, consisting of wheat, gram, pulse, &c.; in the Khureef of Joar, Bajree, &c., the only exceptional article being indigo, which is very extensively cultivated.

Crops.

Minerals. "53. Salt and saltpetre are both manufactured to a slight extent.

Alteration of a small section of boundary between Kooree and Khyrpoor. "60. It should have been mentioned in a preceding part of this Report that a small section of the boundary between Khyrpoor and Roree has undergone a slight alteration since the latter District was surveyed, owing to some lands having been made over to His Highness Meer Ali Morad. The old and new boundaries are both shown on the Map of Main Circuit No. 33, Khyrpoor."

297. No Settlement Operations being conducted in connection with the Survey work of Season 1858-59, no Demarcation Maps were received or compared with the Professional Survey, but a native measurement of Fields and estates was carried on under the Civil Authority in the Jacobabad District, from which no results reached the Surveyor's hands. In the Frontier or Hill Districts, permanent triple junction marks have not been erected or required, as natural boundaries were found. The canals are said to make the most permanent landmarks that could be erected. In Larkhana the Professional boundaries were duly compared with the Demarcation Maps supplied by the Settlement Department, and all differences reconciled. Captain Macdonald especially records his obligations to Mr. Daly, the Deputy Collector of the District, for his hearty co-operation and effective assistance.

298. The Demarcation Maps in the Nowshera District are reported to have been of a most superior description, and the comparison instituted between them and the Professional Plans was, in the Surveyor's opinion, a convincing proof of the care observed in both branches of the Survey to produce the best results.

299. Prior to the termination of the last Recess, the Officiating Revenue Surveyor had to give back his charge to Captain Macdonald, who, returning from sick leave to Europe, rejoined his appointment at Sukkur on the 24th August 1861, having arrived at Bombay on the 8th idem. The Official or Professional year being so nearly at an end, I deemed it advisable to allow Mr. Lane to complete and render the whole of the Season's work on his own responsibility; he therefore signed all the Maps, and reported on the results, which prevented any inconvenience or misunderstanding as to the sharing of either credit or responsibility.

Return of Revenue Surveyor to duty.
Division of Establishment into two Parties.

300. On the 1st October 1861, the commencement of the present season, the original intention of forming two distinct Parties in Sindh, with a view to obtaining greater progress in this large Province, as sanctioned by the Supreme Government in correspondence marginally noted, was carried out. This plan had been kept in abeyance on the recommendation of the late Chief Commissioner on financial grounds, after

Home Department to Chief Secretary, Bombay, No. 89, dated 19th January 1857.

the mutiny, but by the subsequent orders specified in the Financial Resolution, No. 1101, dated the 10th February 1860, received with Home Department docket, No. 388, dated 20th February of the same year, provision was duly made in the Budget Estimate of this Department, and Mr. Lane, whose services were not available until Captain Macdonald's return from England, was appointed to raise and superintend the new Party, whilst Captain Macdonald retained his old one, after contributing largely, both in European and Native Agency, to Mr. Lane's wants. The two Establishments were then told off as No. 1, Right Bank Indus, and No. 2, Left Bank Indus Survey, respectively; Captain Macdonald taking the former line of country.

301. No. 1 Division under Captain Macdonald's able superintendence took up the Mehur District, and the Hills west of Larkhana, in due succession to the work of the Season 1859-60, with which it joins. The Mehur District is situated between District Larkhana of the Shikarpoor Collectorate and District Sehwan of the Kurrachee Collectorate on the right or west bank of the Indus. The Season's operations consist of 1,231 square miles of the usual village detail work in 299 villages and 1,230 square miles of Topographical Survey, making an aggregate of 2,461 square miles as per margin.

Captain J. Macdonald, Revenue Surveyor.			
<i>Assistant.</i>			
Mr. W. H. Bolton	...	...	2nd Class.
<i>Sub-Assistants.</i>			
Mr. J. E. Hodgson	...	...	2nd Class.
„ J. W. Harris	...	...	3rd „
30 Native Surveyors.			
<i>Square Miles.</i>			
Villages	...	...	1,231
Hills	...	...	1,019
Plains	...	...	211
Total	...	...	<u>2,461</u>

302. The entire District of Mehur, together with all the Hilly tract west of it, as well as west of Larkhana, seems to have been well accomplished. The minor Triangulation was carried over 3 distinct ranges of Hills, varying in height from 1,200 to 6,000 feet above the sea, and entailed a great deal of labor. The Plains between Larkhana and the Hills were laid down in order to show the drainage basin of that portion of the country, and without which the General Map of the Province would have been defective. This, therefore, adds much to the practical value of the Survey, which has been based throughout on the Great Triangulation of the Indus Series, and forms a most complete and satisfactory piece of work exceedingly creditable to the Revenue Surveyor. A good index, or approximate Sketch Map, of the entire Season's work has been very promptly furnished, which enables me to accord to Captain Macdonald the credit he deserves for his energetic management and successful results.

303. During the ensuing Season this Division will pursue their course southwards through the Sehwan District, and complete all the intervening portion of country of the Kurrachee Collectorate down to the work executed in Season 1855-56 and 1858-59 in Lower Sindh,

Work proposed to be employed upon.

and, at the same time, include as much of the Hill Territory, forming the extreme western British Frontier, as may be practicable to lay down.

304. No. 2 Division under Mr. Lane has continued on the Survey of the Nowshera District, Hyderabad Collectorate, from where it was left off last Season. The remaining portion of the Sohitee Pergunnah or Talooka, together with Mora and north-east portion of Sukkrund Pergunnahs, have been surveyed in 190 "Dehs" or villages, comprising

Mr. W. Lane, Revenue Surveyor.
Assistant.
 Mr. E. Loftie ... 3rd Class.
Sub-Assistant.
 Mr. G. W. Johnson ... 3rd Class.
 16 Native Surveyors.

1,713 square miles. Of this area 957 square miles have been laid down on the usual village scale of 20 chains to the inch, whilst many of the "Dehs," or villages embracing very large tracts of sandy desert or unprofitable land containing but few details, were only required on half the above scale, which still makes very large Plans of each village, and the reduction of the scale in such cases has therefore been deemed necessary. Seven hundred and fifty-six square miles have been thus treated. In addition to the above, two other Main Circuits were commenced, but the Topographical details could not be finished; a very fair out-turn, considering the incompleteness of the Establishment, which has not yet been nearly recruited up to full strength, it being exceedingly difficult to obtain either European or Native Assistants in Sindh.

305. The completion of the Sukkrund Talooka of the Nowshera District, together with the Survey of Talookas Halla and Shahdadpoor of District Hulla

Programme for ensuing Season.

of the Hyderabad Collectorate, and Narra of the Thurr Parkur Political Superintendency, as far as a line drawn due east from the extreme point of Talooka Shahdadpoor, forms the programme for the next Season for this Division. The Thurr Parkur Districts being of a very poor description, with the exception of one Talooka along the River Narra, will be taken up Topographically only. With his Party strengthened by degrees, I trust it may work up to full power and return a considerable area.

Area surveyed and remaining for Survey in Sindh.

SEASONS.	Square miles.	Total.
* 1855-50	307	18,870
1856-57	3,938	
1857-58	1,660	
1858-59	4,038	
1859-60	2,211	
1860-61	6,665	
1861-62 (Approximate) ...	4,536	4,536
Total Surveyed		23,415
" of the Province		52,120
Remaining		28,705

306. We have thus made a very sensible impression on the Sindh Province, the Survey of which commenced in Season 1855-56.* By the best estimates we have a total area of 52,120 square miles to get through, and 23,415 square miles have been done up to the present date, in seven Seasons, leaving 28,705 square miles, or rather more than one half of the entire Province to be surveyed. This, however, with two Parties instead of one, and when both are recruited up to full strength, will be a

COLLECTORATES.	Square miles.
Shikarpoor ...	6,120
Hyderabad ...	30,000
Kurrachee ...	16,000
Total Area ...	52,120

much easier task, and with the experience already gained, and perhaps easier ground to go over, I hope in a couple or three years more to see the whole completed, when I shall be extremely glad to be able to withdraw our Bengal Parties from that distant Province under another Presidency.

307. Of the Sindh Survey, the general Map of the Districts of Rohree, Jacobabad, and Shikarpoor combined, forming the northern portion of the Province, has been compiled on the $\frac{1}{4}$ inch scale, and is now just gone to the Press. The Khyrpoor Map, on the same scale, is ready, and will likewise be lithographed immediately. The one inch Map of the Kurrachee Khardarate, containing the Harbour, Town, and Cantonments of Kurrachee, is in course of lithography, and will be shortly issued. This is an excellent Map, with the hill features to the westward well delineated in Mr. Lane's approved style.

308. In his Annual Report for 1858-59 Captain Macdonald reported very favorably of his Chief Assistants, Mr. W. Lane and Mr. W. Bolton; the former made excellent arrangements for the prosecution of his work, and carried them out with the greatest success. Mr. Lane's merits and long-approved service in the Department pointed him out as a very competent Officer for executive charge of independent operations, for which I was happy to see him nominated. Mr. Bolton has done excellent service, and is equally well spoken of by both Executive Officers under whom he has served. In consideration of his continuing to give such satisfaction in a distant Province like Sindh, he was promoted, on the 1st October 1860, to the grade of Assistant Surveyor, 3rd Class, and again, on the 1st May last, to the 2nd Class* on Rupees 300. Mr. E. Loftie was also promoted to the grade of Assistant Surveyor, 3rd Class,† from the 1st January, to fill the vacancy caused by the organization of a second Party. Considerable difficulty exists as regards the recruiting of the Sindh Surveys, and several vacancies now exist. Messrs. G. W. Johnson and J. Harris, having satisfied me on the points of qualification, were appointed Sub-Assistants, 3rd Class. I hope to fill up No. 1 Division Establishment with Sappers from the Bombay Army, several of whom have been declared available for such duty.

* G. O. G. G. No. 326, dated 6th June 1862.

† G. O. G. G. No. 218, dated 11th February 1862.

309. Several of the Native Surveyors on these Establishments are able, hardworking men from the Punjab, who have gone through a long course of De-

Native Surveyors.

Beneo Ram.
Ameer Buksh.
Inayat Hoosein.
Jeevun Ram.
Kurreem Elam.
Mahomed Mohsim.
Ahmed Ali.
Wuzeer Ali.
Beharee Lal.
Bhimma Ram.
Geerdharee Lall.
Atma Ram.

partmental Service, and by following Captain Macdonald to Sindh, which is not well suited to their constitutions or tastes, they deserve every consideration and encouragement. The names marginally cited appear to have been the most prominent during the operations under review, and who have received suitable increase to their salaries.

310. It has long been an object of special desire to obtain a Covenanted Assistant for the Sindh Survey, and on the recommendation of Captain Macdonald the name of Lieutenant H. C. B. Tanner, of the 4th Brigade, Royal Artillery (Bombay), who has had the advantage of accompanying the Revenue Surveyor of Sindh in his present Season's operations, was submitted for the approval of Government.* Lieutenant Tanner is reported to be a good Draftsman and practical Photographer, and, if appointed, will, I trust, be useful in this Establishment.

1ST, OR NORTHERN DIVISION, LOWER PROVINCES.

311. On the 1st December 1858, this Division, attached to the Bengal Government, re-commenced its operations for the final completion of the District of Rungpoor, Eastern Bengal, of which only 941 square miles remained unsurveyed. The execution of this area not being sufficient to occupy the whole Party during the entire Field Season, and having obtained the sanction of the Government of Bengal, I took advantage of the opportunity thus afforded to survey the adjoining District or Tributary Native State of Kooch Behar, and so fill up the gap that would otherwise have occurred in the Atlas of India, between Rungpoor and Gowalpara in Assam, and, if possible, to acquire some knowledge of the Bhootan country beyond, for filling up sheet No. 118. Owing to some misconceptions existing on the part of the Rajah of Kooch Behar, as to the nature of the operations to be carried on in his country, work was not commenced there until 1st March, but from that date all progressed as favorably and easily as in one of our own Districts until the end of May, when the approaching rains, which commence early under the Bhootan Hills, brought the Field work to a close.

312. 724 square miles of Topographical Survey of Kooch Behar was

* Has since been appointed by G. O. G. No. 565, dated the 10th October 1862.

Area Surveyed in 18 58-59.

thus added to the regular Village Survey of Rungpoor, giving a grand total of square miles 1,630 for the Season 1858-59.

313. During the prosecution of the Kooch Behar Field work, several attempts were made by the Revenue Surveyor to cross the Teesta River (part of the northern boundary of Kooch Behar,) into Bhootan, but so jealous was the Soobah of any one entering his territory, that he would not permit the Survey of the churs or islands on his side that river, or even to allow flags to be posted on the opposite bank. These features could only, therefore, be laid down by intersections from the Kooch Behar side. Presents and entreaties were tried, but all proved fruitless; a steady and consistent refusal was all that could be obtained from Bhootan, and nothing new is, therefore, known of the country beyond the border.

314. In the following Season of 1859-60 the field was again taken early in December as soon as the District was sufficiently healthy, and the records of the

Season 1859-60.

previous Season had been duly completed and lodged in my Office. The District of Rungpoor having been brought to a conclusion, after detaching a Party of Native Surveyors to complete the remaining portion of Kooch Behar, under the personal superintendence of his Senior Assistant, Mr. R. A. Smith, the Revenue Surveyor, Mr. Pemberton moved with the main body of his Party into the northern portion of the large District of Dinagepore, to co-operate with and assist the 2nd Division under Captain J. Sherwill, in view of working up from the south in the same District, bringing the Survey there to a conclusion as speedily as possible, the District being large and the greater portion of it very unhealthy and troublesome to deal with, in consequence of which it had been left so long untouched, and yet was required so emergently to fill up the blank on the Calcutta meridian in sheet No. 119 of the Indian Atlas. Having completed Kooch Behar early in the Season, the Assistant Surveyor with his Sub-Party was also enabled to move into Dinagepore in time to assist materially in the operations there.

315. The Establishment, in the absence of accommodation in the District under Survey, returned to Berhampore to

Area completed in 1859-60.

recess in May, having accomplished another excellent Season's out-turn, including 598 square miles of Topographical delineation in Kooch Behar, and 939 square miles and 1,048 villages in Dinagepore, giving a grand total for the year of square miles 1,537.

316. The small Tributary State of Kooch Behar, bounded on three sides by the British Districts of Goalpara and

Area of Kooch Behar.

Rungpoor, and on the remaining north side by Bhootan, is thus found to embrace an area of 1,322 square miles.

The Survey is based throughout on the Assam Longitudinal Series of the Great Trigonometrical Survey, which passed directly across from west to east.

317. In the middle of March this Party was suddenly deprived of the services of its Superintendent, who, owing to severe sickness, was obliged to retire to Darjeeling, where, after a painful and lingering illness, he died on the 21st April following. The temporary charge then devolved of necessity on Mr. R. Smith, the Senior Assistant, for the remainder of the Season.

Loss of the Revenue Surveyor.

318. Mr. Pemberton had served 25 years in this Department, during the last 12 years of which he had held independent charge of this Division, and invariably manifested a most laudable zeal and energy in prosecuting his laborious duties. In character he was most upright and amiable; he was greatly beloved by his subordinates, and was respected and esteemed by all the Department, and I sincerely regret the loss the Department has sustained in him.

319. In the following Season of 1860-61, I was enabled, under the sanction of Government, to supply the place of Mr. Pemberton by the appointment of Mr. R. B. Smart, the most highly qualified of the Revenue Survey Assistants, whose training and experience of 14 years in the 4th Division had proved him well fitted for the charge which he assumed early in October 1860. Under his orders, therefore, the Survey Parties left their Recess Quarters at Berhampore and again entered the Dinagepore District, taking up the Western Central portion in conjunction with the 2nd Division; the entire District was completed during this Season at an early date. Some Parties were then detached to re-survey about 60 square miles of Topographical Details on the Rivers Nagur and Mahanuddy, which bounded the country surveyed on the west; this was necessary to mark the change since the former Survey of Malda and Purneah, and so facilitate the connection of this the common boundary. No more work remained for them in the District, and it was much too late in the Season to depute the Party to open the Survey of Tipperah, the next District allotted to this Division, and far removed from the scene of the operations then on hand.

Change of Superintending Surveyor.

District under Survey in 1860-61.

320. The remaining portion of the Field Season of 1860-61 was therefore devoted to making a plan of the Station of Rajmehal, on a large scale, showing the changes that had taken place there since it had been fixed upon and converted into a principal Station of the Great East Indian Railway, and likewise to laying down the new line of road from Titalya through Purneah to the Caragola Ghaut on the Ganges River, where, in connection with the Railway Sta-

tion of Sahibgunge, a Steam Ferry had been established for the convenience of travellers and others along this the Darjeeling line of road. This Survey was duly effected and connected with the Rajmehal Civil Station Survey, both of which will materially enhance the value of the Map of the Dinagepore District.

321. The total area for this last Season was 753 square miles, with 1,352

Area effected in 1860-61.

Village Circuits, a very considerable falling off from that of other years; but this was quite exceptional and unavoidable, there being no other District within reach to take up.

322. An excellent check of the Revenue measurements and a proof of

Connection with the Great Triangulation.

their accuracy was afforded by their connection with the Calcutta Meridional Series Triangulation, which had previously traversed the Dinagepore District from south to north, terminating at the Sonakhoda base line in the Purneah District. In a distance of 164651.40 feet, or that from the Chendoria to the Sankrol Tower, the total error of the Revenue Survey was only 54.66 feet in defect, or 1.75 feet per mile; the errors upon the various sides of the Triangles met with are as follows, giving an average of 3.34 per mile in defect, and 1.20 per mile in excess measurements. These results are exceedingly good, and fully establish the value of the Dinagepore material for combination in the General Atlas.

DISTANCES.	From Revenue Survey.	From Trigonometrical Survey.	Error.	Error per mile.
	Feet.	Feet.	Feet.	Feet.
Chendoria to Ahtgara	50023.4	50012.0	+ 11.4	1.20
Ahtgara to Manglar	61444.7	61477.9	- 33.2	2.85
Manglar to Indur Narainpore	61262.7	61265.4	- 2.7	0.23
Manglar to Sankrol	53329.5	53359.7	- 30.2	2.98
Sankrol to Indur Narainpore	74138.6	74230.8	- 92.2	6.55
Average where the error is -	250175.5	250333.8	- 158.3	3.34
Ditto where the error is +	50023.4	50012.0	+ 11.4	1.20

323. The data, however, furnished for the comparison of the direct Trigonometrical distances on the Kooch Behar Topographical work, is not so satisfactory, which I attribute to the different style of the Survey and the want of due care on the part of the Assistant Surveyor. In the absence of the check usually afforded by the Village Boundary Angular Survey, additional checks were required, but the Assistant has neglected to record the angular observations connecting the Great Trigonometrical Survey Principal Stations with his Main Circuit points, as he ought to have done.

324. The general results for the three Seasons show a total area of 3,920

Area, Cost, and Rates.

square miles, with 2,788 Village Circuits, performed at a total cost of Rupees 96,232,

giving an average rate per square mile of Rupees 24-9, and per Village Circuit of Rupees 28-5 on the Village Survey area only. The mean average annual progress is 1,306 square miles, and the average size of the Village Circuits, after deducting the Topographical Survey area, is 596 acres.

Seasons.	Number of Villages.	Average size of Village Circuits.	Area Surveyed in Square Miles.	Total cost with Contingencies.		Average rate per Square Mile.		Average rate per Village Circuit.			
				Rs.	A. P.	Rs.	A. P.	Rs.	A. P.		
1858-59	388	1,495	1,630	32,210	0 0	19	12	0	59	5	0
1859-60	1,048	574	1,537	33,458	0 0	21	12	0	24	3	0
1860-61	1,352	356	753	30,564	0 0	40	10	0	22	10	0
Total	2,788	596	3,920	96,232	0 0	24	9	0	28	5	0

325. A list of the Maps and records furnished by this Division during

- 3 Index Maps, scale 4 miles = 1 inch.
 2 Pergunnah Maps, District Rungpoor, scale 1 mile = 1 inch.
 7 Ditto ditto ditto Dinagepore, " " = "
 2 Block Maps, ditto Kooch Behar, " " = "
 1 Plan Military Cantonment of Julpigoree, " 8 inch = 1 mile.
 1 Ditto Railway Station of Rajmehal and environs " " = "
 1 Ditto Route Survey of road from Titalya to Caragola Ghaut " " = "
 6 Volumes containing 164 Sheet Maps of Congregated Village Maps of above District " 4 inch = 1 mile.

Records.

- 6 Vols. of Village Registers and Traverses of above Districts.
 3 Vols., Main Circuit Traverses, ditto ditto.
 1 Vol. Traverses of Route Survey.

the three Seasons is given in the margin; all were well executed; the Maps were clear and faithful records of the country, and were finished with taste and care. I am well pleased with them.

326. The Thak-Bust or Demarcation Maps prepared by the Civil

Demarcation Maps.

