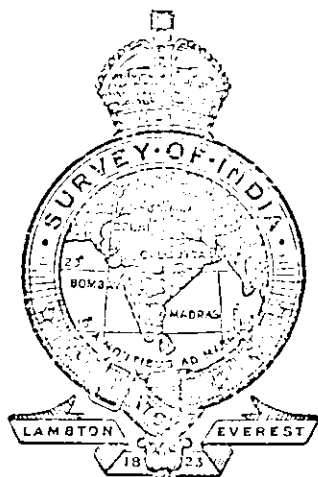


SURVEY OF INDIA
GENERAL REPORT

1936



From 1st October 1935
To 30th September 1936

PUBLISHED BY ORDER OF
BRIGADIER H. J. COUCHMAN, D.S.O., M.C.,
SURVEYOR GENERAL OF INDIA.

Printed at the Photo.-Litho. Office,
Survey of India.

Price Eight Annas or Two Shillings and Six Pence.



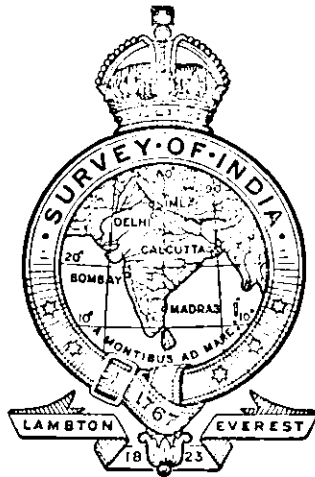
LIEUT. GENERAL CHARLES REYNOLDS. (1758-1819).

SUBSTANTIAL GENERAL BOMBAY 1796-1807.

(For biography see page 2).

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1936.

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NOTICES

- I. Work done by the Survey of India.
- II. How to obtain maps and other publications.
- III. List of Agents for the sale of maps.

I. WORK DONE BY THE SURVEY OF INDIA

APPLICATION FOR SURVEYS OF ANY KIND, whether for private or Government purposes, should be made to the following officers:

The Director,	Frontier Circle,*	Survey of India,	Simla.	(Tel. "Surfrontier").
"	"	Geodetic Branch,*	"	Dehra Dūn. (Tel. "Surtrig").
"	"	Eastern Circle,*	"	Shillong. (Tel. "Sureast").
"	O. C.	No. 6 (South India)	"	Bangalore. (Tel. "Surfield Six")
"	"	Party,*	"	"
"	"	No. 10 (Burma)	"	Maymyo. (Tel. "Surfield Ten")
"	"	Party,*	"	"

FOREST AND CANTONMENT SURVEYS, LEVELLING, TRIANGULATION AND TIDE-TABLES. Advice in regard to these, and on scientific questions, is obtainable from the *Director, Geodetic Branch, Survey of India, Dehra Dūn*, who undertakes a good deal of levelling and similar work for municipalities and engineering projects, on payment (Telegrams "Surtrig").

MAPS AND ILLUSTRATIONS can be printed by the *Director, Map Publication, Survey of India, 13 Wood Street, Calcutta*, for Government Departments only, and special maps can also sometimes be prepared, on payment. (Telegrams "Surpub").

THE MATHEMATICAL INSTRUMENT OFFICE, Survey of India, 15, Wood Street, Calcutta, is a well equipped Government Factory which supplies, manufactures and repairs all kinds of Surveying, Drawing, Optical, Meteorological and Medical instruments. It also manufactures special instruments for experimental purposes and receives back surplus instruments on valuation, from all Government Departments, whether Imperial or Provincial.

The Price List, Rules and Regulations and Forms for Indent, Repairs and Deposits are supplied gratis on application. (Telegram "Surinst").

GENERAL ENQUIRIES should be addressed to the Assistant Surveyor General, 13, Wood Street, Calcutta. (Telegrams "Surveys") as the Surveyor General of India is on tour during most of the year.

* Provinces and States in each Survey Circle.

- | | | |
|---|--|---|
| <p>1. FRONTIER Circle
Kashmir and Jammu
N. W. F. Province
Balochistān
Punjab
Punjab States
Bikaner State
Sind.</p> | <p>2. GEODETIC Branch
United Provinces
Central India
Gwalior
Ajmer-Merwāra
Delhi
Rājputāna (excluding
Bikaner).
Baroda
Bombay (Northern
Division).
States of Western
India.</p> | <p>3. No. 6 (South
India) Party.
Madras
Madras States
Hyderābād
Mysore and Coorg
Bombay (Southern
Division).</p> |
| <p>5. No. 10 (Burma) Party.
Burma.</p> | <p>4. EASTERN Circle
Central Provinces
(including Berār).
Bengal
Bihār
Assam and Sikkim
Eastern States
Orissa.</p> | |

II. HOW TO OBTAIN MAPS AND OTHER PUBLICATIONS

SURVEY OF INDIA MAPS are obtainable from the Map Office, 13, Wood Street, Calcutta (*Tel. "Surmaps"*). Also to some extent from the Agents listed in Notice III and from the Directors of Survey Circles. A **MAP CATALOGUE**, which itself forms a useful atlas of India and surrounding countries, can be obtained for *Re. 1/- (post free)*.