Superintendent or Settlement Officer's Establishment, as a guide to the profess-

ional branch, are well spoken of, and their measurements agreed very fairly with those of the Professional Survey. The system of demarcation of village boundaries, as pursued of late years in the Lower Provinces, is exceedingly good and efficient, forming a sure and certain guide to the Surveyor. These Maps have all been made by scale and compass; the cost no doubt has been very heavy, but this part of the work has been well done.

327. In a perpetually settled Province like Behar and Bengal Proper,

Object of Revenue Survey in perpetually settled Districts.

the system of the internal measurement of small estates or fields required special dealing with. The existing method of

simply measuring them in the lump, by mere external demarcation, was introduced in 1850 by the Board of Revenue, Lower Provinces, with the sanction of the Government of that day, and is carried out strictly under the management and superintendence of the Civil Authorities. This Department has, therefore, no knowledge of this proceeding, and is in no way responsible for it. The only object of the Survey in the Lower Provinces being to ascertain

the number and area of all estates on the Rent Roll, and the relation of land to Revenue, the Board ruled, when transferring this part of the combined operations from the Professional to the Civil Branch, and taking it under their own jurisdiction, that it was unnecessary

Change of the system by Board of Revenue, Lower Provinces.

to define *fields* or under-tenures, in order to get at the smaller estates, as existing on the Collector's Rent Roll, and consequently the old long-established custom, as pursued by the Revenue Survey Department, for so many years, and throughout the entire North-Western Provinces, of giving the *field* or each cultivator's holding, was changed by the Board of Revenue, Lower Provinces, for a simple external demarcation of estates, without reference to fields or the ryots' (cultivators') sub-tenures.

328. In Lower Bengal, where the intricacy and number of estates is so

Objections to alteration of combined system of Revenue detail measurement of Estates.

great as to defy comprehension, and where interlaced and detached parcels of the same estate lie in all directions in the utmost confusion, and form the rule instead of the exception, the abolition of the *Field* measurement was, according to my humble judgment, a most fatal error, and my most strenuous objections were recorded at the time, but ineffectually, as far as preventing this serious measure being carried out. The "Khusrah," or detailed method of measurement of Fields, always pursued whilst the combined operations were both under the superintendence of the Revenue Surveyor, was thus cast aside and rejected as valueless, just at the very critical point where it was above all things needed.

329. The disputes which have taken place lately, originating in the

Validity as to objections against abolition of Field measurements.

Indigo question, and the Bill which was discussed in the Legislative Council in August 1861, for the registration of small holdings or sub-tenures (ryottee) involving the immediate possession of the soil for the purposes of cultivation (commonly called the Nij Jote and Khamar Lands Registration Bill,) amply show the want of a definition of each cultivator's (or ryot's) field. The intricacy of the tenures is so complicated, and the number of the estates so great, as, in the absence of the Field definition, to defy the identification of the lands, or to admit of accuracy of measurement where area is sought for.

330. For the purpose of ascertaining the true areas of these minor

Present system very defective as a means for arriving at areas.

estates, the external demarcation system has proved a lamentable failure, because the error involved by such a multiplicity of measurements and observations in the interior of a single village, with rude instruments and rude native hands untaught by Professional or competent

persons, is so out of all proportion, as to cause serious difficulty in regard to the residuary estate; it sometimes happening that the aggregate area of the component parcels of estates lying within a village has proved in excess of the total area of the same Village Circuit by the Professional Survey, a part greater than the whole, which is a mathematical absurdity. These parcels of different estates are found in hundreds and even thousands, scattered all over a village; it has, therefore, been the practice of the Civil Department to deduct these incorrect areas from the true and absolutely correct area of the whole village, and, if we take incorrect things from correct, the remainder must be incorrect, and therefore the whole of the residuary village estate areas obtained by such means must be wrong and quite unreliable for all purposes of civil or revenue administration.

331. The Field or each cultivator's holding should, therefore, undoubtedly have been defined and laid down by that ordinary native system, improved by English checks, which has so long been established, and is well known to zemindars or landed proprietors and village servants, not only with a view of perpetuating some sort of measurement record or Field book, by which alone a clue to such a mass of confusion as exists on the ground can be found, but likewise to prevent that enormous accumulation of error in the mensuration of estates, the areas of which are only susceptible of calculation on paper by the roughest means known to Surveyors. But all this has of late years been omitted by the present Revenue Survey, which has cost so many lakhs of Rupees, and which in a permanently settled Province falls entirely on the Government as unremunerative expenditure, except so far as its value is undoubted for the better government of the country. It is unnecessary in this place to enter further into this question, which has been fully laid before the Bengal Government, my object being solely to describe the nature and extent of the operations in each Province and District.

332. During the current Season of 1861-62 the whole Establishment, after completing and lodging all the
Current Season, 1861-62. Dinagepore work, moved into the District of Tipperah, taking up the Survey east of the Megna River, adjoining the previously surveyed Districts of Dacca and Sylhet, succeeded in completing the Survey of 1,596 villages, comprising approximately 1,256 square miles. This, considering the move made by the Establishment from Berhampore to Tipperah, is creditable to all; indeed, under any circumstances, it would have been an excellent out-turn. The portion of the new District thus taken up was bounded on the west and east by the Districts of Dacca, Mymensing, and Sylhet, and Independent Tipperah, respectively, and on the south by the public road leading from Daoodkandee on the River Megna to Comillah, the Civil Station. An excellent and perfect connection was formed with the Dacca District Survey from the triple junction of the Dacca, Mymensing, and Tipperah Districts to Daoodkandee, along a series of stations fixed by the Surveyor of the 2nd Division,

during his operations in Dacca, the previous Season. It also amalgamates well with the Sylhet District, already surveyed, at that particular point.

333. The southern half of the Tipperah District will form the labors of this Party in 1862-63. They will then

Proposed employment next Season.

push on southwards, taking up the Districts of Bullooh or Noacolly in succession, finally completing the last of the eastern Districts of Bengal in this direction, two or three Seasons hence, on the seaboard of the Bay of Bengal between Chittagong and the large Island of Deccan Shahbajpore. This part of Bengal Proper is so little known, that a Geographical Map of the commonest pretensions to accuracy could not be constructed; the labors of the next few years will, therefore, completely alter our knowledge of this part of the British Possessions. The Great Trigonometrical Survey has not yet reached the Tipperah District, but the Gowhatty Series may be expected to do so next Season, and will provide amply for all wants.

334. The Assistants were well reported of generally through the three Seasons under review. The Establishment is one of the oldest in the Department, and has performed a vast extent of work in Behar and Bengal for very many years past. The particular merits and promotions of the Assistants have been detailed in the Bengal Reports annually.

335. Mr. Smart, having had charge of this Survey for two Field Seasons, has given me great satisfaction; he promises to be as efficient at the head of an Establishment as he had already proved himself in the various grades through which he has passed to attain his present rank. He is a very zealous and pains-taking Officer, and I have had much pleasure in obtaining the sanction of Government of Bengal to his being permanently appointed to the charge of this Division; he was accordingly promoted to the grade of full Revenue Surveyor as per margin.

G. O. No. 1649, dated 27th June 1862.

2ND, OR SOUTHERN DIVISION, LOWER PROVINCES.

336. In the District of Dinagepore, on which this Division was engaged

District taken up in 1858-59.

Lieutenant-Colonel W. S. Sherwill, Revenue Surveyor, on deputation.
 Captain J. L. Sherwill, Officiating Revenue Surveyor.

Assistants.

Mr. W. Ivey... .. 1st Class.
 „ J. Vaughan resigned 15th September 1860.

Sub-Assistants.

Mr. A. Hyde... .. 1st Class.
 „ W. Sinclair... .. Ditto.
 „ G. Hyde resigned 1st May 1860.
 „ G. E. Nash... .. 3rd Class.

40 Native Surveyors.

General average rate per square mile, Rs. 47-1-0.

prior to the Season 1858-59, there remained for Survey upwards of 4,000 square miles. The country, as before mentioned, is notoriously unhealthy, and was consequently dreaded by the whole of the Native Establishment, many of whom failed to make their appearance for the Field Season of 1858-59; whilst of those who did return to their task, many Surveyors and Measurers were still suffering from the debilitating effects of fever and dysentery

contracted during the previous year's operations. Under these difficulties, the Party again renewed the work in the Dinagepore District, and prosecuted it up to so late a period as the middle of June, when they were fairly driven from the field by the rains. Previous to the year 1857, when Dinagepore was commenced, this Party was employed on the several Districts of 24-Pergunnahs, Nuddeah and Burdwan, all of which were completed under its former able Superintendent, Major Ralph Smyth, whose resignation of the service in 1858, after a very long and admirable service in the Department, I so greatly regretted.

337. During that period they accomplished the very large number of 2,004 villages, which, small even for Bengal, averaging only 211 acres, yielded the small area of only 662 square miles. Owing to the sickness of Captain Row, (the Officiating Revenue Surveyor of the former Season,) necessitating his return to Europe on Medical Certificate, Captain James Sherwill, an experienced Assistant of one of the Punjab Surveys, had come down by orders of the Government of India, cited marginally, to take charge, which he accordingly did on the 16th December 1858. To his untiring industry and determination I attribute the success that attended even the moderate results of the labors of this Party.

338. Retiring to Darjeeling to bring up the computations and mapping, this Party descended from the hills again the following November 1859, when recruited in health, and with extra hands from the North-West, the new Season of 1859-60 was opened in continuation of the former year's labors; they completed 2,454 villages and 873 square miles of the south-east portion of the same District.

339. The country was of much the same character as before, swampy and low, interspersed with jungle, through which the lines had to be cut previous to measurement, and sickness again retarded the more rapid advance of the Survey. But the out-turn was decidedly favorable in comparison with the former year, yielding 211 square miles and 450 villages in excess of that of the previous Season. The trouble and delay that attends the measurement of such small villages as were met with in this District, can scarcely be appreciated by others than practical men. Their average size, in this District, for the past two Seasons was only 219 acres, or about one-third of a square mile, one of which is considered of fair average size to afford a good return of area.

340. I have already mentioned that my anxiety to get the Survey of this unhealthy district finished had led to the introduction there of another Establish-

Area surveyed in 1860-61.

ment, that of the 1st Division already reported on. The joint efforts of these two Parties left only 1,579 square miles for them to complete it in 1860-61. Accordingly, in November 1860, this Party again took the field, and after a short Season of four months, left about the same time as No. 1 Division, having completed the allotted portion which comprised 826 square miles, with 1,502 villages, including the Native town and Civil Station of Dinagepore, which has been mapped on the large scale of 12 inches equal to 1 mile.

341. This brought the Survey of the District of Dinagepore to a conclusion after four Seasons' operations, the total area of which is 4,586 square miles,

Completed District.

the mean average rate per square mile Rupees 44, and the rate per Village Circuit Rupees 26-7, as given in detail in Appendix Table (H.). These rates, forming the result of two Surveyors' labors, are higher than usual, but the villages were so unusually small, the sickness and difficulty of surveying were greater here than in other districts, and fully account for the increased cost.

342. An excellent and complete connection was effected with the 1st Division along the line of their common

Connection with adjoining District Surveys.

boundary, and in like manner along the Kurotya River in Rungpoor, where many old Survey Stations were identified, taken up, and incorporated with the work of this Division. The connection, therefore, of the Dinagepore District with those of the adjoining ones of Purneah and Maldah on the west, of Rajshahye and Bograh to the south, and of Rungpoor to the east, is complete and satisfactory.

343. Due connection was also made with 7 Stations of the Calcutta Meridional Series of the Great Trigonometrical Survey Triangulation passing directly

Connection with the Great Triangulation.

through the western portion of the District, and met with in 1860-61. The results obtained from comparison of the value of the sides by Revenue Survey calculations with those of the Great Trigonometrical Survey, prove the excellence of the measurements made by the former, and are most satisfactory, showing an average error of only 3 feet per mile.

Numbers.	Names of G. T. Stations.	From G. T. Survey.	From Revenue Survey.	Error of Revenue Survey.	Error per mile.
		Feet.	Feet.	Feet.	Feet.
1.	Chendoria to Ramchunderpore ...	61397·3	61343·0	54·3	- 4·67
2.	Ahatgarah to Chendoria ...	50012·0	50018·7	6·7	+ 0·70
3.	„ to Ramchunderpore ...	62972·8	62933·0	39·8	- 3·34
4.	„ to Chundol ...	61410·6	61389·7	20·9	- 1·79
5.	Chundol to Ramchunderpore ...	54917·5	54892·3	25·2	- 2·42
6.	Ramchunderpore to Dinagepore (Mr. Grant's house) ...	37014·0	36985·3	28·7	- 4·09
7.	Dinagepore, Mr. Grant's house, to Chundol	45157·0	45141·8	15·2	- 1·77
	Average where the error is - ...	322869·2	322685·1	184·1	- 3·01
	Ditto where the error is + ...	50012·0	50018·7	6·7	+ 0·70

Total area, cost, and rates for three Seasons.

344. The area, cost, and rates of the work for the three Seasons under review, including contingencies, are as follows :—

Seasons.	Number of Villages.	Average size of Village Circuits.	Area Surveyed in Square Miles.	Total cost with Contingencies.	Average rate per Square Mile.	Average rate per Village Circuit.
1858-59	2,004	211	662	36,167 0 0	54 10 0	18 0 0
1859-60	2,454	227	873	38,055 0 0	43 9 0	15 8 0
1860-61	1,502	352	826	36,841 0 0	44 9 0	24 8 0
Total	5,960	253	2,361	1,11,063 0 0	47 1 0	27 1 0

It will be observed that although the mileage rate is very high, owing to the various drawbacks above described, and much in excess of other Surveys, yet the Village Circuit average is low, which shows the extra labor involved in this very intricate District. Major Sherwill has had great difficulties to contend with, and an Establishment deteriorated by secessions and ill health. It is impossible for all Surveyors to enjoy the same advantages of ground and other circumstances, but, with equal chances, I have no doubt this Division will come up to the others in the amount of area, as it already does in the quality of its work. Major Sherwill is an excellent Officer in every respect, and I approve highly of the manner in which his duties are performed.

345. After completing the mapping and records at Darjeeling as before, the Lieutenant-Governor of Bengal, then

Work performed in Current Season of 1861-62.

at that place, called for the Survey of certain Grants and Tea allotments in the hills, supposed to be only of trifling extent; a small Party of Native Surveyors, under charge of his Senior Assistant, Mr. Ivey, for the above purpose, was left behind, whilst the bulk of the Establishment proceeded to take up new ground in District Maunbhoom of the Chota Nagpore Division.

346. This District is situated immediately west of Burdwan and Bancoorah and south of Beerbhoom; the portion prepared for Survey was that lying between the Damoodah and Burakur Rivers, on either side of the Great Trunk Road between Raneegunge and the Parasnath Hill. The demarcations were well prepared by Captain G. H. Thompson, Revenue Surveyor of the adjoining District of Hazareebaugh, to whom the Civil duties of the Division have been entrusted by the Board of Revenue, but who had very short notice given him of the approach of another Party. This District is hilly and jungly, and presented many natural difficulties to the rapid progress of a Village Circuit Survey, added to which, the people of the District gave no little trouble at one time, and obstructed proceedings considerably; but owing to the judicious steps taken by the Commissioner, this did not last very long, and the Revenue

Surveyor after considerable anxiety closed a very arduous Season's work at the end of May, after accomplishing with his reduced Establishment an approximate area of 836 square miles included in 733 villages.

347. In addition to this, the detached Party have been employed on the Darjeeling Tea allotments the whole Season, and are likely to find similar work for some time to come. The results of the present Season's labors there are not yet known, but the work is represented as very tedious and difficult, and, if prolonged, must be provided for by a separate Budget.

348. This new Survey of Maunbhoom depends on very complete and extensive principal triangulation of the Calcutta Great Longitudinal Series, which covers the entire District in the most convenient manner, and will ensure the perfect adjustment of the materials with the Indian Atlas Sheet, Nos. 105 and 114. The District is very hilly towards the south, which will necessitate the breaking up of the old triangulation into minor triangles, and the ground is convenient for this purpose.

349. The Demarcation Maps were generally well reported of, and always supplied in advance of the Professional Survey, and the disputes were all adjusted ; when this is the case no interruption in the Professional Survey takes place.

350. The Maps by this Division have been neatly and creditably executed ; they show the topography of the country distinctly, and are acceptable and good records. The Volumes of calculations and areas are also neatly and carefully got up. A list of Maps and records is given marginally. In Season 1860-61 the Revenue Surveyor, in addition to

- 3 Index Maps of Season's operations.
- 8 Main Circuit Maps of M. C. Nos. 4 to 12.
- 3 Vols. (Atlas) of Congregated Village Plans.
- 3 Vols. Main Circuit Traverses.
- 9 Vols. of Village Registers and Traverses.
- 1 Plan of Town and Station of Dinagepore.

Extra Records.

- 97 Sheets of Congregated Village Maps, with Alphabetical Index bound in one Volume, scale 1 mile = 4 inches.
- 1 General Map of all lands of Bograh, outlying in Dinagepore, comprising an area of 573-59 square miles, scale 1 mile = 1 inch.
- 1 Index Map, scale 1 mile = $\frac{1}{4}$ inch.

his legitimate work, prepared the extra Maps noted for the Collector of Bograh, whose jurisdiction extended over a large portion of Dinagepore, and who consequently desired to have these records to complete those of his Collectorate. As both Collectors of Dinagepore and Bograh now possess these manuscript records, the settlement of any confusion that may arise from the intermixture of lands will, I trust, be greatly facilitated.

351. I personally inspected Major Sherwill's Office twice during the past Field Season at his Camp in Maunbhoom, first on the 11th of January at Rajgunge,

on my journey up, and again on the 15th April at Fitkooree, on my return. The programme of operations for the Season was fully discussed and agreed on, and all matters connected with the work in hand appeared to me to be well cared for under the Revenue Surveyor's judicious management; whilst his Office was in excellent order. Major Sherwill is an Officer of good business habits, and judgment, and has my entire confidence.

352. The District Map of Dinagore, so long wanting to fill up the gap in sheets 118 and 119, where the Triangulation had been completed for many years previously, has now been compiled, and a preliminary edition lithographed, which will, I trust, supply a desideratum long felt by the Local Officers. The Bograh District, being so intimately mixed up with Dinagore, has been embodied on the same sheet, and forms a very convenient reference. The new road from Titalyah to Carragola Ghaut on the Ganges, together with the Railway Station of Rajmehal, has been added to the Map, the final edition of which has also been constructed and is now ready for dispatch to England. The one inch Pergunnah Maps are also in course of lithography, and will be issued as fast as printed.

353. Lieutenant Donald Macdonald, of the late 19th Native Infantry, now of the Staff Corps, was appointed an Assistant Surveyor on this Establishment by the orders of the Government of Bengal, cited in the margin, and he joined his appointment on the 29th idem, since when he has been under the able tuition of Major Sherwill, and has given satisfaction by his attention to his duties.

3RD, OR EASTERN DIVISION, LOWER PROVINCES.

354. The operations on which this Establishment have for many years past been employed have been in the Eastern Districts of Mymensing and Dacca, under Mr. N. T. Davey, Revenue Surveyor in charge, and the Survey of the latter District was renewed in December 1858. This Party was originally one of the old North-West Province ones, and brought down from Tirhoot under the late Mr. Alexander Wyatt, an old and experienced Surveyor; and Mymensing was commenced on in Season 1851-52. Owing to certain unforeseen circumstances in connection with the Civil Branch of the Survey, the Surveyor, on taking the field this Season, found that, instead

N. T. Davey, Esq., Revenue Surveyor.

Assistants.

- Mr. G. S. Swiney 2nd Class.
- " J. K. Moran resigned. 3rd Class.
- " P. Agabeg

Sub-Assistants.

- Mr. W. H. Beatson resigned.
- " R. Barclay 2nd Class.
- " S. M. Smiley 3rd Class.
- " G. C. Bolst Draftsman.

40 Native Surveyors.
General average rate per square mile, Rs. 36 3 0.

of a full Season's work being ready for his Party, only 730 square miles had been demarcated. Though most anxious to procure more, he failed to do so, and his Establishment having accordingly finished this small area, he withdrew them from the field in May, after a short Season of $4\frac{1}{2}$ months, instead of 6 as usual.

355. Attendant on this deficient area, were, as will be seen hereafter, the necessary accompanying high rates of

Small Return.

Field duties in full strength and in most efficient working condition, and was fully capable of performing 1,100 square miles. Obligated to keep up their carefully trained hands, ample employment must be provided for Revenue Survey Parties, or the rates must invariably and uncontrollably rise in an inverse proportion to the quantity or area of ground demarcated and adjusted free of disputes.

356. The portion surveyed contained 1,455 villages, lying chiefly between

Large number of villages surveyed.

the two Rivers Dallasery and Ganges or Pudda, the latter dividing it from the District of Furreedpore, trending east and south of the City of Dacca, which is situated on the north bank of the Booree-gunga River. The tract is a very low and swampy one, and, except on the margin of the rivers, is inundated the greater part of the year.

357. In the ensuing Season of 1859-60 the Revenue Surveyor again took the field, but under very different

Season 1859-60.

auspices. By the very praiseworthy endeavours of the Civil Superintendent, an area of 1,450 square miles, in 2,363 Village Circuits, had been demarcated, in full completion of the Dacca District.

Area and number of villages.

358. There being a possibility, however, of the non-accomplishment of so large an area by one Party, and being

Division of labor.

desirous of ensuring the Survey of the whole in one year, I called on Captain Gastrell, of the 4th Division, to take up and survey that portion conterminous with his own proper work in the Furreedpore and Backergunge Districts, and separated from the rest of the Dacca District by the great River Ganges, which, since it was mapped by Rennel in 1769, had cut across and completely altered the whole appearance of the country.

359. By these means the much-wished-for termination of the Dacca District Survey was secured. Captain

District Dacca completed.

Gastrell undertook 389 square miles and 455 villages, leaving Mr. Davey 1,062 square miles and 1,908 villages, besides 64 miles of the Megna River running between Dacca and Tipperah Districts.

360. The whole of this country being within the influence of the great floods of the Megna is submerged annually during the rains ; owing to this, most of the small mud demarcation pillars had been swept away, and the want of them delayed proceedings exceedingly ; notwithstanding this evil, which was remedied by Mr. Morris, Civil Superintendent, as far as lay in his power, the whole area was effected in good time and after a full Survey term of $6\frac{1}{2}$ months in the field ; the Party returning for their mapping and calculations to Dacca as before.

361. Subsequently, during the Recess, many village boundaries of the old Survey of Mymensing, which had been most injudiciously left unsettled by the Civil Branch, when operations had been going on there, required adjustments of disputes, which necessarily involved alteration of areas and correction of the Professional records ; so great was the litigation in this District, and so often were the village boundary disputes taken up and decided after Survey, contrary to all rule and principle, that the records were being continually altered. It was found practically impossible to perform the work satisfactorily without professional aid ; Mr. Moran, Sub-Assistant Revenue Surveyor, was therefore deputed to go first to the Head Quarters of the Districts to complete the Collectorate records, and subsequently to perform the same duties for the original records of this Office, so securing agreement between the two.

362. He had scarcely brought this work to a satisfactory conclusion, and returned to his Survey at Dacca, than a fresh call for help was made, to correct another batch of discrepant Mymensing boundaries and village areas. By this time, however, the near approach of the Field Season of 1860-61 precluded the possibility of any of the European Assistants being spared for such duty ; a good Native Surveyor was therefore deputed to the task, which he carried out, but the whole duty entailed serious inconvenience.

363. The opportunity of this Native Surveyor's deputation was taken to adjust and mark off the northern boundary of Pergunnah Sheyrpoor, of Mymensing District, along the foot of the Garrow Hills, according to its definition during the Survey of the District, as approved by the Board of Revenue, Lower Provinces, and confirmed by Government. If, therefore, the Collector seized the opportunity to erect masonry pillars or platforms, as strongly insisted on by myself, no further disputes or necessity for re-survey can arise there. The whole of this line of boundary gave great trouble ; it has been fixed after great enquiry and adjudication by the most competent Officers, and it is to be hoped it may not be again disturbed.

364. It is in instances like the last, that the error of not erecting pillars or platforms of masonry during the course of demarcations or of Survey is

Want of permanent marks.

clearly shown, and the extra expense of not doing so demonstrated. The expense of pillars is the same in both cases, but the additional cost of litigation from the want of them, and subsequently of a second Survey to fix them, might and would have been saved had they been erected at the time of Survey.

365. The important and obvious use of these permanent marks has often been urged by myself, but I regret to say, most unsuccessfully in the Lower Provinces, where they are most wanted, and where enormous sums are expended on the Survey, almost for the entire benefit of the landowners, without the prospect of any increased assessment, which the results of the Survey would undoubtedly afford to the Government, if any revision of the settlement could be made. The Surveys pass on, and except the few marks Surveyors erect for purely professional purposes, on Azimuth and connecting stations, and sundry temples and brick buildings selected by them as fixed stations, to permit of connection with the Great Trigonometrical Survey operations hereafter in districts hitherto untraversed by Triangulation, nothing of a permanent nature marks the course of the Survey, which would enable a non-professional man to go to the field, and, map in hand, relay or identify a boundary.

366. Simultaneous with the Dacca Survey, north of the Ganges, was that of Furreedpore to the south. This afforded an excellent opportunity for forming a complete junction of the various Surveys of Bengal. Mr. Davey's 3rd Division Party had come down south from Mymensing, along the Jumoona River, parallel to that of Mr. Pemberton (1st Division) in Rajshahye and Pubna, interchanging common stations the whole distance; whilst, on the other side, Captain Gastrell (4th Division), after joining with Major Smyth (2nd Division) in Jessore, on the common boundary of Nuddeah and 24-Pergunnahs, worked eastwardly, connecting *en route* with Mr. Pemberton (1st Division) along the Pubnah boundary, until he met with Mr. Davey (3rd Division) on the Ganges or Pudda, in the Dacca District.

367. Throughout the course of the Ganges or Pudda, as it is here called, from Jaffergunj near its junction with the Jumoona River to the Megna, 68 miles lower down, and again 14 miles further south along the joint streams, Ganges and Megna, the two Surveyors, acting in concert, and with excellent 12 inch Theodolites, effected a most perfect and complete junction, concluding their joint operations by connecting the Bullooh District, on the east of the River Megna, and Backergunge on the west. Here they separated, and Mr. Davey proceeded north for 64 miles up the Megna, and fixed points for the future identification and conjunction of the operations of the Tipperah Survey Party with his own in Dacca.

368. The District of Dacca contains a gross area, including rivers, of square miles 3,375. The cost comes to Rupees 1,07,373, and the average rate per square mile Rupees 31-13-0 and per Village Circuit Rupees 17-11-0.

Area and cost of Dacca District completed Survey.

369. There being no further employment in the Dacca District, Mr. Davey in December 1860, moved his Establishment into the adjoining one of Sylhet, and opened Survey operations there, as soon as the country was sufficiently dry; conterminous with the Districts of Mymensing and Tipperah on the west, Sylhet is bounded on the north by the Cossyah Hills and Jynteah, on the east by Cachar, and on the south by the territory of Independent Tipperah.

Season 1860-61.

370. The trijunction point of the Districts of Sylhet, Tipperah, and Mymensing, on which a masonry pillar had been erected during the Survey of the latter District, was selected for the origin of the Survey. Lapse of time, and the heavy rains of this part of the country, had obliterated all other traces of the former work. But a careful re-survey of the old boundary corresponded well with the previous definition. One other masonry pillar remains, however, to be taken up hereafter in the extreme north, and will suffice for comparison of numerical results.

371. The portion marked off for Survey comprised the south-western part of the District; even for Bengal this tract is considered unusually low and swampy; it is recorded on Rennel's old Atlas as the "low country." Bounded by hills on the north, south, and east, it forms a great drainage basin abounding in beels or marshes which greatly impeded the progress of the Survey, not only on account of the difficulty experienced in chaining and fixing the instruments steadily, but also apparently of preserving the landmarks on such a soil. In the rainy season the whole country becomes a perfect sea, the entire traffic and communication being of course by boats. The village sites are raised on mounds, from which even the cattle cannot move, but are fed on grass cut under water and brought into the villages.

Nature of country prepared for Survey.

372. Notwithstanding the difficulties he had to encounter, and being deprived of the services of one of his Assistants, Mr. Moran, who, with two Native Surveyors and their Parties, was deputed to accompany the Force, which, in the cold weather of 1860, under the command of Captain Raban, penetrated Chittagong into the Hills, Mr. Davey did not quit the field before accomplishing a very good out-turn of 935 square miles in no less than 1,998 Village Circuits.

Area.

373. Connected with the above Survey, Mr. Davey, aided by one Native Surveyor's Party, and in conjunction with the Superintendent of the Civil Branch of the Survey, succeeded, after great difficulty and detention, in personally laying down a part of the boundary between the Sylhet District and Independent Tipperah. This work, owing to the tacit opposition of the Rajah, and to his people failing to aid, as they ought to have done, took six weeks, and might, says the Surveyor, have been easily performed, under favorable circumstances, in as many days. Great credit was due to Mr. Davey for his steady perseverance in this important duty, though suffering from fever all the time he was so employed. His zeal and energy displayed on this duty met with the acknowledgment of the Government of Bengal.

374. No information of geographical interest was, however, obtained beyond the boundary line, but as the Government have directed the Rajah's country to be entirely surveyed Topographically, and several Survey Parties are prepared to act simultaneously in that quarter next Season, I trust we shall soon possess a good knowledge of this hitherto *terra incognita*. The Rajah has likewise expressed his consent to the measure.

375. In consequence of the Military expedition into the Kookee Hills, east of Chittagong, under Major Raban, in February and March 1861, advantage was taken of it to endeavour to obtain some geographical information, and Mr. J. K. Moran, a very intelligent Assistant, attached to the 3rd Division, was deputed to accompany the Force and make a route Survey along the line of march. The tract of country which fell under the Assistant Surveyor's observation, and of which he managed to make a very fair Map, lies between the parallels of 22° 26' and 23° 05' North Latitude, and 92° to 93° East Longitude. Five ranges of hills, as specified marginally, running from south-east to north-west, and varying from 250 to 2,000 feet high, with two other ranges, Loong Sin, inhabited by Ruttun Pooeah's tribe, and further east, the great Howlong range, estimated at 4,000 feet high, occupy this space. The four chief rivers, also marginally enumerated, can be used throughout the year for boats of small burthen, and form a marked feature in these hills. A full account of these operations are published in the supplement to the *Government Gazette*, No. 53, dated the 17th August 1861, and the following extracts show the value and importance placed on the results of Mr. Moran's labors:—

EXTRACT.

"As the expedition against the Kookee tribes in the Chittagong Frontier has now, as far as I am concerned, come to an end, I think it right to bring specially to your notice the services rendered by Mr. Moran, of the Survey Department, attached to the expedition.

Dhee Poom Range.

Saichul Range.

Burkul Range.

Subalong and Bang Rung Kool Range.

Secta Ghaut Range.

Kurnafoolce.

Chingree.

Kasalong.

Myanee.

“During our advance into the heart of the hostile country, the necessary rapidity of our movements, and the difficulty of the country itself, rendered it impossible to carry on any Survey in regular form, but all that was possible was, I believe, accomplished by Mr. Moran, who, on every occasion, showed himself most anxious to carry out the views under which he was sent to accompany the expedition.

“Subsequently Mr. Moran undertook a Survey of a considerable portion of the Kasalong River and of other tributaries of the Kurnafoolee, in a country hitherto quite unexplored, and I feel no doubt that you will be fully satisfied with the results which he has been able to attain under very difficult circumstances and with limited means.

“In my opinion, speaking of course quite unprofessionally, Mr. Moran has shown himself exceedingly well fitted for Survey operations in a very difficult country, and under exceptional and difficult circumstances.”

E X T R A C T.

“I am desired to state that the Lieutenant-Governor has perused Mr. Moran's Report with much interest, and considers that the gentleman has performed the duty with which he was entrusted in a highly satisfactory and creditable manner.”

The Map furnished on the scale of two miles = 1 inch will be duly lithographed and issued for general information. It will add materially to the geography of these hitherto totally unknown regions.

376. The Districts of Dacca and Sylhet not having yet been included in the Triangulation of the Great Trigonometrical Survey of India, no means of rigidly testing the actual value of the foregoing results has been afforded. But a Meridional Series of Triangulation, emanating from the Assam Longitudinal Series at Gowhatty, and passing across the Cossyah Hills near Cherra Poonjee, is now being carried southwards through the Sylhet District, and during the ensuing Season will traverse the area above alluded to, when the Trigonometrical Surveyor will be able to incorporate the many points fixed by the Revenue Surveyor with his own work, and show unerringly the exact differences in absolute measurements.

377. The total area rendered by this Revenue Survey Party during the three Seasons, 1858-61, equalled 2,728 square miles, with no less than 5,481 Village Circuits, all of purely Revenue Village Detail Survey of intricate character; the small average size of the Village Circuit, only 331 acres, being a great bar to rapid progress. In its performance Rupees 98,768-2-10 were expended, including all charges, permanent and contingent, of which the latter amounted to 4,901-12-0. This gives Rupees 36-3-2 as the rate per square mile and 18-6-4 per Village Circuit as the average for the whole period; the annexed Table showing the results and comparative progress of each Season :—

SEASONS.	Number of Villages.	Average size of Village Circuits.	Area surveyed in Square Miles.	Total cost with Contingencies.	Average rate per Square Mile.	Average rate per Village Circuit.
1858-59	1,455	321	731	30,975 0 0	42 6 0	22 1 0
1859-60	1,908	355	1,062	32,465 0 0	30 9 0	16 15 0
1860-61	1,998	299	935	35,338 0 0	37 13 0	17 11 0
Total ...	5,361	325	2,728	98,768 0 0	36 3 0	18 6 0

378. The Maps and other Records to the extent marginally noted have

Maps and Records.

Maps and Plans.

- 3 Index Maps, scale 4 miles = 1 inch.
 9 Pergunnah ditto ,, 1 ,, = 1 ,,
 3 Vols. Village ,, 1 ,, = 1 ,,
 6 Plans of City and Cantonments of } Vari-
 Dacca, and of sundry Govern- } ous large
 ment buildings and lands ... } scales.

Records

- 3 Vols. of Main Circuit Traverse Computations.

Still Due.

- Vols. of Village Register and Traverse Calculations for 1858-61.

been duly rendered by the Revenue Surveyor, all in duplicate, for this Office, and for the Collectors of the different Districts. The plans of Government lands and buildings and of the Cantonments and City of Dacca were exceedingly well got up, and reflect great credit on all concerned in their production. The other Maps are good and useful documents, full of valuable information, and as to Topographical details, printing, and general finish, are fair average specimens; those of the last Season manifesting a decided improvement over the Maps of former years.

379. The general Maps of the Dacca District, on the $\frac{1}{4}$ inch to the mile scale, has been reduced and compiled from the above materials, and a preliminary edition of the same lithographed in this Office and issued for general use and sale. The Furreedpore District has been added to it, and the whole forms a most valuable addition to the geographical knowledge previously extant of this peculiar portion of Eastern Bengal, where the great rivers cause such wonderful changes. The final Map on the same scale, also compiled in this Office, and which is a very beautiful one, has been transmitted to England; it will supply portions of Atlas sheets Nos. 120 and 121, and also fill up a good space in No. 126. The one inch Pergunnah or Main Circuit Maps are likewise in course of lithography, and several of them already done.

380. The correct adjustment of the Village Registers and alphabetical lists, especially in the Eastern Districts,

Intricate Records.

where the intricate intermixture of the most minute estates baffles all description, presents difficulties unknown in any other parts of India which have hitherto come under Survey, and much praise is due to Revenue Surveyors and Civil Officers for the patience and labor they have all devoted, and are still giving, to this duty. In these mazes of separate small holdings, thousands of which in Sylhet pay only a Rupee per annum as the Government Revenue, the want of the Khusreh or detail

measurement of Fields will be felt severely eventually, and as I see them becoming more complicated as we advance eastwardly, the cause for regret as to the introduction of the present bare external demarcation system, and the abandonment of the field definition (or Khusreh) as previously described, is the greater.

381. During the present Season this Party, again weakened by the deputation of Mr. Moran, Assistant Revenue Surveyor, on special duty on the Chittagong Frontier, under the orders of Government of Bengal, proceeded with the Survey of the western portion of the Sylhet District, abutting on Mymensing, and effected an approximate area of 1,170 square miles with 1,223 Village Circuits, an excellent out-turn for such peculiar ground, and in every way satisfactory.

382. It was deemed essential by the Bengal Government that a Survey of the Fenny River, in connection with the route Survey, executed in the Chittagong Hills the previous year, should be carried out, and Mr. Moran, Assistant Revenue Surveyor, was consequently again detached with a small Party, consisting of two Native Surveyors, to effect the object the Government had in view of selecting suitable posts within the Hill Territory for Police Guards. With Mr. Moran's intimate knowledge of this difficult and almost untrodden country, it was expected and hoped he would be able to penetrate up the Fenny River, and afford the most material assistance to the Commissioner in regulating his Police arrangements amongst Kookees and other half savage hill tribes on that Frontier, only recently subdued by the campaign so ably conducted by Captain Raban; but I regret much to be obliged to record that the Assistant Surveyor, neglectful of the Government interests and of his first and bounden duty, left his post in opposition to my earnest remonstrance, and quitted India for Europe in the month of January last, without having effected any portion of the Survey for which he was deputed, and I have never heard of him since.

383. Mr. Moran had justly obtained for himself a reputation in the Department, and was in every way an excellent Assistant and capital public servant. He simply left a letter behind him to inform me that private affairs of the most pressing and painful nature compelled him reluctantly to take the steps he had done. I much regret his loss, and the more so as, by ordinary action, he might have obtained leave of absence at a fitting time, to which he was fully entitled.

384. Owing to the numerous and pressing demands made to the Government of Bengal, for the possession of lands for the cultivation of the Tea plantations Survey. in the District of Cachar by European

capitalists, the Hon'ble the Lieutenant-Governor, fully sensible of the importance of this newly-discovered source of prosperity, and anxious to render the acquisition of land, for this purpose, easy and certain, at the same time preserving intact the rights of existing proprietors in the soil, strongly urged me to provide means for a complete Survey during the ensuing Season. It has consequently been determined, although at the sacrifice of continuous and systematic progress, temporarily to divert the services of this entire Establishment from Sylhet to the District of Cachar, the original Survey of which, upwards of 20 years ago, embraced but little of the existing Tea localities.

385. The area of Cachar is not large; the former Survey records but 246 villages and about 650 square miles, and including all the unsurveyed and uncleared Forests, probably not more than 1,200 square miles. Mr. Davey, who will employ the whole of his Establishment in furtherance of the object contemplated, will therefore, I hope, be able to accomplish the Survey in one Season, and the necessary Maps and data will be forthcoming by the close of the year 1863.

386. It is intended and ordered that this Survey be most perfect in all its details. All existing villages, grants, lots, or holdings, are to be laid down on the scale of 20 chains to the inch, and marked permanently by masonry pillars. The waste and unoccupied lands to be marked off in convenient blocks, ready to be taken up by intending purchasers, and every means will be adopted to make this work a standard and finished one.

387. On the completion of Cachar, and progressing westwards, the Survey will re-enter Sylhet on its eastern boundary, and so in time rejoin on the old work in that District, where it has now been unfortunately broken off; more than one-half of the Sylhet District remains to be taken up. Here also, it is believed, many localities will be found in which the culture of Tea is carried on or well adapted for the same; all of which will come under Survey, and be mapped for general public use as speedily as possible.

Superintending Officer. 388. Mr. Davey's exertions throughout have been well directed, and I had much pleasure in marking my appreciation of them and obtaining the sanction of the Bengal Government, as per margin, to his being permanently appointed to the charge of this Division, in the full grade of Revenue Surveyor.

G. O. B. G. No. 3000, dated 31st May 1860.

389. The services of the Assistants of this Division have been regularly noticed in the Annual Report to the Bengal Government. It will suffice to

Assistants.

mention that they, as well as the Native Surveyors, worked assiduously and well, and gave satisfaction; slight promotion for the most deserving of them having, from time to time, been accorded by the Local Government.

4TH, OR WESTERN DIVISION, LOWER PROVINCES.

390. This Establishment is one of the oldest and best in India, composed

Major J. E. Gastrell, Revenue Surveyor.

Assistants.

Mr. R. B. Smart, transferred 1st } Division, 6th October 1860 ... }	1st Class.
" C. Bradley, died 27th Septem- } ber 1860 }	2nd Class.
" A. D. Smart }	2nd Class.

Sub-Assistants.

Baboo Lallarm	2nd Class.
Mr. H. W. Stevens	" "
" C. David	" "
" C. Littlewood	3rd "
" W. Bradley	" "
25 Native Surveyors.	

General average rate per square mile, Rs. 28 15 0.

almost entirely of Up-country men, some of whom can look back to the days when they were under the lamented Sir Henry Lawrence, in the Survey of the North-Western Provinces, from whence the Party gradually worked down through Behar and Bengal, and for many years under the superintendence of Major Walter Sherwill, now retired from the service. To the long training in the Monghyr and Rajmehal Hills and jungles

under the above Officer, and later under his talented successor, Major Gastrell, in the swamps and Soonderbun jungles of Jessore and Backergunge, I attribute mainly the great success the Party has had in the diversified and difficult country encountered. The numbers of old trained men have, however, greatly diminished by sickness and death, since the Jessore District was entered, and it has not been practicable to recruit with the same stamp of men. Most of the young hands succumb either to sickness or dread of the water and climate, before they can learn their duties thoroughly.

391. Early in December 1858, Major Gastrell having brought up all his Recess work of the previous Season at Berhampore, and recruited to full strength, left that Station to complete a small remaining portion of the District of Jessore, and to begin that of Furreedpore. The Survey progressed rapidly and well until the end of May 1859, when the spread of fever and dysentery crippled the Field Parties and put a stop to all further out-door work. No accommodation being then procurable at Berhampore, or in or near the District under Survey, it was deemed advisable to bring the Party to Serampore to recess.