FOREST AND CANTONMENT MAPS are obtainable from the Map Office, Survey of India, Dehra Dūn. (*Tel. "Surtrig"*).

GEOLOGICAL MAPS are prepared by and can be obtained from the Director, Geological Survey, Calcutta.

SURVEY PUBLICATIONS OTHER THAN MAPS, as outlined below, are obtainable through the Director, Geodetic Branch, Survey of India, Dehra Dūn, who will supply a full Catalogue *gratis* on application. The Catalogue is also included in the Annual Geodetic Report.

- (a) *Trigonometrical data.* Triangulation pamphlets, each covering one square degree, giving descriptions, positions, and heights of triangulated points and other data, with chart. Levelling pamphlets, each covering $4^{\circ} \times 4^{\circ}$, giving descriptions and heights of Bench marks, with chart.
- (b) *Tidal Predictions*, published annually in advance as *Tide-Tables of the Indian Ocean*. These tables contain predictions for 41 Indian and Burmese ports, and for 28 other ports in various parts of the world.
- (c) *Geodetic works of Reference*—The G.T.S. series of twenty-one large quarto volumes describing in detail the geodetic operations of the Great Trigonometrical Survey from 1800. Detailed accounts are given of the Base-line measurements, of the reduction of the Geodetic Triangulation treated in five portions, of the early Pendulum observations, of Telegraphic Longitude and Astronomical Latitude operations, of Tidal observations, and of Levelling of high precision.
- (d) *Historical, and General Reports*, including the "Memoirs on Indian Surveys" by Sir Clements Markham and C.E.D. Black: also Annual Reports, Narrative Reports, Record Volumes, and the annual Geodetic Reports.
- (e) *Miscellaneous.* Papers on Geodesy, Exploration, etc. including a "Sketch of the Geography and Geology of the Himālaya Mountains and Tibet" (in 4 parts) revised in 1933.

III. LIST OF AGENTS FOR THE SALE OF MAPS

OUT OF INDIA.

- | | |
|-----------------|---|
| <i>England.</i> | 1. Secy. to the High Commissioner for India. (Genl. Deptt.), India House, Aldwych, London, W. C. 2. |
| | 2. Sifton Praed & Co. Ltd., The Map House, 67 St. James's Street, London, S. W. 1. |
| <i>America.</i> | 3. C. S. Hammond & Co., 30 Church St., Hudson Terminal, New York, and 75 State St., Boston, Mass. |
| <i>Germany.</i> | 4. Dietrich Reimer, Berlin, S. W. 48. |
| <i>China.</i> | 5. French Book Stores, Grand Hotel de Pekin, Peiping. |

INDIA.