Season 1858-59. Area effected.

	Square miles.	Villages.
Jessore District	104	122
Furreedpore District	1,278	1,851
Grand Total	1,382	1,973

392. The out-turn for the $5\frac{1}{4}$ months of active duty was a very successful one, yielding 1,382 square miles in 1,973 villages, as per margin, thus bringing the Jessore District Survey to a close, and leaving only 200 square miles of Furreedpore to be brought up the following year, part of which lay to the south of great

swamps east of the Mudhoomuttee River, and the remainder in the extreme east on the Ureal Khan River.

393. As already detailed in the proceedings of the 3rd Division, Major Gastrell was actively employed, the greater part of the Field Season, with **Dacca and Pubna junctions.** Mr. Davey of that Party, in effecting by minor Triangulation a connection between the two Surveys along the common line of the Ganges River, and with the former Survey of the District of Pubna.

394. The completion of Jessore gives a total area, including 99 square miles of Soonderbuns, of 3,441; this was performed at a total cost of Rupees 92,150-11-10, or at an average rate of Rupees 26-12-6 per square mile. The total number of included villages and Soonderbuns, grants, or clearings was 4,557, giving Rupees 20-3-6 as the rate for each. **Jessore completed District, area and cost.**

395. The Party again, from the 15th December 1859, finished the small remaining area of Furreedpore, co-operated with the 3rd Division in getting the **Season 1859-60.** **Area.** the **Dacca Survey** out of hand, and opened up the Backergunge District, then perhaps the least known of any of Bengal, completing the area as per margin, thus showing a very capital out-turn of 1,478 square miles with 1,785 villages.

	Square miles.	Villages.
In Furreedpore	201	173
„ Dacca	389	455
„ Backergunge	888	1,157
Total	1,478	1,785

396. During this Season also, the exertions of the Revenue Surveyor were again directed, with those of the Revenue Surveyor of Dacca, in perfecting the junction of the two Surveys to the southern point of the District of Dacca on the Megna River. Thence Major Gastrell proceeded alone, carrying a minor Triangulation down the Megna, connecting Backergunge with and fixing stations on the Bullooh Bank, on which the future operations of the Survey of that District might be based, thus affording a good means of connection. **Connection of Surveys continued.**

397. The District of Furreedpore, finished this Season, was found to contain 1479.5 square miles and 2,024 Village Circuits, and Rupees 39,202-3-0 were expended in its execution, the rate per Village Circuit being Rupees 19-6-0 and per square mile Rupees 26-8-0. **Furreedpoor final results.**

398. The amount of mapping and computation work, to bring up in connection with so large an area, was necessarily very great, whilst the working strength of the Establishment was materially reduced, first, by the death of Mr. C. Bradley, Assistant Surveyor, the transfer of Mr. Robert B. Smart, Assistant Surveyor, to fill the vacancy created in the charge of the 1st Division, by the death of Mr. Pemberton; and further, by the absence of Baboo Lallaram, Sub-Assistant, 2nd Class, on Medical Certificate for 6 months. Mr. Bradley had served 22 years in the Department; he was an excellent, hard-working Government servant, universally liked and respected, and his loss was much felt and regretted. Notwithstanding such serious drawbacks, the able Officer superintending this Survey, zealously supported by the rest of his Establishment, managed to bring up the whole of his work in his usual masterly manner.

399. Owing to the above vacancies, strenuous endeavours were made to help the Revenue Surveyor with a Covenanted Assistant appointed, and by the appointment of Lieutenant W. J. Stewart, Artillery, in G. O. B. G. No. 5079, of 29th October 1860, a most promising young Officer and excellent Draftsman, well fitted by his Addiscombe training for the Department, the Staff of the Party was somewhat strengthened.

400. Necessarily reduced in working strength, though numerically the same, by the appointment of young hands to fill the vacancies, the Establishment again broke ground in the Backergunge District, about the end of December 1860, the state of the country not permitting of any Field operations earlier. Major Gastrell, accompanied by his Assistant, Lieutenant Stewart, proceeded to carry on once more the Triangulation of the great Megna River, a most difficult and hazardous job, requiring much skill which the Revenue Surveyor brought to bear on it; connecting with and erecting marks, as in the previous Season, on the Bhullooh side and the intervening islands, a good Survey of the entire river was made, thus affording a good basis for the future operations of the 1st Division, on that side where the topography of the country was well surveyed and shown by Lieutenant Stewart.

401. The area executed was 1,049 square miles and 1,363 villages in Backergunge, including a Survey on a scale of 16 inches = 1 mile of the Civil Station of Burrisaul. This out-turn may be considered very large, if the shortness of the Field Season is considered, as well as the tedious character of the operations on the Megna. During the Recess, a Survey and plan of the Town and Suburbs of Serampore on the Hooghly, scale 16 inches = 1 mile, as well as the Government Powder works at Ishapoor, was effected by Lieutenant

Stewart, on scale 24 inches = 1 mile; this duty was carried out much to my satisfaction.

402. Active work in the field proceeded, until the rapid and sudden high rise of the tides, inundating the low lying tracts then under Survey, precluded the possibility of doing more. All hands were accordingly withdrawn about the middle of May.

403. The tract of country surveyed during these three Seasons, consisting of the Furreedpoor (in old Maps "Dacca, Julullpore") District, the southern portion of Dacca, and the northern of Backergunge, is bounded respectively on the north, north-east, and east by the great rivers Ganges or Pudda, the Megna, and one of its mouths or branches, the Helsha, on the west by the Chundna and the Muddhomuttee, or Barrashee, or Ballissur, and south by the then unsurveyed portion of the Backergunge District. The greater portion, and especially the central and southern, consisted of either vast bheels or swamps, interspersed with khalls (small nullahs) and covered in many parts by dense reed and grass jungles, sparsedly inhabited, where every hut was raised on mounds from 10 to 20 feet in height, or was traversed by large rivers, the outlets of the Gangetic valley drainage, and intersected by tidal khalls in every direction, rendering the task of Survey most difficult, and the delays and hindrances innumerable; the only really dry portions being the northern part of Furreedpoor and the villages on the banks of the large rivers and streams.

404. The total area accomplished during the three Seasons was 3,909 square miles, and the number of villages 5,121, besides several large rivers, all involving much labor in their correct delineation. The total expenditure amounted to Rupees 1,03,105-3 for Professional and Rupees 9,952-8 for Contingent expenses, total Rupees 1,13,057-11-2, giving Rupees 28-15 per square mile, and 22-1 per Village Circuit. The sub-joined Table shows the comparative results of each Season :—

SEASONS.	Number of Villages.	Average size of Village Circuits.	Area Surveyed in Square Miles.	Total cost with Contingencies.	Average rate per Square Mile.	Average rate per Village Circuit.
1858-59	1,973	448	1,382	36,797 0 0	26 10 0	18 10 0
1859-60	1,785	530	1,478	37,861 0 0	25 10 0	21 3 0
1860-61	1,363	437	1,049	38,400 0 0	36 10 0	28 2 0
Total	5,121	488	3,909	1,13,058 0 0	28 15 0	22 1 0

405. The above gives a mean average progress of 1,303 square miles per annum, and Rupees 37,686 as the mean annual cost. The mileage rate is the lowest of all those Surveys, whether in the Lower or Upper Provinces, whose operations have been confined strictly to the large scale and detail revenue village system, without the aid of areas laid down topographically only. This redounds highly in the Surveyor's favor.

406. The Maps furnished by this Establishment, as enumerated in the margin, are of great artistic merit. The Pergunnah or Main Circuit Maps, as well

Maps and Records rendered. as the sheets of Congregated Village Plans, are elaborately finished, complete

3 Index Maps of three Seasons' operations.
 1 Map of Main Circuits Nos. 20 and 21, District Jessore.
 5 " " " " 1 to 9 " Furreedpoor.
 6 " " " " 1 to 9 " Backergunge.
 1 " " " " 13 and 14 " Dacca.
 13 Vols. Atlas of " Congregated Village Plans of above Districts, scale 4 inches = 1 mile.

Records.

6 Vols. Main Circuit Traverse Computation.
 14 " Village Registers and Traverse Computation.
 1 " Sheet Areas.

1 Plan of Civil Station of Furreedpoor, scale 16 inches = 1 mile.
 1 " " Burrisaul " " "
 1 " " Powder Works, Ishapoor " 24 " "

and full in all their details, and highly interesting and valuable, as furnishing the true geography of this intricate part of Bengal never before laid down. The whole of these records being rendered in duplicate, form an enormous

amount of work for each recess, but by the systematic and excellent management of Major Gastrell, and the zealous and efficient co-operation of his subordinates, the whole has been got through in a masterly manner, and the entire records are highly creditable productions, calling for my entire approval.

407. Several admirable plans of Civil Stations and Towns on the large scale have also been prepared and furnished, *viz.*, of Jessore, Furreedpoor, Burrisaul, Serampore, and Government Powder Works, Ishapoor; the two latter Surveys were undertaken by Major Gastrell for special objects and formed additional labor, which was met in the usual zealous and willing spirit for which this Officer is remarkable.

408. The aid of type printing has been very successfully introduced by

Type printing.

Major Gastrell, on his manuscript Maps, by preparing the outline of each Map in duplicate, and stamping the titles, village, and other names, by means of type; a great saving of time and labor is effected, and the effect is quite sufficiently good for all practical purposes; the same system has been adopted in several other Surveys, and tends to economy.

409. The southern portion of the Backergunge District, including its Soonderbuns, the Estuaries of the Hooringotta and Megna, and the islands to

Current Season of 1861-62.

the east, the Don Manik and others, still remained to be surveyed. For the performance of the latter duties to connect these Islands, and to fix their situations relatively with the mainland, it was essential to be provided with a small Steamer, and the Bengal Government placed the Steamer *Teesta* at the disposal of the Revenue Surveyor. It had been requested and ordered for the 13th December, but owing to the delay of the Marine Department in furnishing a vessel, the Surveyor was only able to leave Calcutta on the 9th January; his parties having preceded him to the field.

410. With the aid of this vessel the work progressed rapidly, the weather being highly favorable, but only until the middle of March, when strong south-westers setting in, with a heavy rolling swell from the Bay of Bengal, rendered all further progress impossible, and the Revenue Surveyor, who had finished all the outer Islands, was obliged to give up the Survey of the Coast line and the Hooringotta Estuary, which, had the Steamer been furnished earlier, he would have done easily and effected an immense saving in expense for another voyage out and home.

411. Leaving his Assistants, Lieutenant W. J. Stewart and Mr. A. D. Smart, to finish off the easy current duties then remaining, the Revenue Surveyor by my direction returned to Calcutta on the 19th March, to relieve the Superintendent of Great Trigonometrical Survey, Major Walker, who was temporarily in charge of my Office, until my own return on the 16th April last, from a tour of inspection in the Upper Provinces.

412. In June the whole Party returned, having effected another very large approximate area of 1,488 square miles and 903 villages, leaving only the extreme southern portion or seaboard of Backergunge Soonderbuns and the Hooringotta Estuary, for future measurement. These then, and the portion of cleared Soonderbuns, lying between the Passur and Ballissur Rivers in Jessore, will form the scene of next cold weather's operations, and conclude the Survey of Backergunge and the Soonderbuns, when the Party will be available for other work elsewhere.

413. Major Gastrell has been appointed by the Bengal Government, No. 383, dated 13th May last, to succeed Major W. Sherwill, as Boundary Commissioner, for the adjustment of the new Civil and Criminal Jurisdictions in Bengal and Behar, and is now employed on that duty.

414. The Officiating charge of this Division devolved therefore, from the 13th May last, on Lieutenant W. J. Stewart, the next Senior Assistant in the Department, and I have no doubt

that the great practical experience he has had during the past two years, under such an able master, added to his zeal and the great interest he takes in his profession, will enable him to perform the executive and administrative duties satisfactorily.

415. The Survey of the Tea allotments and waste land grants in Assam, is another of the numerous calls made on this Department, of late, and such a Survey is doubtless a *desideratum*. In order to meet the emergency, it will be necessary to call on this Establishment to furnish the necessary staff next cold season, and I propose detaching Mr. A. D. Smart, Assistant Revenue Surveyor, who will, aided by as many Native hands as can be spared to him, proceed there and gradually organize a Party capable of dealing with such work, according to the requirements of the Civil authorities and to the financial means granted for the purpose.

416. Mr. A. D. Smart has served in this Division for 15½ years. He has had the advantage of a good school, in a most difficult and diversified country, is thoroughly well acquainted with all the duties of his profession; he is also a good Bengalee scholar, and is well qualified for the charge it is now proposed to entrust him with.

417. A re-survey of the Dearahs, or Island churs, and villages immediately on the banks of the Ganges River in Behar, Monghyr, and other Districts that have been surveyed 10 years and upwards, is another pressing want long demanded by the Revenue Authorities, and now urged by the Board. To meet this during the ensuing Season is impossible, but I propose, as soon as the Backergunge work be all brought up, that this Party shall proceed in the Season of 1863-64, to commence the Survey of the Ganges with the conterminous villages on both banks from Sarun and Shahabad eastwards, adjusting the many differences and disputes now existing, caused by the constant fluctuations of the river's course, and by there having been no permanent marks established on either bank to guide Magistrates or other Local Officers, when called on to decide on questions of right to occupancy of newly-formed lands, or remission of rent in cases of decretion, &c. This evil will, I trust, now be remedied, and the next Survey be based on more lasting and practical principles than the former one.

418. All the Assistants, European and Native, of this Establishment have worked well and cheerfully in very trying ground, as repeatedly reported by the Officer in charge, Major Gastrell; the Return for the three Seasons under Review, and the systematic rendering of all records annually, and taking the field without any arrears, is a sufficient proof of their great efficiency and

zeal. I have long had the highest opinion of this Party, and am greatly indebted to it for work which is not surpassed either in quality or quantity in the Department.

419. Of the merits and superior qualifications of Major Gastrell I cannot speak too highly; his Departmental service has been everything that could be desired. As a practical Surveyor and accomplished Draftsman he excels, whilst his judgment and tact in conducting all his duties point him out as an invaluable public Officer; and I would especially solicit the favorable notice of the Government of India towards him.

5TH, OR ARRACAN DIVISION, LOWER PROVINCES.

420. The regular Survey of the Arracan Province was started in the

J. H. O'Donel, Esq., Revenue Surveyor.

Assistant.

Mr. J. Pickard, 2nd Class.

Sub-Assistants.

Mr. G. V. Thompson, 3rd Class.

„ R. Savage ... Do.

„ W. S. Madge... Do.

„ J. W. Nicholson ... Do.

„ J. Bridge, Office Assistant, and

30 Native Surveyors.

General average rate per square mile, Rs. 16-12-0.

year 1855-56 under the superintendence of the present Revenue Surveyor, Mr. J. H. O'Donel, an old Departmental Officer, of long experience, formerly an Assistant on the 1st Division Establishment, but who had frequently been employed on detached small independent Surveys. Mr. O'Donel was deputed to raise an entire new Party, as detailed in the margin, for

the extensive operations required in such a wild and difficult country. From the year 1853, a few desultory and detached unimportant measurements of grants had been made, under the direction of the Collector of Akyab, by Mr. H. A. Porteous, Assistant Surveyor, but it was not until that Officer was relieved that any real or satisfactory progress was made, or any attempt to systematic and regular procedure.

421. From the Season 1853-54 up to 1858-59 an area of 3,692 square miles

Season 1858-59.

had been accomplished, chiefly of that part of the Akyab District immediately to the north of the town of that name. The Season 1858-59, the first coming under review in this Report, added 1,504 square miles to the geography of that hitherto unknown country. The northern portion of the tract surveyed consisted of almost uninhabited ranges of hills, clothed with the densest jungle, and situated north of the old Town of Arracan. In the south alone, on the left bank of the Koladyne River, and between it and the Lemroo, from Ooreeloung Pagodah to the Station of Akyab, low lands and cultivation to any extent existed.

422. In December 1859 the Revenue Surveyor proceeded with his

Season 1859-60.

Establishment to a village called Rolla, near the Koladyne River, and from

whence as the most advantageous position for his future operations, and having made all preparatory arrangements for supplies, coolies for their transport, and canoes for travelling, the various Parties, each supplied with one month's provisions, started for their several destinations, proceeding slowly and with difficulty up the various Hill streams, which afford the only means of travelling through the otherwise impervious forests.

423. The out-turn of this Season was very favorable indeed, yielding 2,370

Area. square miles, of which 2,072 square miles lay directly north of and adjoining the work of the former Season, forming the extreme north of the District. A network of Triangles extended over and embraced the whole. The remainder 298 square miles included the three small islands off the mouth of the Koladyne River, and between which and the mainland of Kyouk Phoo lies Hunter's Bay; the high ridged Island of Angarakheong protecting the Bay on the west.

424. The following Season of 1860-61, the rendezvous was made at a

Season 1860-61. village named Nangeea, on the Lemroo, when heavy rains in the Hills, which are always followed by sickness, determined the Revenue Surveyor to postpone the commencement of the Field work, until the middle of December 1860. Then, having established store houses, in the most favorable localities, to fall back on, and draw supplies from, the Surveyors entered the Hills as before, and wending their way up the various valleys in canoes, they penetrated into the wild and inhospitable Hilly country between their former Season's work and the Burmese Territory. Prosecuting their operations with vigour until the end of May, an area of 3,408 square miles was accomplished, constituting the remainder of the District of Akyab.

425. The tract of country thus finished in three Seasons, lying between the

Geographical position. parallels of 21° and 23° North Latitude, and meridians of 92° and 93° 30' East Longitude, is bounded on the west by the Koladyne River, from the sea to Tulheence, 120 miles inland, and thence by the District of Chittagong, from which it is divided by the Neodhotong, Mraneedong, and Keohradong Ranges of Mountains, varying from 2,300 to 4,850 feet in height, on the north by the Yandong Hills, a spur of the last-named range, and thence by a line from the Yandong peak across the valley of the Koladyne, to the summit of the Keochootong Mountain (5,021 feet), on the east by the lofty Youmadong chain, which, separating Arracan from Burmah, forms an almost impenetrable barrier in this direction, varying from 3,000 to 6,000 feet in altitude, and on the south by Hunter's Bay, the Sagaen mouth of the Lemroo River, and the Yeonunwa Kheong branch, or spur of the last-named great range of mountains, which forms the land boundary between the Akyab District and Kyouk Phoo or Ramree.

426. The total area thus derived, amounting to 7,283 square miles, was performed at a total cost, including all contingencies, of Rupees 1,22,205, thus

Total area.

averaging Rupees 16-12-0 per square mile, which would be rather high for the class of Survey performed, if it were all Topographical, but some of it being very minute and detailed, this makes a difference, and looking to the effect of the climate and all the serious obstacles interposed, the cost might have been greater under less able management.

SEASONS.	Number of Villages.	Average size of Village Circuits.	Area Surveyed in Square Miles.	Total cost with Contingencies.	Average rate per Square Mile.	Average rate per Village Circuit.
1858-59	88	8,674	1,504	30,857 0 0	20 8 0	.....
1859-60	34	2,522	2,370	46,611 0 0	19 11 0	.....
1860-61	90	2,495	3,408	44,736 0 0	13 2 0	.....
Total	212	.....	7,282	1,22,204 0 0	16 12 0	.....

427. The contingent charges were necessarily very heavy. With such a desolate country to travel over, every article of consumption for each individual

Contingent Charges.

employed, including Guards, had to be carried by coolies or porters at the enormous wages of Rupees 10 per mensem each, the price fixed by the Civil Local Authorities. The cost of canoes and boat men, without which no progress could be made, also tended to swell the expenses under this head, and to add to the general average mileage rate. The several details of contingent charges are as follows :—

Description of Contingencies.	Season 1858-59.	Season 1859-60.	Season 1860-61.	TOTAL.
Presents to Chiefs	0 0 0	1,104 2 5	700 0 0	1,804 2 5
Coolies for carrying provisions	0 0 0	3,951 1 2	5,486 8 0	9,437 9 2
Provision Depôt	0 0 0	288 1 9	378 14 0	666 15 9
Feed and keep of elephants	1,376 13 7	1,345 14 2	1,389 3 9	4,111 15 6
Jungle-cutting	0 0 0	3,706 11 0	0 0 0	3,706 11 0
Boat hire	0 0 0	1,874 11 10	1,022 10 0	2,897 5 10
Total	1,376 13 7	12,270 10 4	8,977 3 9	22,624 11 8

428. The Akyab District, thus brought to a conclusion, was found to contain a superficial area of 10,783 square miles, and to have cost Rupees 2,07,294,

Completion of District. or an average rate of Rupees 19-4-0 per square mile. Out of the above large extent of country, only 706 square miles were actually under cultivation, whilst the Survey was progressing, the remainder consisting of hills (chiefly), rivers, streams, and forests.

429. The difficulties experienced by Mr. O'Donel, in bringing this Survey to a conclusion, in such an unhabited and densely-covered country, may be readily imagined, but it was not alone against natural difficulties that he and his Establishment had to contend. They had frequently to take great precautions against the wild tribes in some of the ranges of hills, who objected strongly to this invasion of their solitudes. On one occasion, on the banks of the Yeokhong River, the Party had to wait patiently before commencing work, until bamboos could be collected to stockade the stream above them, and thus prevent any sudden onset. Few villages paying revenue were met with in these wilds, and they invariably stockaded ones. As they penetrated onward, they came in contact with still more lawless tribes; neither guides nor coolies could be induced to enter the hill tracts immediately west of the Koladyne River without a Military Guard, such was their dread of the Araeng tribes that inhabited those mountains.

430. The sanction of Government being obtained for the expenditure of small sums of money annually, in payment of presents made to Hill Chiefs, for their good will and assistance, and to their followers for cutting jungles, for the formation of depôts of provisions, and for guides, coolies, and guards to accompany each Party, had an excellent effect, and proved true economy in the end; without this political expedient, we might never have obtained such a footing in those hills. After this, as may be seen from the steadily increasing yearly out-turn, the Survey progressed most favorably, and I believe that its success has been no less owing to the judicious arrangements of the Officer in charge, than to his excellent tact and judgment in winning the confidence of these uncivilized Chiefs and their dependents.

Maps and Records.

- 3 Index Maps of 3 Seasons' operations.
- 19 Maps of Main Circuits Nos. 13 to 31.
- 3 Vols. Atlas of Congregated Village Plans.
- 3 Vols. Main Circuit Traverses.
- 3 Vols. Village Register and Traverses.
- 1 Index Map exhibiting the Civil and Criminal Jurisdiction of District Akyab.

431. The marginal list of Maps and records shows the amount of documentary work rendered by this Survey Party. These were all received in excellent time, no arrears ever being allowed to accumulate in this Division. In general style

and minuteness of detail, in the lower country and partially cultivated and inhabited parts, the Maps are admirable representations of the topography, and all that could be desired, whilst the delineation of the most difficult

and extensive hilly features has been more successful than might have been expected, and I consider them most valuable acquisitions to the geography of a very prominent part of the British dominions, reflecting great credit both on the Revenue Surveyor and his Assistants, for the great perseverance and unflinching energy brought to bear on the Survey of so inhospitable and unhealthy a region.

432. The following notes taken from the Surveyor's Annual Reports, descriptive of the geographical features and tribes of this remarkable country, will be found interesting:—

EXTRACT FROM ANNUAL REPORT OF 1858-59.

“ 10. The Khoomees occupy the hills bordering on the Koladyne River and Peekhoong from Koladyne Thannah northwards for 60 miles. The Shendoos occupy the hills near the sources of the Koladyne. All intercourse between the Shendoos and Khoomees is carried on by interpreters, called Koongs, who live about midway between the nearest villages of both tribes about 20 miles from Teelukmee.

“ 14. The Lemroo River, for 60 miles of its course, south of the Shengianoo Hill till it enters the Plains, is a mountain torrent, and only admits of canoes of the smallest size, capable of carrying about three maunds. The navigation is much interrupted by numerous rapids and falls. During the dry season the channel is diminished to 10 or 15 yards in several places, and the waters rush with increased force over the inclined bed of the river. * * * * * Within 8 miles of Jegaandong Hill, the Lemroo receives the waters of 3 large tributary streams, the Wakkheong and Laengkheong on the left bank, and the Yeokheong on the right bank. Castor-oil plants, black pepper, and a species of cinnamon (*cassia lignea*), grow wild in this locality. The hills are in general covered with sufficient soil to admit of the growth of bamboos. The chief agricultural products are hill rice, Indian corn, cotton, linseed, and tobacco.

“ 15. * * * * * The Onegroo River, called also Toungphetkheong, is the most southern line of water communication between the Koladyne and Lemroo Rivers, and affords a safe inland passage to Kyouk Phyoo. The Redeh, Chankhoondine, and other large streams have always sufficient water to admit of the largest boats passing at all times. Vessels of 600 tons load at Choonray and Henkhara. The Keem and Krinkhwaiman Hills are entirely isolated, and attain an elevation of 500 feet. On the northern side of the latter is a volcano, called Naga-dweng (serpent's well), of greasy mud, constantly bubbling up with a great noise. The proportion of mud and water is nearly equal. Akyab, situated at the mouth of the Koladyne River on its right bank, the chief Civil and Military Station in Arracan, is also the chief Port of trade, and has all the qualities of a good and commodious harbour. The entrance, easy of ingress and egress, is marked by the Fukeer reef buoy on the north, and passage rock on the south near the Savage Light-house; it is a mile wide, and leads to a safe anchorage in 21 to 33 feet for the largest ships at all times of the tide. It may easily be protected from hostile attacks, but there are no defences or docks for the building, repair, and outfit of ships. The mud brought down by the stream * * * has formed a bar, over which the average depth of water is from 27 to 33 feet at high water; the rise and fall of the tide being 9 feet. The bar is situated 4 miles outside the entrance, and the time of the high water on the bar at new and full moon is 9 hours 45 minutes. The season for loading rice commences on the breaking up of the rains in November, and lasts till the middle of May, when the south-west monsoon sets in strong. Ships leaving after that period are exposed to risk and difficulty in crossing the heavy swell on the bar. The Port of Akyab is subject to Act No. XXII. of 1855. The limits of the said Port

are as follows :—To the south a line drawn from the boundary pillar on the Fukeer's Point to the great Savage Light-house, from thence to the northernmost point of Walekeon Island, and from thence to the boundary pillar on the north bank of the Toungpoo-mrit Creek (or Onegroo River). To the north a line drawn from the boundary pillar on the north bank of the Mongie Creek to the boundary pillar on the north bank of the Toungpoo-mrit Creek. So much of the Cherogya Nullah as lies to the eastward of the Government Bankshall, and so much of the Jullia Khallie as lies to the eastward of the Jullia Khallie Bridge. The entrance into the harbour and neighbouring localities have been carefully determined. The Fukeer Rocks, covered at high water, extend for half a mile near the entrance; the position is marked by a buoy. An extensive flat of sand and mud, nearly dry at low water, to the south of Guaprai, or flat island, is marked by two buoys; 200 ships can load at one time opposite the bazar and Native town. The Savage Light-house stands on a rock at an elevation of 85 feet. From the Point Flag Staff, or Station E., the bearing is 175° 14' S. E. and distance 151·31 chains."

EXTRACT FROM ANNUAL REPORT OF 1859-60.

"13. A high range of hills, from 2,500 to 5,000 feet high, called Modootong, Chittagong and North-Eastern Frontier. Mraneedong, and Yandong, or Blue Mountain, forms a natural boundary between the Akyab and Chittagong Districts. From Teelukmee northwards, and within 12 miles along the banks of the Koladyne River, there are six villages on the right bank and four on the left bank: no other villages are met with higher up for 60 miles, and the intermediate country between the river and the boundary range is totally uninhabited. The Loosai Kookees reside on the west of the boundary range within the Chittagong District. The Independent Shendoos, called Poehs, occupy the tract of country to the east of the Koladyne River, from the mouth of the Sullakheong northwards. Being at feud with the Koomees, no accurate information could be obtained of the population or the precise limits of the Shendoo Country. Further north to the 23rd parallel of north latitude, the country is occupied by independent tribes of Muncepoor, Arracan, and Ava. From the utter impossibility of maintaining so difficult a position, and keeping my Parties supplied with provisions with the means available for that purpose, I did not attempt to penetrate the valley of the Koladyne, for a short distance beyond the mouth of the Kansa Kheong. Canoes were dragged up so far with the greatest difficulty, through narrow openings in large masses of rock which block up the stream. There is no recognized frontier in that direction, and it will be necessary to fix a frontier line, after the Survey towards the Yeomadoung is finished.

"14. The Village of Teelukmee contains 30 houses. During the day the village is occupied; at night the inhabitants remove to large substantial floating huts moved into the middle of the stream, being afraid of the secret and sudden attacks made by their wild neighbours. Mounghkine, Survey on the Koladyne completed without any disturbance with the wild tribes. the chief of the clan Yeasing, who had committed dacoities a few years ago near the Koladyne Thannah, at first objected to my Parties surveying his village on the Samec Kheong, but two months after, finding that all the most influential chiefs had paid their respects to me, he offered no further resistance. During the period of my stay in the hills for 4 months, with the above exception, the most perfect harmony prevailed between my Party and the wild people. The difficult country on the Koladyne River, more than a 100 miles distant from the most northern Military Outpost and Thannah of the District, has been completed without any disturbance with the wild tribes. It will give me great satisfaction to know that the results of the past Season have been satisfactory."

433. Well trained by the speciality and laborious duties entailed in

Current Season 1861-62.

in 1861-62 to stop the Arracan Division work, and to push forward the Survey

Change of District.

of the remaining portion of the eastern Hill Territory, lying between the Akyab or Arracan Frontier Boundary, and the old surveyed District of Chittagong. The Map of the Arracan Eastern Frontier having been so well filled up by the operations as above described, it was deemed advisable to complete the gaps still left in that untrodden region due east of Chittagong, and the more so as the Military expedition into these hills against the refractory tribes, headed by Ruttun Poeah, rendered it most desirable and important to obtain better and more complete information of the interior of this Hill tract, which has of late years given so much trouble. The filling up of the entire remaining area from the limits reached by the Akyab Survey in the locality of the Shendoo tribe was, therefore, determined on and ordered by the Government of Bengal.

434. During the current Season, Mr. O'Donel has completed the Survey of the Fenny River, from the Nizampoor

Chittagong and Kookee Hills.

Plains to the head waters of the stream, in latitude $23^{\circ} 19'$, including two of the principal feeders of the same river, *viz.*, the Dholea Suree and the Goomtee. The Chingree River, separated from the Fenny by a range of hills 12 miles more to the eastward, as well as a route from Golabaree to Narainkehaut, have been likewise laid down. This was effected in order to permit of proper Police defensive posts being established for the pacification of the country. The general operations of the Season are to the south of the Kurnafoolee River and of Ruttun Poeah's Head Quarters, and forming the south-eastern portion of the Chittagong District, embrace an area of nearly 3,300 square miles, connecting the topography of the old Survey of the Chittagong District with the general Survey of the Arracan Frontier, and with the routes laid down by Mr. Moran, the previous Season.

435. The Fenny River forms the north-west boundary of the Chittagong District, further east a massive branch from the central ridge of mountains separating Bengal from Burmah, forms the northern boundary adjoining the Independent State of Tipperah, and still further east, the Chittagong and Cachar Kookees occupy the country, on either side of the same range. Three Kookee clans, Ruttun Poeah, Syloo, and Howlong, inhabit the Chittagong side, and the Bartoza clan of Kookees on the Cachar side of the dividing range. The Fenny River flows quite in a different direction from that shown on the old Maps, and the northern boundary of Chittagong is a range of hills forming the watershed of the Fenny, the Chingree, the Kasalong, and the Kurnafoolee Rivers, a little further to the north than the supposed old course of the Fenny. It comes up, in fact, to latitude $23^{\circ} 30'$ the parallel of the station of Comillah. The country lying between Ruttun Poeah's village and the Fenny, or all east-

ward as far as the Kookee, villages on the Burkut Range, near the Kasalong River, was totally deserted from February 1861 by the inhabitants, after the aggressions of the Kookees during the past two years.

436. Four Hill tribes, the "Chukmas," "Joomea Mughs," "Tipperahs," and "Rehangs," occupy the low hills, within a short distance of the Plains; the Kalindee Ranee being the recognized head of the Chukmas, and Keojasine, or Manu Rajah, having influence over the Mughs. Numerous Tipperahs and Rehangs, unwilling to expose themselves to the oppressive rule of the Tipperah Rajah's relatives, have recently settled in the Chittagong Hills, and are, in general, peaceable cultivators. Wild elephants were very numerous and troublesome, requiring the aid of the Sepoy Guard to drive them away.

437. The Surveyor states that from his intimate knowledge of the Arracan Frontier tribes, he has every reason to hope that the mild and conciliatory policy pursued will soon reduce the Syloo and Howlong clans of Kookees to quietude, and he feels confident that Captain Graham, the present Superintendent of the Hill tribes, will be able to bring them to terms without bloodshed; as yet, however, their fears have the mastery over their reason, and they cannot understand a mode of action so much at variance with their own; under similar circumstances, blood for blood being their only law. They naturally fear treachery, and the only remedy to overcome this is patience. Such are the style of people amongst whom it falls to the lot of some of our Surveyors to work. The hill people are now scattered over the Plains; many have settled on the Nizampoor Hills north of Seetakoond; all, however, are said to be very eager to return in the approaching cold weather to their old villages, and to be awaiting "the order to return," with anxiety.

438. The Hill country above described will be again taken up in the ensuing cold weather; about 3,500 square miles of the most difficult ground remains for Survey, to complete the British Territory in Chittagong, and this will of course be the first object, before attempting to push northwards across the Fenny, to enter Independent Tipperah. It is only in this northern Frontier and in tracing the Goomtee River, from which the line of boundary will be more easy of access, that any assistance will be required from the Tipperah Rajah. The detailed arrangements for the Survey of the remainder of the Kookee Hills must depend on the information received from the Commissioner, as regards the political relations with the "Syloo" and "Howlong" clans of Kookees. These clans occupy the very difficult unexplored country near the sources of the Chittagong or Kurnafuolee River, which the last Military expedition did not attempt to enter. There is now no doubt these Kookees were chiefly concerned in the late massacres, and unless they are brought to terms, there will be no security in these hills, and no coolies could be depended on for a single day, after the Survey Parties entered

the country, in case there was any chance of fighting. A Guard of about 60 or 80 men of the Police Battalion will accompany the Surveyors.

439. The present Commissioner of Chittagong, Mr. Gordon Young, has entered warmly into the object in view, and rendered this Department valuable assistance and advice. He proposes to give every detached Assistant Surveyor a passport for entering the Tipperah Rajah's Territory, the precise date of which will be duly communicated beforehand to the Rajah through the Commissioner. In such peculiar and difficult scenes of labor, both physically and politically, of course without strong support and assistance, isolated Surveyors can do nothing, but I have the utmost reliance on the good temper, tact, and ability of Mr. O'Donel, whose knowledge of this sort of country and people is very considerable, and if any man can succeed in the present undertaking, I am sure he will. The area now before him of this wild hilly country, including Independent Tipperah, is about 11,000 square miles, and I am in hopes that a new Chief having recently succeeded to the management of the Tipperah Native State, who has expressed his entire concurrence in the objects of the Survey of his country, greater facilities will be derived.

440. As these Topographical operations progress northwards, I am in hopes they will soon meet the principal triangulation of the Great Trigonometrical Survey, which is coming down south, on the meridian of Gowhatty and Cherra Poonjee, through the Sylhet District. A connection with these operations by Mr. O'Donel is of the first importance, for the due check of his minor triangulation, which has now extended from such a distance, with only the check of two or three approximately measured small Bases in the plains of Chittagong. The experience and information gained by Mr. O'Donel cannot fail also to prove of material assistance to the Trigonometrical operations.

441. The District Map of Akyab on the $\frac{1}{4}$ inch scale has been compiled in this Office, and is ready for the Press; it is a very fine map, covering upwards of 10,000 square miles, and exhibits features never before attempted to be sketched, the whole being a dense mass of hills running in successive ridges parallel with the Bay of Bengal coast line, in the direction north-west to south-east. This Map will entirely fill up sheet No. 134 of the Atlas, when the Triangulation is able to assign it its true place on the General Map of India. The one inch Maps of all the more cultivated and populated parts are also just about to be lithographed. The barren and unpopulated hills will not require publication on this large scale, but will be sufficiently represented on the $\frac{1}{4}$ inch. A very useful Map of the Chittagong

Division, scale 8 miles to the inch, embracing all that was known of the hilly territory north of Akyab, has likewise been published.

442. In consequence of the Survey operations having been diverted

Suspension of Arracan Survey.

northwards, the next District of the Arracan Province to the south of Akyab still demanding Survey cannot at present be taken up ; Kyouk Phyoo with the Ramree and Chuduba Islands must therefore remain in abeyance for some time. The area of this District is roughly estimated at 4,000 square miles. The necessary transfer of the Budget Estimate from British Burmah (to which Chief Commissionership Arracan now belongs) to the Lower Provinces has been effected.

443. The Assistants, both European and Native, on this Survey, have a

Assistants.

most arduous duty to perform, to which they give the most cheerful and praiseworthy devotion. By the judicious precautions taken by Mr. O'Donel, the health of the entire Party has been wonderfully preserved, and by his continued watchfulness, combined with his knowledge of the country and the people, he continues to maintain the Establishment in a state of efficiency, which is highly creditable to his foresight. Mr. J. Pickard, Assistant Surveyor, is highly commended for his qualifications, and the zealous services he has rendered in Arracan, since the Survey first commenced.

444. Mr. O'Donel's services have frequently been enlarged upon in my Reports to the Bengal Government. He is a most valuable Officer in every respect, and highly deserving the favorable notice of the Government of India.

6TH, OR HAZAREEBAUGH DIVISION, LOWER PROVINCES.

(Late Baree Doab, Punjab.)

445. As shown in paragraphs 149 to 151 of my last Report, by the orders

Captain G. Hunter Thompson, Revenue Surveyor.

Assistants.

Major W. S. Row.	...	...	...	...	2nd Class.
Lieutenant Minto Elliot, resigned.	...	...	...	...
Mr. G. H. Blyth ...	...	...	...	...	"
" W. Ellison ...	...	...	...	...	"

Sub-Assistants.

Mr. E. Billon, resigned	...	...	...	...	3rd Class.
" R. Scott	...	...	...	...	"
" H. Billon	...	...	...	...	"
" P. H. W. Brady	...	...	...	...	"
Baboo Kirpa Ram	...	...	...	...	"
and 26 Native Surveyors	...	...	...	...
General average rate per square mile	...	...	...	...	Rupees 30-6-0.

of the Supreme Government, in Foreign Department letter, No. 4070, of the 26th October 1858, this efficient Establishment, as per margin, under the orders of Captain G. Hunter Thompson, Revenue Surveyor, who

had for some years conducted the operations in the Baree Doab of the Punjab, was transferred to Bengal, where it was decided their services were most re-

quired, and deputed to survey the Hazareebaugh Division, including the Districts or Estates of Hazareebaugh, Ramghur, Palamow, &c., in conformity with the Bengal Government instructions, No. 418, dated the 14th January 1859.

446. Having completed and rendered all work connected with the Punjab, the Party marched down from Simlah, where the Recess duties had been conducted,

Season 1858-59.

and arrived on their new ground in February 1859, when arrangements were immediately made for opening the Survey of the part of the Hazareebaugh

Change of ground.

District lying to the north of the Great Trunk Road, known as the Burhee Sub-Division, and bounded on three sides by the surveyed Districts of Behar, Monghyr, Bhaugulpore, and Beerbhoom, and the unsurveyed District of Maunbhoom, the Trunk Road forming the base or fourth side. This tract includes the well-known coal localities of Kurruckdhea and Kurrurbalee, the growing importance and richness of which rendered the Survey of more pressing importance and necessity. But the cold Season of 1858-59 was one of excitement and partial disturbance in the locality in question, and combined with the late arrival of the Surveyors and the entire unpreparedness of the District for Survey operations, and the additional difficulty caused by the destruction of all the Collectory records, by the mutineers at Dorundah and Hazareebaugh, the change of Civil Officers, and other obstacles, it was not to be expected that much progress could be effected the first Season.

447. Moreover, the great radical change in the nature of the country, and the style of Survey consequent thereon, is a very serious consideration in estimating the results of the operations. An ordinary Revenue Survey Establishment, with its large proportion of Native Agency, is well able to deal with a perfectly flat and cultivated champaign country, and to make very large progress, but to transfer the same people, all of a sudden, into a hilly, difficult country, much covered with jungle, is, in fact, to change entirely the nature of the work demanded, and every individual has to learn a new and difficult duty, and to overcome many obstacles never before met with. Revenue Survey Parties are not accustomed to Topographical Field sketching of intricate ground, and their equipment and style of surveying has to be changed for it. This must be a work of time, and the quality of the Survey must partake of the aptitude and skill of the Surveyors, and their ability to master the most difficult part of their Profession; as each Season passes, gradual improvement will be evidently discernible on the Maps of a Surveyor so situated.

448. The Revenue Surveyor and his Covenanted Assistant having preceded the Party by Dāk, arrived, in December 1858, at Hazareebaugh, when the entire Civil duties of demarcation and preparation of the country for Survey devolved on himself, with scarcely a record to assist him. Contending, therefore,

with so many drawbacks, as above described, Captain Thompson managed to obtain information of a reliable nature to define and mark off only a few estates and villages, by the time his Establishment arrived. The whole of the revenue tenures of this wild Non-Regulation Province, forming the Chota Nagpore Division or Commissionership, are of a peculiar nature and unlike those in the Regulation Districts. The very rugged and unproductive character of the greater portion of the area coming under Survey, and the exceedingly spare population and poorness of the land, rendered a complete village by village definition and Survey in many parts quite impracticable and unnecessary.

449. The system of Survey had, therefore, to be adapted to the wants and requirements of the civil administration and nature of the ground. All the Government Estates, as well as temporarily settled estates, and the more open and cultivated tracts, had to be carefully dealt with, according to the usual rigorous revenue detail method, whilst the large perpetually settled estates, not susceptible of further or of any revised assessment, embracing chiefly jungle and hilly ground, had to be separated for Topographical delineation only ; and in this way the whole Division is being carefully picked out, the Surveyor being his own Settlement Officer.

450. The result of this first Season, therefore, was only 224 square miles, with 306 villages of Pergunnahs Kodurma and Kurruckdhea, all minute and detailed work, a very small area on which to throw the entire expenses of the Establishment, during its long march from the Punjab, but under the circumstances all that could possibly be effected.

451. In the following Season, field work was resumed early in November 1859 with better prospects. The country was exceedingly rugged and hilly, interspersed with heavy jungle and most difficult for Survey. It was necessary, therefore, to have resort to Triangulation, and a series of 50 first class secondary triangles having been thrown over the country, the usual Main Circuit Traverse work was carried on, under the checks thus afforded. By the good management of Captain Thompson, his demarcations were well carried out, with the smallest means and proportionately low expense. The result of the Season gave square miles 943 and 1,363 villages, of an average size of 443 acres each, all separately defined village surveys; a very good return, looking to the number and average size of the villages. A continuous and very minute Survey of 136 miles of the Grand Trunk Road, on the large scale of 8 inches = 1 mile right through the District, was also effected, and one of the Civil and Military Station of Hazareebaugh, on the same scale, both of which were well executed, and will prove of great use in various ways.

452. On the 15th November 1860, another Season's operations were commenced, to the south-east of the former Season's work, in continuation of the Hazareebaugh District, with parts of Pergunnahs Kurruckdhea, the whole of that portion lying north of the Grand Trunk Road being thus brought to a conclusion.

453. The nature of the country was generally much the same as in the two previous Seasons, hilly and rugged, with scanty population, and demanded, as then, a series of minor triangulation, to control the otherwise unavoidable errors attendant on chain Survey over such country. A net-work of 57 triangles in connection with, and continuation of those of the preceding Season was accordingly laid out and observed; the Parisnath Meridional Series of the Great Trigonometrical Survey, crossing this part of the operations, connection with its principal and secondary stations was duly effected, and an excellent check obtained on all the Revenue Survey measurements. The Great or Calcutta Longitudinal Series also completely traverses the entire length of this District, forming the most admirable basis for extending the minor Triangulation and Topographical details.

454. The following Table exhibits the results of comparison of Great Trigonometrical and Revenue Survey distances, the largest error being 6.69 feet, and the general average $\frac{+ 2.47}{- 1.08}$ feet per mile; results which, considering the rough uneven ground chained over, are very satisfactory.

NAMES OF G. T. STATIONS.			From Revenue Survey.	From G. T. Survey.	Error of Revenue Survey.	Error per mile.
Bamani	... to	Rehwah	133545.2	133511.2	+ 34.0	1.34
Bamani	... to	Ghoranjee	130350.5	130332.8	+ 17.7	0.72
Rehwah	... to	Ghoranjee	138310.6	138310.6	0.0	0.00
Parisnath	... to	Bamani	214319.4	214181.5	+ 137.9	3.40
Parisnath	... to	Ghoranjee	218149.2	217977.7	+ 171.5	4.15
Bamani	... to	Dooburseni	83437.9	83451.0	- 13.1	0.83
Bamani	... to	Purtkola	79452.9	79465.0	- 12.1	0.80
Purtkola	... to	Dooburseni	96275.6	96283.0	- 7.4	0.41
Parisnath	... to	Khondonlee	120611.5	120568.1	+ 43.4	1.90
Khondonlee	... to	Ghoranjee	136623.5	136450.3	+ 173.2	6.69
Parisnath	... to	Ghatee	152057.2	152002.3	+ 54.9	1.91
Ghatee	... to	Khondonlee	105384.5	105367.4	+ 17.1	0.86
Poraiya	... to	Lohawar	96252.3	96224.0	+ 28.3	1.55
Purtkola	... to	Jarenno	43876.0	43901.0	- 25.0	3.01
Purtkola	... to	Bursote	53839.9	53855.0	- 15.1	1.48
Average where the error is +			1445603.9	1444925.9	+ 678.0	2.47
,, where the error is -			356882.3	356955.0	- 72.7	1.08

455. The gross area obtained this Season was 1,674 square miles, comprised in 47 large estates, 136 blocks or parcels of estates, and 293 villages; these

Season 1860-61.

latter being situated in more open and cultivated country than the former, admitted of separate demarcation.

456. The area of that portion of the Hazareebaugh District thus surveyed in the three Seasons under review, and lying north of the Grand Trunk Road, was ascertained to be 2,841 square miles, the cost of which, including all contingencies, amounted to Rupees 1,03,318, giving a general average of Rupees 36-6 per square mile. 1,327 square miles containing 1,962 villages was Mouzahwar, or village by village Survey, and the remaining 1,514 square miles Topographical, on the one inch scale. This cost is high but unavoidable, and will be reduced year by year, as the Surveyors become more accustomed to the difficult nature of the ground, and in proportion as the Topographical Survey preponderates over the Revenue. The progress and cost for each Season stand as follows :—

SEASONS.	Number of Villages.	Average size of Village Circuits.	Area Surveyed in Square Miles.	Total cost with Contingencies.	Average rate per Square Mile.	Average rate per Village Circuit.
1858-59 ...	306	468	224	28,512 0 0	127 14 0	93 2 0
1859-60 ...	1,363	443	943	39,494 0 0	41 14 0	23 15 0
1860-61 ...	298	350	1,674	35,312 0 0	21 1 0	0 0 0
Total ...	1,962	0	2,841	1,03,318 0 0	36 6 0	0 0 0

457. In consequence of the difficult nature of the District, and there being no Civil Officer available for the Settlement or demarcation duties, on the sudden emergency of this Party coming down from the Punjab, Captain Thompson had to perform these himself, in addition to his Professional Survey operations, with the aid of some highly experienced men from the Punjab, who were brought down with the Party; the Civil duties have been performed throughout by the Revenue Surveyor, who has given much satisfaction to the Commissioner and the Board of Revenue in this respect. The addition of the entire and responsible business connected with the proper registry, identification, and adjustment of all the various descriptions of Estates in this District, without even the assistance of a Deputy Collector, has been of course a most laborious task, but by the energy and well-directed exertions of Captain Thompson, great success has been achieved, which has obtained for him the acknowledgments of the Government of Bengal. This extra duty imposed on the Surveyor has been entirely gratuitous, no remuneration whatever having been accorded to him for the same, although the saving effected by the non-employment of a Covenanted Settlement Officer, as in other Districts, has been very great.

458. The adjoining District of Maunbhoom, taken up by the 2nd Division Party, has likewise been prepared for Survey by Captain Thompson, with his small Civil Establishment, and the demarcations kept well in advance. Great credit is due to this Surveyor, for the energetic manner in which he contrives to carry out these increasing and important Civil duties.

459. The Maps and records marginally quoted, illustrative of this Survey, were duly lodged in this Office by the

Maps and Records.

The Maps of this Surveyor have always been of a high order. In execution of ordinary details, they

3 Index Maps	...	...	...	scale 1 mile = $\frac{1}{4}$ inch.
10 Main Circuit ditto	...	...	...	" 1 " = 1 "
1 Plan Cantonments and Civil Station of Hazareebaugh	...	...	...	" 1 " = 1 "
1 Plan of Grand Trunk Road	...	...	...	" 1 " = 8 "
4 Vols. Congregated Village Sheets	...	...	...	" 1 " = 4 "

are unexceptionable. The new style of country was at first a great difficulty, demanding the most experienced Professional hands. Employed exclusively hitherto in the level Plains of the Barea Doab of the Punjab,

Records.

4 Vols. Village Registers and Traverses.
2 " Main Circuit Traverses.
1 " Triangulation Field Book.

time and practice was essential to enable the Surveyors engaged on this work to faithfully pourtray the very broken and rugged features of the Hazareebaugh District; considerable progressive improvement is discernible as each Season advances, and no pains have been spared to instruct the Surveyor, as far as it can be done from this Office. The Establishment is unfortunately very weak in the particular sort of European Agency which alone is able to deal with such ground, and I have as yet been unable to find good Assistants to transfer to it; the exertions of the Surveyor and his Assistants are highly commendable, and I have every reason to be satisfied with their endeavours to perfect their Maps, in this the most difficult branch of Military or Topographical drawing.

460. The whole of these one-inch Maps have been lithographed and issued, as being of importance for Geological investigations, in the enquiry regarding coal, with which the locality abounds.

461. During the current Season, the operations have been pushed forward

Current Season, 1861-62.

Rampoor.	|	Oormanjee.
Golah.	|	Bunmumbeh.
Tisree.	|	Juggaisur.
Singhpoor.	|	Chumpah.
Chunguora.	|	Holung.
Bursote.		

south of the Trunk Road, in the Pergunnahs named in the margin, of the independent Estate of Ramghur, and are entirely Topographical; an area of 2,305 square miles has been covered by a network of 73 minor triangles, and the

details filled in, besides two other Pergunnahs triangulated in advance, on which the Plane Tables will be set to work in the ensuing Season.

462. It will be observed that, commencing with pure Revenue Village

Change in nature of Survey.

Survey, *i. e.*, definition of each separate Village, the first year the Survey has

gradually assumed the Topographical character. This step was determined on by the Bengal Government, after mature consideration of the opinions formed on the subject by the Revenue Board, the Commissioner, and myself. The less expensive and far more rapid progress of the Topographical system was deemed better in the sparsely inhabited and more wild and rugged portions of the District, where the country is clothed in almost impenetrable jungle, and any attempt at the definition of Village boundaries, many of which had no tangible existence, was held to be unnecessary.

463. The only exceptions to this general rule are to be Government Revenue Detail Survey in certain parts. estates, open or well cultivated lands, and any such other particular Estates or Villages likely to become profitable, or to come under new assessments, as may, in the opinion of the Civil Authorities and Revenue Surveyor, demand the larger scale and more detailed definition Survey.

464. The general extent and area of this Commissionership or Division, known as the South-West Frontier Agency, embraces the Districts as per margin, and may be said to be comprised between the Meridians of 82° and 87° East Longitude, and the parallels 21° 40' and 24° 40' of North Latitude, and bounded on the north by the Province of Behar, already surveyed; on the east by the Districts of Beerbhoom, Bancoorah, Burdwan, Midnapoor; on the south and south-east by the Tributary Mehals of Mohurbung and Keimgur, of the Cuttack Division, and the Gurjat Estates of Bandiah, Rygurrh, and Tosimbur, and the Sumbulpore District, all lately transferred to the Central Province; and on the west and south-west by Mirzapore, Rewah, and Belaspore, or Chutteesgurh. The country to the south and west is entirely unknown and undefined, some parts of it scarcely ever having been visited by Europeans. As far as can be ascertained and computed from the best Maps extant, the present Civil Jurisdiction, after the transfer of Sumbulpore and the Gurjat Estates to the Central Province, covers about 46,348 square miles of country of a very diversified character, more or less poor and thinly inhabited, paying but very small revenue, and a great portion extremely unhealthy and difficult of access; economy in the execution of this arduous task, both as regards life and money, is therefore a point of vital importance.

	<i>Square miles.</i>
Hazareebaugh and Ramghur	6,800
Palamow	4,200
Maunbhoom	5,400
Chota Nagpoor or Lohardugga	6,890
Singrowlee	...
Sirgoojah	...
Odeypoor	...
Singhbhoom	...
Justipoor	...
Gangpoor	...
Bonni	...
Korea, &c.	...
Sumbulpore	2,664
Gurjat Estates	13,811
	23,058
	46,348
	16,475

transferred to Central Province

Total of the old South-West Frontier Agency } 62,823

Gurjat States transferred, viz.—

Bamra.	Brindanawagurrh.
Sarungur.	Kharonide.
Pholjur.	Sohnpoor.
Barasambur	Kelraicole.
Patna.	Suktee.
6. Karriar.	13. Raighur and Burghar.

west by Mirzapore, Rewah, and Belaspore, or Chutteesgurh. The country to the south and west is entirely unknown and undefined, some parts of it scarcely ever having been visited by Europeans. As far as can be ascertained and computed from the best Maps extant, the present Civil Jurisdiction, after the transfer of Sumbulpore and the Gurjat Estates to the Central Province, covers about 46,348 square miles of country of a very diversified character, more or less poor and thinly inhabited, paying but very small revenue, and a great portion extremely unhealthy and difficult of access; economy in the execution of this arduous task, both as regards life and money, is therefore a point of vital importance.

465. The Surveyor estimated that, were he to survey the Districts as per margin, originally made over to him, by the usual detail method, defining every village boundary, he could not possibly

District Hazareebaugh.
 " Palamow.
 " Maunbhoom.

complete them with his present Establishment under a period of about 16 years, still leaving the largest part of the Commissionership, *viz.*, the whole of the Districts of Chota Nagpore or Lohardugga, Singhbhoom, Sirgoojah, Odeypoor, Justipoor, and other small Gurjat Estates to the westward, untouched. The Topographical system therefore on the reduced scale is the only one adapted for such a country, or necessary to afford the required information within a moderate time, and at a cost proportionate to the object to be obtained.

466. But the Topographical Survey Party under Captain Depree, advancing from the south and the Cuttack Tributary Mehals, is now engaged and making good

Division of labor.

progress in the latter Districts, and will provide for all this extensive area, leaving the Revenue Survey Party to be employed on other ground more adapted to its competency, by which means it may be reasonably expected, the Map of this part of the country, contained in Sheets Nos. 105, 106, parts of 89, 90, 104, and 114, of the Indian Atlas, may be filled up within a very few years. The Maunbhoom District also has been transferred to another Revenue Survey Party, with a view of expediting the completion of the operations. The Map attached to this Report shows the proportion of area already effected by the two Survey Parties, Revenue and Topographical, respectively, together with what remains yet to be accomplished in this Division.

467. Of the Hazareebaugh District, only about 1,654 square miles remain

Proposed employment in ensuing Season.

		<i>Square miles.</i>
Estimated area	...	6,800
Surveyed up to date	...	5,146
Remaining	...	1,654
Add Palamow	...	4,200
Total remaining for this Party	...	5,854

for Survey, this, therefore, will be completed, and the Palamow District, where good coal has been found, taken up during the ensuing Season, and we may reckon on a couple of years more after the next to get this out of hand. It may be possible that some parts of the Chota Nagpore Districts will require to be dealt with, Revenue fashion, in which case the

services of Captain Thompson will be called in to aid the Topographical Party, and thus, by a judicious division of labor and treatment of the extensive areas calling for separate Survey or detail measurement, the whole may be got through in the most economical as well as accurate manner.

468. Captain Thompson's management, both in the Professional and Civil branches, has given great satisfaction. He turns out his work well, and with great regularity; he is a most energetic Officer, and has had considerable

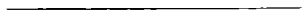
difficulties to overcome, with rather a weak Establishment, and one totally unaccustomed to the nature of the country under Survey. During the last cold season I twice inspected this Surveyor's Office in the Hazareebaugh District, and formed a high opinion of the method and order observable in all details.

469. The above constitutes the whole of the Executive Surveys engaged during the period in question. This Report has extended to a greater length

Conclusion. than I anticipated or could have desired, but the extensive operations now in progress, and the long time embraced, necessitated full explanation and detail on many points, which it is essential to place on record for future Departmental reference.

(Sd.) H. L. THUILLIER, *Lieut.-Col.*,
Surveyor General of India.

SURVEYOR GENERAL'S OFFICE ; }
CALCUTTA, }
The 15th September 1862. }



APPENDICES.

TABLE A.

GENERAL RETURN of Professional Work for the three Seasons, 1858-59 to 1860-61, exhibiting AREA, TOTAL COST, and AVERAGE RATE per Square Mile and per Village Circuit of the North-Western Provinces, Oudh, Poojab, and Sindh Surveys.

DIVISIONS AND NAMES OF SUPERINTENDING OFFICERS.	Seasons.	No. of Villages.	Average size of Village Circuits.	AREA SURVEYED.		Cost of work on permanent charges only.	Average rate per square mile.		Total cost including all Contingent charges.	Average rate per square mile.		REMARKS.
				In Acres.	In square miles.		Rs. As.	Rs. As.		Rs. As.	Rs. As.	
1ST DIVISION NAGPORE.												
Captain D. C. Vanrenen (on leave) ...	1858-59 ...	910	1,043	9,40,441	1,469	37,036	25 3	40 11	40,139	27 5	44 2	
Lieutenant R. E. Oakes in charge ...	1859-60 ...	938	1,130	10,37,702	1,653	34,070	20 10	39 6	36,992	22 5	39 6	
Lieutenant E. E. Oakes, Revenue Surveyor ...	1860-61 ...	578	1,099	6,34,925	992	37,508	37 13	64 14	42,746	43 1	73 15	
SAGOR AND NERBODDA.												
Lieutenant R. E. Oakes, Revenue Surveyor ...	2,424	1,086	26,33,069	4,114	1,08,614	26 6	44 13	1,19,766	29 2	49 6		
2ND DIVISION, NAGPORE.												
Captain E. H. Willoughby (on leave) ...	1858-59 ..	590	1,238	7,30,793	1,142	37,367	32 12	63 5	40,968	35 14	69 7	
" J. H. Grant (Officialing), Revenue Surveyor.	1859-60 ...	878	1,074	9,43,360	1,474	41,408	28 1	47 3	45,796	31 1	52 2	
	1860-61 ...	634	1,120	7,24,268	1,132	37,508	33 2	59 3	41,917	37 1	66 2	
	2,102	1,141	23,98,421	3,748	1,16,281	31 1	55 5	1,28,671	34 5	61 3		
3RD DIVISION, BUNDELKHAND.												
Lieutenant A. D. Vanrenen, Revenue Surveyor ...	1858-59 ...	296	2,158	6,93,646	988	8,249	16 00	19 10	18,737	18 12	63 4	
	1859-60 ...	425	1,792	1,37,210	1,366	50,135	23 9	70 15	30,283	23 11	71 4	
	1860-61 ...	351	1,723	6,02,720	845	92,427	17 10	63 12	27,634	17 13	64 8	
	Mouza war Topographical ...			20,01,091	3,127	71,125	19 13	66 5	71,081	19 14	66 14	
		1,072	1,867	7,44,706	1,163	13,307	19 13	66 5	13,954	19 14	66 14	* Debited to the Bhurtpore Raj.
Lieutenant F. C. Anderson, Revenue Surveyor ...	1858-59 ...	82	.....	9,98,788	1,560	41,226	28 7	0 0	43,105	27 10	0 0	
Lieutenant F. C. Anderson, Revenue Surveyor ...	1859-60 ...	822	368	2,98,522	467	30,815	68 0	37 8	32,742	70 2	39 13	Rates of Village Circuits calculated on two last Seasons.
	1860-61 ...	1,460	462	6,69,987	1,047	37,511	35 13	25 14	39,254	37 8	27 2	
	Oudh ...	2,272	451	9,68,509	1,514	68,326	45 2	30 1	71,996	47 9	31 11	
	Total	2,254	.....	19,67,297	3,074	1,09,652	35 10	0 0	1,15,101	37 7	0 0	

TABLE A.

GENERAL RETURN of Professional Work for the three Seasons, 1858-59 to 1860-61, exhibiting AREA, TOTAL COST, and AVERAGE RATE per Square Mile and per Village Circuit of the six Lower Province Surveys.

DIVISIONS AND NAMES OF SUPERINTENDING OFFICERS.	Seasons.	No. of Villages.	Average size of Village Circuits.	AREA SURVEYED.		Cost of work on permanent charges only.	Average rate per square mile.	Average rate per Village Circuit.	Total cost, including all Contingent charges.	Average rate per square mile.	Average rate per Village Circuit.
				In Acres.	In square miles.						
1ST OR NORTHERN DIVISION. J. J. Pemberton, Esq., Revenue Surveyor	1858-59	388	1,495	M 5,80,140	906	Rs. 22,073	Rs. 18 15	Rs. 56 14	Rs. 23,015	Rs. 19 12	Rs. 59 5
				T 4,43,228	724	8,814	0 0	0 0	9,195	0 0	0 0
				M 6,01,006	939	24,070	22 15	22 15	25,377	21 12	24 3
R. B. Smart, Esq., Assistant Revenue Surveyor in charge	1859-60	1,048	574	T 3,82,364	598	7,664	20 10	0 0	9,081	21 12	0 0
				M 4,81,764	753	29,837	37 15	21 1	30,664	40 10	22 10
				Mouzarwar	2,598	74,680	23 4	26 13	76,966	24 9	28 5
2ND, OR SOUTHERN DIVISION. Captain J. L. Sherwill, Officiating Revenue Surveyor	1858-59	2,004	211	25,08,562	3,920	91,158	23 4	26 13	96,232	24 9	28 5
				4,23,798	662	34,337	51 14	17 2	36,167	54 10	18 0
				5,58,989	873	36,332	41 9	14 13	39,055	43 9	15 8
3RD, OR EASTERN DIVISION. N. T. Davey, Esq., Revenue Surveyor	1859-60	2,454	227	15,11,527	2,361	1,05,979	44 14	25 13	1,11,083	47 1	27 1
				5,38,735	826	35,310	42 12	23 8	36,641	44 9	24 8
				Mouzarwar	2,598	74,680	23 4	26 13	76,966	24 9	28 5
4TH, OR WESTERN DIVISION. Captain J. E. Gastrell, Revenue Surveyor	1860-61	1,502	353	17,45,851	2,728	93,866	34 6	17 7	96,768	36 3	18 6
				6,84,207	1,382	35,314	25 9	17 14	36,797	26 10	18 10
				9,85,568	1,478	35,056	23 11	19 10	37,861	25 10	21 3
Captain J. E. Gastrell, Revenue Surveyor	1860-61	1,983	437	25,00,987	3,909	1,03,106	31 3	24 0	98,400	36 10	28 2
				6,71,212	1,049	32,736	31 3	24 0	36,400	36 10	28 2
				25,00,987	3,909	1,03,106	26 6	20 2	1,13,055	28 15	22 1

5TH, OR ARRACAN DIVISION.

1858-59	88	3,674	M 1,65,156 T 7,77,615	289	9,503	19 10	...	9,947 20,910	20 8	...
1859-60	34	2,522	M 65,739 T 14,31,188	134	3,676	14 8	...	4,988 41,623	19 11	...
1860-61	90	2,485	M 2,24,590 T 19,56,589	351	6,678	10 8	...	8,355 36,391	13 2	...
Mouzaraw...	...	...	4,35,485	774	10,857	13 11	...	23,290	10 12	...
Topographical	...	...	41,65,390	6,508	79,723	...	...	98,914	...	...
	212	"	46,60,875	7,292	99,580	13 11	...	1,22,204	16 12	...
1868-69	306	468	1,43,228	224	26,561	118 11	86 13	29,512	127 14	93 3
1869-60	1,363	443	6,08,511	943	37,677	39 15	27 10	39,404	41 14	29 0
1860-61	293	350	M 1,02,506 T 9,69,068	160	5,852	20 0	19 16	6,161	21 1	21 0
	...	...	...	1,514	27,690	...	0 0	29,151	...	0 0
Mouzaraw...	...	...	6,48,345	1,327	70,090	34 7	35 11	74,167	36 6	37 13
Topographical	...	...	9,69,068	1,514	27,690	...	0 0	29,151	...	0 0
	1,982	...	18,18,413	2,841	97,780	34 7	35 11	1,08,318	36 6	37 13
Total Revenue Detail Surveys	...	...	M 97,66,135 T 69,80,070	13,687	4,67,578	25 11	21 13	4,99,302	28 0	23 5
" Topographical	21,404	469	...	9,344	1,23,891	...	0 0	1,45,341	...	0 0
Grand Total or work completed	...	...	14,746,205	23,041	5,91,469	25 11	...	6,44,943	28 0	...

SURVEYOR GENERAL'S OFFICE,
REVENUE BRANCH:
Calcutta, the 16th September 1869.

(Sd.) H. L. THULLIER.
Surveyor General of India.

(A) 2310

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TABLE E.

GENERAL STATEMENT of sums actually drawn, inclusive of Guards, for the North-Western Provinces, Punjab, Oudh, and Sindh Revenue Surveys, during Seasons 1858 to 1861, exhibiting amount drawn in each Class.

MONTHS.	Superintending Officers & Contract allowance.		European Assistants.		Native Establishment.		Guards.		Total cost without Contingencies.	
	1858	1861								
October	13,154	0	16,742	4	30,954	0	1,522	1	62,372	5
November	13,026	7	17,683	1	34,169	15	1,689	11	66,569	2
December	12,930	0	17,548	4	36,438	6	1,651	8	68,568	2
January	13,656	0	18,467	14	37,149	7	1,743	8	71,016	13
February	13,109	9	18,462	12	36,634	3	1,735	10	69,932	2
March	14,226	11	18,141	4	33,373	6	1,630	9	67,371	14
April	13,296	1	18,858	5	27,708	10	1,464	13	61,327	13
May	13,687	4	18,786	5	19,221	0	1,086	11	52,781	4
June	13,755	0	18,195	13	14,381	12	945	9	47,278	2
July	13,755	0	18,185	0	12,814	10	847	9	45,602	3
August	13,755	0	18,526	10	12,509	6	869	3	45,660	3
September	13,048	13	19,260	0	16,503	9	1,224	0	51,036	6
Total drawn for each Class	1,62,399	13	2,18,857	8	3,11,858	4	16,400	12	7,09,516	5
" Contingencies	.....	.....	.....	.....	.....	.....	.....	.....	66,094	5
Total cost with Contingencies...	.....								
	Total cost with Contingencies... .. 7,75,610 10									

Of the above Statement, the following Table exhibits the expense under each Class of the Revenue Surveys respectively.

SURVEYS.	Surveyors & Contract allowance.		Assistants.		Guards.		Native Surveyors.		Tindals, Khala-sees, or Measurers.		Total expense without Contingencies.		Total expense with Contingencies.	
Nagpore	41,855	0	61,192	12	4,002	9	32,276	11	48,059	9	1,87,386	9	2,05,690	5
Saugor and Nerbudda	8,712	0	11,400	0	914	1	6,772	15	9,709	6	37,508	6	42,746	0
Bundelkhand	23,958	0	28,969	15	1,603	12	15,402	12	14,826	7	84,760	14	85,615	0
Punjab	36,600	0	48,452	7	4,472	7	19,632	8	42,966	15	1,52,124	5	1,68,514	9
Oudh	23,624	7	31,878	8	2,506	7	18,413	1	25,899	14	1,05,322	5	1,12,969	12
Sindh	27,650	6	33,963	14	2,901	8	38,015	10	39,882	8	1,42,413	14	1,60,075	0
Total	1,62,399	13	2,18,857	8	16,400	12	1,30,513	9	1,81,344	11	7,09,516	5	7,75,610	10

SURVEYOR GENERAL'S OFFICE, }
 REVENUE BRANCH: }
 Calcutta, the 15th September 1862.

(Sd.) H. L. THULLIER,
 Surveyor General of India.

(H) 203 312

TABLE E.

GENERAL STATEMENT of sums actually drawn, inclusive of Guards, for the six Bengal or Lower Province Revenue Surveys, during Seasons 1858 to 1861, exhibiting amount drawn in each Class.

MONTHS.	Superintending Officers and Contract allowance.	European Assistants.	Native Establishment.	Guards.	Total cost without Contingencies.	Total cost with Contingencies.
October 1858 to 61	11,865 7	14,878 8	10,414 7	579 0	37,737 6	42,168 10
November	11,928 0	14,467 7	21,185 14	619 13	48,201 2	52,632 6
December	11,847 3	14,905 7	25,687 1	997 3	53,436 14	57,868 1
January	12,451 0	17,052 15	27,394 6	1,171 7	58,009 12	62,441 0
February	12,615 2	18,180 0	26,213 0	1,171 0	58,179 9	62,610 12
March	12,804 1	17,816 1	27,337 2	1,219 13	59,177 1	63,608 5
April	12,710 9	17,462 3	25,529 10	1,070 12	56,773 2	61,204 5
May	12,391 0	17,014 3	21,231 8	869 13	51,536 8	55,967 13
June	12,251 4	17,204 3	14,139 9	650 4	44,245 14	48,677 2
July	12,128 0	16,680 2	11,360 15	596 0	40,768 1	45,196 5
August	13,513 2	16,788 2	10,800 1	638 12	41,740 1	46,171 5
September	12,654 0	17,308 12	11,058 3	647 5	41,865 4	46,099 10
Total drawn for each Class	1,49,159 6	1,99,788 6	2,32,291 12	10,231 2	5,91,470 10	6,44,645 10

Of the above Statement, the following Table exhibits the expense under each Class of the six Revenue Surveys respectively.

SURVEYS.	Surveyors and Contract allowance.	Assistants.	Guards.	Native Surveyors.	Khalasces or Measurers.	Total cost without Contingencies.	Total cost with Contingencies.
1st, or Northern Division	23,686 0	30,514 13	1,148 0	17,962 11	17,847 2	91,158 10	96,232 7
2nd, or Southern Division	25,236 5	35,026 12	1,759 12	22,922 13	21,034 3	1,05,970 13	1,11,063 4
3rd, or Eastern Division	23,514 0	31,906 9	1,438 9	18,415 9	18,591 13	98,866 8	98,768 3
4th, or Western Division	26,136 0	37,593 15	1,309 1	18,466 14	19,599 5	1,03,106 5	1,13,057 11
5th, or Arracan Division	26,629 0	30,294 3	1,598 1	16,740 6	23,918 9	99,580 3	1,23,205 2
6th, or Chota Nagpore Division	23,958 1	34,452 2	2,577 11	16,683 1	20,109 6	97,780 5	1,03,318 15
Total	1,49,159 6	1,99,788 6	10,231 2	1,11,191 6	1,21,100 6	5,91,470 10	6,44,645 10

SURVEYOR GENERAL'S OFFICE,

REVENUE BRANCH:

Calcutta, the 15th September 1862.

(Sd.)

H. L. THULLIER,

Surveyor General of India.

TABLE H.

Statement showing Area, Cost, Average rate per Square Mile, &c., of the whole Sind Saugor Doab Punjab completed Survey.

SEASONS.	DISTRICTS.	No. of Main Cir- cuts.	No. of Mouzahs.	No. of Hulkas, or Traverse Cir- cuts.	Average size of Traverse Cir- cuts.	AREA IN		Cost, exclusive of Contingent ex- penses.	Average rate per square mile.	Cost, inclusive of Contingent ex- penses.	Average rate per square mile, in- cluding Con- tingents.
						Acres.	Square miles.				
1855-56	Mozuffergurh ... Jhung ...	12 and 14 R.C.	633	633	3,217	23,17,183	3620.59	49,392	13 10	51,521	14 3
1856-57	Leia ...	8	272	303 including 7 R. Circuits	7,399	23,86,576	3729.03	37,994	10 3	39,701	10 10
1857-58	Leia ...	8	100	100	27,567	27,56,769	4307.45	34,582	8 0	35,845	8 5
1858-59	Leia and Shabpore ...	5	118	118	8,464	9,98,788	1560.61	41,226	26 6	43,105	27 9
4 Seasons.	Mozuffergurh, Leia, and portions of Jhung and Shabpore ...	33 + 14 R.C.	1,123	1,154	6,917	84,59,316	13217.68	1,63,194	12 5	1,70,172	12 14

Mouzarwar.	Thul.	River.	Hills.	Total.
1855-56...	2071.35	1110.62	438.62	3620.59
1856-57...	2060.10	1362.11	306.82	3729.03
1857-58...	620.90	3598.91	87.64	4307.45
1858-59...	1379.51	"	119.36	1560.61
6131.86	6071.64	952.44	61.74	13217.68

SURVEYOR GENERAL'S OFFICE,
REVENUE BRANCH:
Calcutta, the 15th September 1862.

(Sd.)

H. L. THULLIER,

Surveyor General of India.

TABLE H.

STATEMENT showing the AREA, COST, and RATE per Square Mile, &c., of the Districts in the LOWER PROVINCES, the Survey of which has been completed since last Report.

DISTRICTS.	When commenced to be surveyed.	When finished.	By whom surveyed.	AREA.		Cost exclusive of Contingent Expenses.	Rate per square Mile.	Cost inclusive of Contingent Expenses.	Rate per square Mile.	REMARKS.
				Acres.	Square Miles.					
Jessore ...	Season 1855-56	Season 1858-59	Captain J. E. Gastrell ...	2,202,152	3,441	Rs. 88,522	Rs. As. 25 11	Rs. 92,151	Rs. As. 26 12	
Rungpore ...	" 55-56	" 58-59	Mr. J. J. Pemberton ...	3,167,460	4,949	*1,24,125	25 1	1,28,029	25 13	* Portions of these Districts have been transferred to District Bogra.
Dacca ...	" 57-58	" 59-60	Mr. N. T. Davey and Captain J. E. Gastrell ...	2,159,774	3,375	1,02,581	30 6	1,07,373	31 13	
Furzedpore ...	" 58-59	" 59-60	Captain J. E. Gastrell ...	936,938	1,464	37,449	25 9	39,202	26 12	
Dinagpore ...	" 57-58	" 60-61	Captains W. S. Row and J. L. Sherwill, and Messrs. J. J. Pemberton and R. A. Smith..	2,935,152	4,586	*1,93,392	42 2	2,02,028	44 0	
Kooch Behar ...	" 58-59	" 59-60	Messrs. J. J. Pemberton and R. A. Smith ...	846,626	1,323	9,935	7 8	10,402	7 13	
Akyab ...	" 53-54	" 60-61	Mr. J. H. O'Donel ...	7,024,004	10,975	†2,07,294	18 14	2,32,533	21 3	† This includes 102 Square miles of District Chittagong.

SURVEYOR GENERAL'S OFFICE,
REVENUE BRANCH;
Calcutta, the 15th September 1862.

(Sd.) H. L. THULLIER,
Surveyor General of India.

(A) 205 319

(*) 206 315

APPENDIX G.

Statement exhibiting the number, different grades, and length of Service of Military and Civil Officers, Assistants and Sub-Assistants, attached to the Revenue Branch of the Survey Department.

CALCULATED TO 15TH SEPTEMBER 1862.

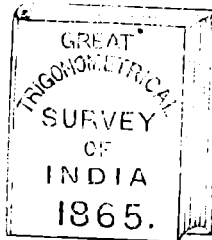
Number.	NAME AND RANK.	Departmental designation.	Date of first appointment to Department.	Total length of Service.		Service in present grade.	Present Salary			
				Y. M. D.	Y. M. D.					
1	Lieutenant-Colonel D. C. Vanrenen ...	Revenue Surveyor ...	29th Dec. 1846 ...	15	11	15	14	13	15	528
	Captain G. H. Thompson ...	Ditto ...	20th Nov. 50 ...	11	9	15	9	12	15	526
	Major J. E. Gastrell ...	Ditto on special duty ...	Oct. 51 ...	10	11	15	8	8	10	528
	J. H. O'Donel, Esq. ...	Ditto ...	1st Dec. 36 ...	25	9	15	6	11	15	520
	Captain H. C. Johnstone ...	Ditto ...	18th June 53 ...	9	3	0	6	9	15	526
	„ J. MacDonald ...	Ditto ...	10th Sept. 52 ...	10	0	15	6	8	15	526
	„ F. C. Anderson ...	Ditto ...	11th Sept. 52 ...	10	0	5	4	9	15	526
	„ J. H. Grant ...	Officiating Surveyor ...	6th Sept. 56 ...	6	0	15	4	5	15	526
	„ A. D. Vanrenen ...	Revenue Surveyor ...	6th Oct. 56 ...	5	11	15	3	10	15	526
	Major J. L. Sherwill ...	Ditto ...	23rd Sept. 56 ...	5	11	23	3	9	15	520
	W. Lane, Esq. ...	Ditto ...	10th Feb. 37 ...	24	7	15	2	4	21	526
	N. T. Davey, Esq. ...	Ditto ...	18th Mar. 41 ...	21	6	15	2	4	15	526
	Captain R. E. Oakes ...	Ditto ...	10th April 58 ...	4	5	15	2	1	15	526
	R. B. Smart, Esq. ...	Ditto ...	21st Sept. 46 ...	15	11	15	0	2	15	526
	Lieutenant Penton Thompson ...	Ditto ...	6th Oct. 59 ...	3	11	11	0	2	15	526
	„ J. Sconce ...	Officiating Surveyor ...	13th Dec. 59 ...	2	9	16	0	1	23	398
17	„ W. J. Stewart ...	Ditto ...	8th Oct. 60 ...	1	11	9	0	4	2	388
1	Mr. E. T. S. Johnson ...	Assistant Revenue Surveyor in charge ...	10th Oct. 47 ...	14	11	15	...	...	...	398
	„ A. D. Smart ...	Ditto ...	3rd Dec. 47 ...	14	9	14	...	...	...	398
3	„ H. B. Talbot ...	Ditto ...	1st Oct. 52 ...	9	11	15	...	...	...	399
1	Major W. S. Row ...	Assistant Revenue Surveyor ...	27th Jan. 56 ...	6	7	15	6	7	15	360
	Lieutenant D. MacDonald ...	Ditto ...	29th Dec. 60 ...	1	8	27	1	8	27	260
	„ J. W. Taylor ...	Ditto ...	4th Jan. 61 ...	1	8	15	1	8	15	250
	„ F. Coddington ...	Ditto ...	13th Jan. 62 ...	0	8	0	0	8	0	250
	„ J. H. W. Osborne ...	Ditto ...	4th Mar. 62 ...	0	6	15	0	6	15	250
	„ A. D. Butler ...	Ditto ...	1st July 62 ...	0	2	15	0	2	15	250
	„ W. Barron ...	Ditto ...	1st July 62 ...	0	2	15	0	2	15	250
8	„ H. C. B. Tanner ...	Ditto ...	15th Oct. 62 ...	...	...	...	...	...	...	...
1	Mr. J. Campbell ...	Assistant Revenue Surveyor, 1st Class ...	8th Oct. 44 ...	17	11	15	2	5	15	350
	„ W. A. Wilson ...	Ditto ...	4th Dec. 23 ...	33	9	13	1	8	15	350
3	„ W. Ivey ...	Ditto ...	3rd Mar. 38 ...	24	9	15	1	8	15	350
1	Mr. G. H. Blyth ...	Assistant Revenue Surveyor, 2nd Class ...	1st Dec. 46 ...	15	9	15	3	8	14	300
	„ G. S. Swiney ...	Ditto ...	Oct. 41 ...	20	11	15	2	8	15	300
	„ G. Housden ...	Ditto ...	18th Feb. 47 ...	15	6	26	1	11	15	300
	„ J. R. Pringle ...	Ditto ...	1st Mar. 38 ...	24	9	15	1	8	15	300
	„ W. Ellison ...	Ditto ...	1st Oct. 46 ...	15	11	15	0	8	15	300
6	„ J. Pickard ...	Ditto ...	1st Nov. 46 ...	15	10	15	0	8	15	300

Number.	NAME AND RANK.	Departmental designation.	Date of first appointment to Department.	Total length of Service.	Service in present grade.	Present Salary.
				Y. M. D.	Y. M. D.	
7	Mr. W. H. Bolton	Assistant Revenue Surveyor, } 2nd Class	5th Jan. 1854 ...	8 8 11	0 4 15	300
8	" W. H. Patterson	Ditto	1st Dec. 51 ...	10 9 15	0 0 15	300
1	Mr. E. Loftie	Assistant Revenue Surveyor, } 3rd Class	1st Jan. 47 ...	15 8 15	0 8 15	250
2	" P. Agabeg	Ditto	1st Dec. 51 ...	10 9 15	0 8 15	250
1	Mr. J. J. Burrowes	Senior Sub-Assistant Revenue } Surveyor, 1st Class	21st Dec. 46 ...	15 8 26	3 3 15	225
	" E. Foy	Ditto	7th Feb. 55 ...	7 7 7	1 11 15	200
	" C. W. Campbell	Ditto	1st Nov. 53 ...	8 10 15	1 11 15	200
	" F. W. Kelly	Ditto	4th Dec. 54 ...	7 9 13	1 8 15	200
	" W. Vvall	Ditto	13th June 56 ...	6 3 3	1 6 15	200
	" W. Sinclair	Ditto	6th Oct. 55 ...	6 11 15	0 8 15	200
	" A. Hyde	Ditto	19th Feb. 56 ...	6 7 15	0 8 15	200
8	" F. Grant	Ditto	10th July 56 ...	6 2 15	0 5 15	200
1	Mr. D. W. Burnett	Sub-Assistant Revenue Sur- } veyor, 2nd Class	1st Nov. 52 ...	9 10 15	1 8 15	175
	" C. P. Brownfield	Ditto	20th Sept. 56 ...	5 11 15	1 8 15	175
	" J. Hodgson	Ditto	1st Nov. 53 ...	8 10 15	0 8 15	175
	" H. L. Pemberton	Ditto	20th Dec. 56 ...	5 8 27	0 8 15	175
	Baboo Lallaram	Ditto	1st Sept. 35 ...	27 0 15	5 8 15	150
	Mr. A. F. Bonny	Ditto	1st Sept. 54 ...	8 0 15	2 11 15	150
	" C. David	Ditto	1st Sept. 47 ...	15 0 15	0 8 15	150
8	" R. Barclay	Ditto	20th Sept. 56 ...	5 11 15	0 8 15	150
1	Mr. E. Scott	Sub-Assistant Revenue Sur- } veyor, 3rd Class	1st Oct. 51 ...	10 11 15	2 9 14	125
	" G. R. Buttress	Ditto	1st Nov. 55 ...	6 10 15	2 11 15	125
	" G. Bonny	Ditto	6th Feb. 56 ...	6 7 8	1 6 15	125
	" H. Billen	Ditto	1st June 52 ...	10 3 15	0 11 14	100
	" P. H. W. Brady	Ditto	1st Feb. 60 ...	2 7 15	0 9 14	100
6	" G. W. Johnson	Ditto	1st June 61 ...	1 3 15	0 8 15	100
1	Mr. G. V. Thompson	Junior Sub-Assistant Revenue } Surveyor	19th Nov. 47 ...	14 9 27	3 8	100
	Baboo Hurri Sing	Ditto	28th Oct. 52 ...	9 10 19	2 8 15	100
	Mr. R. Savage	Ditto	12th Aug. 57 ...	5 1 5	2 8 15	100
	" M. Brennan	Ditto	18th Dec. 58 ...	3 8 20	1 11 15	100
	" P. Cowley	Ditto	1st Sept. 59 ...	3 0 15	3 0 15	100
	" G. Rae	Ditto	1st Sept. 59 ...	3 0 15	3 0 15	100
	" W. Reilly	Ditto	18th Oct. 59 ...	2 10 29	2 10 20	100
	" L. Deveria	Ditto	15th Nov. 59 ...	2 9 15	2 9 15	100
	" W. A. Madge	Ditto	1st Dec. 59 ...	2 9 15	2 2 15	100
	" T. W. Nicholson	Ditto	1st Dec. 59 ...	2 9 15	2 2 15	100
	" G. E. Nash	Ditto	1st Jan. 60 ...	2 8 15	2 8 15	100
	" J. Harris	Ditto	1st May 60 ...	2 4 15	0 8 15	100
	" S. M. Smylle	Ditto	24th July 60 ...	2 1 15	2 1 15	100
14	" C. Sheridan	Ditto	20th Sept. 60 ...	1 11 20	1 11 28	100

Num. ber.	NAME AND RANK.	Departmental designation.	Date of first appointment to Department.	Total length of Service.	Service in present grade.	Present Salary.
				Y. M. D.	Y. M. D.	
15	Mr. W. S. Buttress...	Junior Sub-Assistant Revenue } Surveyor, 3rd Class ...	1st Oct. 1860 ...	1 11 15	0 8 15	100
	„ H. R. Littlewood ...	Ditto ...	6th Oct. 60 ...	1 11 11	1 11 11	100
	„ J. S. Pemberton ...	Ditto ...	6th Oct. 60 ...	1 11 11	1 11 11	100
	„ W. A. Wilson ...	Ditto ...	1st Jan. 61 ...	1 8 15	1 8 15	100
	„ W. H. Reynolds ...	Ditto ...	14th Mar. 61 ...	1 6 3	0 8 15	100
	„ H. Walsh ...	Ditto ...	14th Mar. 61 ...	1 6 3	0 8 15	100
	„ A. Gibson ...	Ditto ...	1st May 61 ...	1 4 15	0 8 15	100
	„ J. D. Lynch ...	Ditto ...	1st Aug. 61 ...	1 0 15	0 10 15	100
	„ W. E. Bradley... ..	Ditto ...	1st Nov. 61 ...	0 10 15	0 10 15	100
	„ J. A. Swyny ...	Ditto ...	13th Feb. 62 ...	0 7 0	0 4 15	100
	„ H. Meany ...	Ditto ...	8th Oct. 62 ...			
	„ H. Dowman ...	Ditto ...	16th Oct. 62 ...			
	„ H. T. Hanby ...	Ditto ...	13th Nov. 62 ...			
	Corporal A. Lawson ...	Ditto ...				
	„ J. Mills ...	Ditto ...				
	„ L. G. Hill... ..	Ditto ...				
	„ W. Street... ..	Ditto ...				
	Gunner H. Wray ...	Ditto ...				
33	Corporal J. Bartram ...	Ditto ...				
				Recently appointed, not joined.		
1	Mr. G. C. Bolst ...	Office Assistant and Draftsman ...	16th Oct. 50 ...	11 11 0	3 2 15	125
	„ J. Doran ...	Ditto ...	14th Nov. 55 ...	4 8 15	4 8 15	75
	„ J. Bridge ...	Ditto ...	15th Jan. 58 ...	4 8 2	4 8 2	75
4	„ E. Little ...	Ditto ...	1st Jan. 60 ...	2 8 15	2 8 15	60

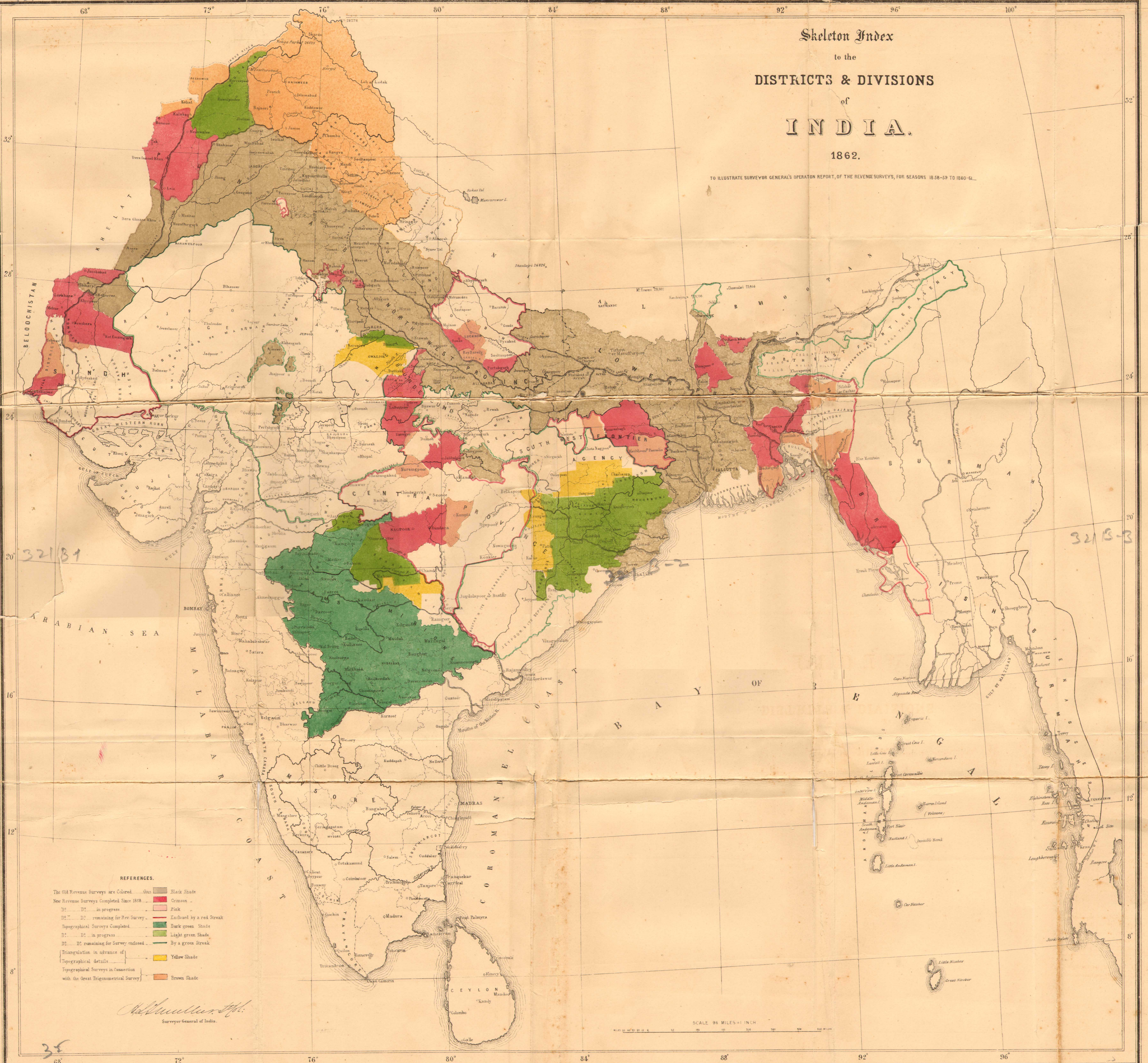
SURVEYOR GENERAL'S OFFICE,
REVENUE BRANCH;
Calcutta, 25th November 1862.

(8d.) H. L. THULLIER, *Lieut.-Col.*,
Surveyor General of India.



Skeleton Index
to the
DISTRICTS & DIVISIONS
of
INDIA.
1862.

TO ILLUSTRATE SURVEYOR GENERAL'S OPERATION REPORT, OF THE REVENUE SURVEYS, FOR SEASONS 1858-59 TO 1860-61.



REFERENCES.

- The Old Revenue Surveys are Colored Black Shade
- New Revenue Surveys Completed Since 1858 Crimson
- D1. D2. In progress Pink
- D1. D2. remaining for Rev Survey Enclosed by a red Streak
- Topographical Surveys Completed Dark green Shade
- D1. D2. in progress Light green Shade
- D1. D2. remaining for Survey enclosed By a green Streak
- Triangulation in advance of Topographical details Yellow Shade
- Topographical Surveys in Connection with the Great Trigonometrical Survey Brown Shade

W. H. Murray
Surveyor General of India.

SCALE 96 MILES = 1 INCH

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321 A-3

321 B-1

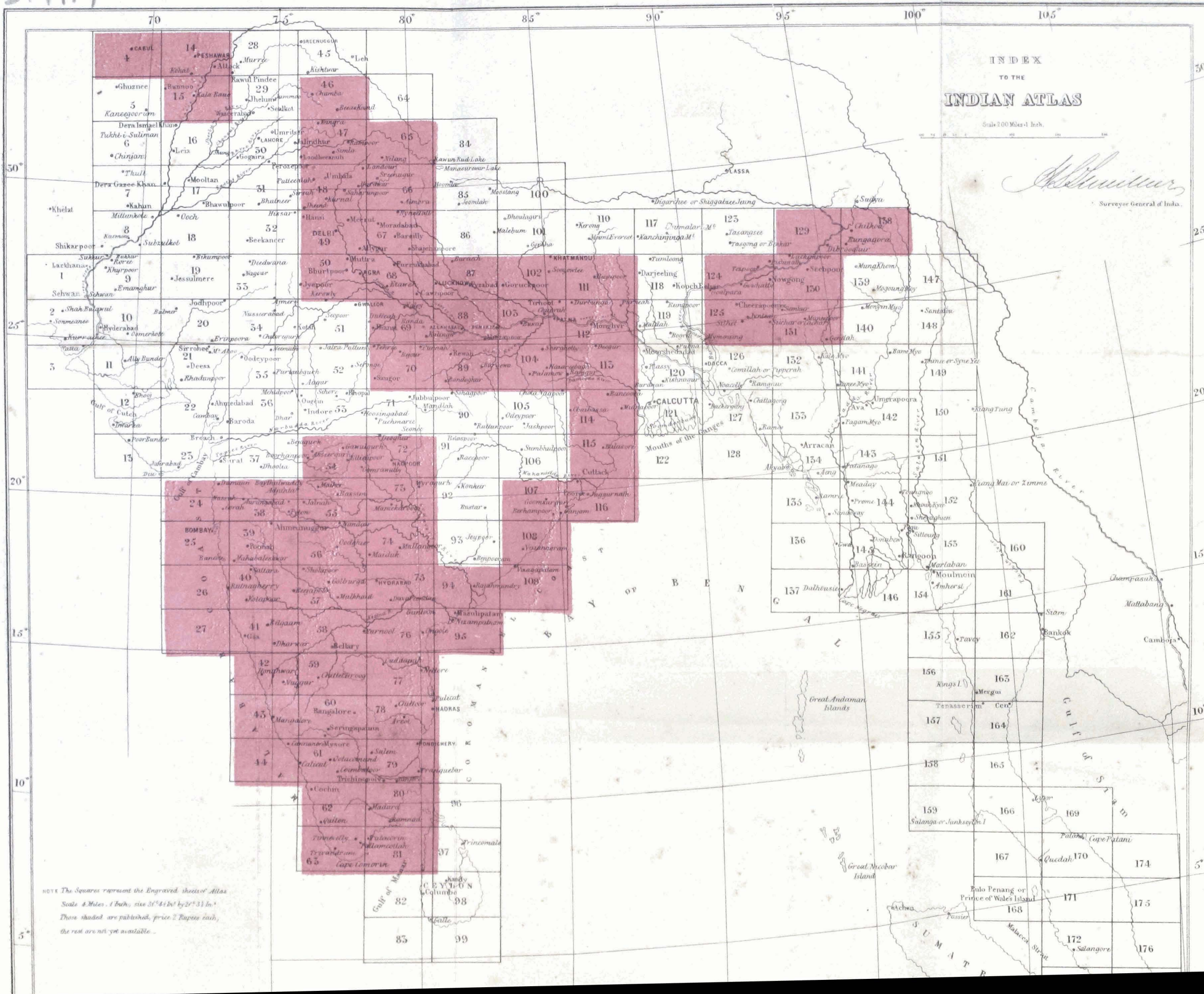
321 B-3

321 C-1

321 C-3

321 C-2

319A-1 210



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INDIAN ATLAS

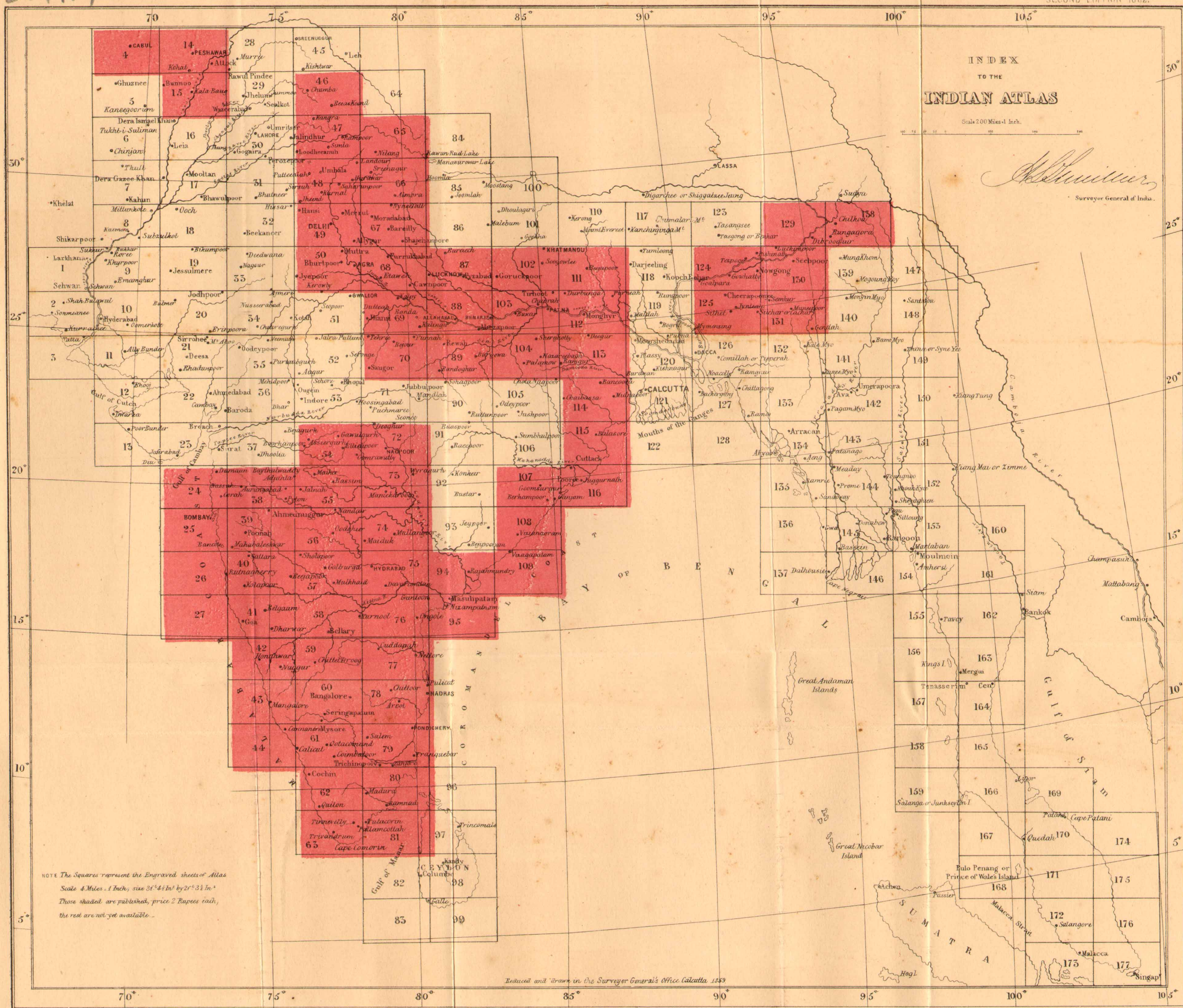
Scale 200 Miles = 1 Inch.

W. H. Murray
Surveyor General of India.

NOTE The Squares represent the Engraved sheets of Atlas
Scale 4 Miles = 1 Inch, size 31" 44 lines by 27" 31 lines.
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the rest are not yet available.

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319A2
SECOND EDITION 1862.



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W. H. Miller
Surveyor General of India.

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Revised and drawn in the Surveyor General's Office Calcutta 1859

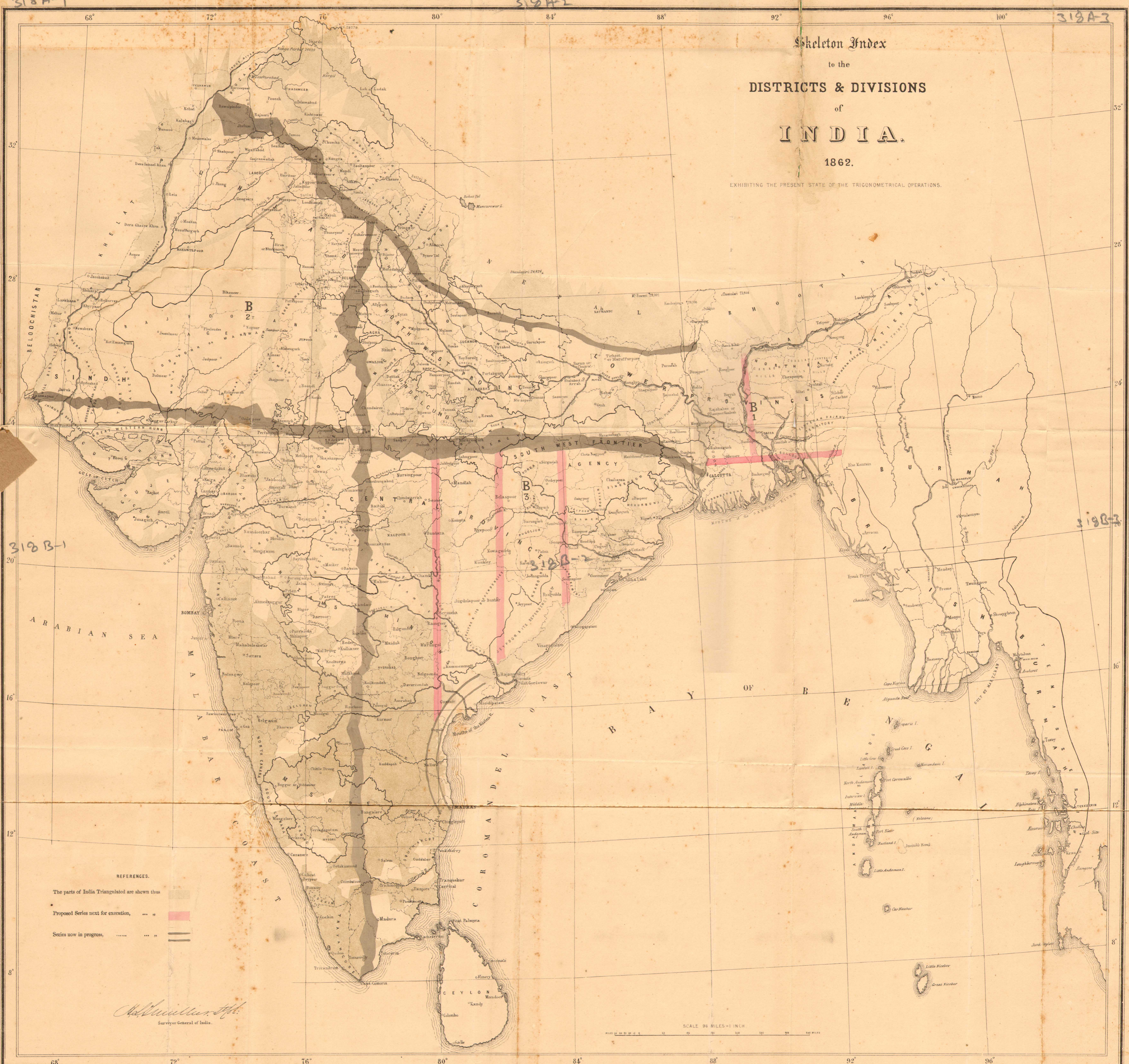
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to the
DISTRICTS & DIVISIONS

of
INDIA.

1862.

EXHIBITING THE PRESENT STATE OF THE TRIGONOMETRICAL OPERATIONS.



REFERENCES.

The parts of India Triangulated are shown thus

Proposed Series next for execution, ...

Series now in progress,



W. H. Miller
Surveyor General of India.

SCALE 96 MILES = 1 INCH