- | | |
|--------------------|---|
| <i>Agra.</i> | 1. English Book Depot, Taj Road. |
| | 2. Indian Army Book Depot, Dayal Bagh. |
| <i>Ajmer.</i> | 3. Rajputana Book House. |
| <i>Allahabad.</i> | 4. North India Christian Tract and Book Society. |
| <i>Ambala.</i> | 5. Ram Chander & Sons. |
| | 6. English Book Depot, Ambala Cantonment. |
| <i>Bangalore.</i> | 7. Raja Gopal Photo. Zinco. and Printing Works, Fort Bangalore. |
| <i>Bareilly.</i> | 8. London Book Depot. |
| <i>Baroda.</i> | 9. B. Parikh & Co., Mandvi Road. |
| <i>Bombay.</i> | 10. Thacker & Co. |
| | 11. D. B. Taraporevala Sons & Co. |
| | 12. King & Co., 213-215 Badri Mahal, Hornby Road. |
| <i>Calcutta.</i> | 13. W. Newman & Co., 3 Old Court House Street. |
| | 14. Automobile Association of Bengal, 40 Chowringhee. |
| | 15. City Map Agency, Govt. Book Depot, 8 Hastings St. |
| | 16. Oxford Book & Stationery Co., 17, Park St. |
| | 17. Thacker Spink & Co., 3 Esplanade East. |
| | 18. Kali Charan & Co., B. 40-41, Municipal Market. |
| | 19. Royal Book Store, B. 48 Municipal Market. |
| <i>Cawnpore.</i> | 20. Advani Brothers. |
| <i>Darjeeling.</i> | 21. Oxford Book & Stationery Co. |
| <i>Delhi.</i> | 22. Oxford Book & Stationery Co., Kashmir Gate. |
| | 23. Oxford Book & Stationery Co., Connaught Place, New Delhi. |
| | 24. Ramesh Book Depot and Stationery Mart. |
| | 25. J. M. Jaina & Brothers, Mori Gate. |
| | 26. Bhawani & Sons, Connaught Place, New Delhi. |
| <i>Dum-Dum.</i> | 27. Indian Air Survey & Transport Ltd. |
| <i>Ferozepore.</i> | 28. English Book Depot, Wazir Ali Buildings. |
| <i>Indore.</i> | 29. The Manager, Dak Bungalow, Indore. |
| | 30. The Proprietor, Central India High Class Athletic Depot. |
| <i>Jhansi.</i> | 31. English Book Depot. |
| <i>Karachi.</i> | 32. Aero Stores, Napier Road. |
| <i>Kasauli.</i> | 33. Ram Chander & Sons. |
| <i>Kashmir.</i> | 34. Cockburns Agency, Srinagar. |
| | 35. D. G. Smith & Co., Srinagar. |
| <i>Lahore.</i> | 36. Punjab Religious Book Society, Anarkali. |
| | 37. Standard Book Depot. |
| | 38. Oxford Book & Stationery Co. |
| <i>Lucknow.</i> | 39. Lucknow Publishing House, The Mall. |
| <i>Madras.</i> | 40. Higginbothams Ltd. |
| <i>Meerut.</i> | 41. Oxford Book & Stationery Co. |

(Continued Overleaf)

III. LIST OF AGENTS FOR THE
SALE OF MAPS—(Concl'd.)

INDIA.—(Concl'd.)

- | | | |
|--------------------|-----|--|
| <i>Murree.</i> | 42. | J. Ray & Sons, The Mall. |
| <i>Mussoorie.</i> | 43. | The Mussoorie Book Society. |
| <i>Muzajarpur.</i> | 44. | Burman & Co. |
| <i>Nāgpur.</i> | 45. | Superintendent, Govt. Printing, Book Depot. |
| <i>Ootacamund.</i> | 46. | Higginbothams Ltd. |
| <i>Patna City.</i> | 47. | K. P. Saxena & Co., Diwan Mohlla. |
| <i>Peshāwar.</i> | 48. | Faqir Chand Marwah, Peshāwar Cantonment. |
| | 49. | J. Ray & Sons, Arbab Road. |
| | 50. | Sham Lal & Sons. |
| | 51. | London Book Co. (India). |
| <i>Poona.</i> | 52. | International Book Service, Deccan Gymkhana
Colony. |
| <i>Quetta.</i> | 53. | Standard Book Stall, Circular Road. |
| <i>Rangoon.</i> | 54. | The Curator, Government Book Depot, Burma. |
| <i>Rāwalpindi.</i> | 55. | J. Ray & Sons, 43 K & L, Edwardes Road. |
| <i>Simla.</i> | 56. | Oxford Book & Stationery Co. |

PREFACE

THE HISTORY AND WORK OF THE SURVEY OF INDIA.

The first authoritative map of India was published by D'Anville in 1752, when the exploration of the then unknown India was still largely in French hands. It had been compiled from routes of solitary travellers and rough charts of the coast.

The Survey of India may be said to have been founded in 1767—ten years after the battle of Plassey—when Lord Clive formally appointed Major James Rennell, the first Surveyor General of Bengal, at that time the most important of the East India Company's possessions, though there were earlier settlements in Madras and Bombay.

Rennell's maps were originally military reconnaissances and latterly chained surveys based on astronomically fixed points, and do not pretend to the accuracy of modern maps of India based on the rigid system of triangulation commenced at Madras in 1802 and since extended over and beyond India. Even now however the *relative* accuracy of these old maps makes them valuable in legal disputes, as for instance in proving that the holding of a Bengal landowner was a river area at the time of the Permanent Settlement of 1793, so that he is debarred from its benefits.

From these beginnings, this department has gradually become primarily responsible for all topographical surveys, explorations and the maintenance of geographical maps of the greater part of Southern Asia, and also for geodetic work.

Geodesy means the investigation of the size, shape and structure of the earth, and the geodetic work of the department consists of primary (or geodetic) triangulation, latitude, longitude and gravity determinations. From these the exact "figure" of the earth is obtained, whereby points fixed by triangulation can be accurately located on its curved surface. This system of fixed points holds together all topographical and revenue surveys, and the existence of such a system from the early days of the department has avoided the embarrassments caused in other countries where isolated topographical surveys have been started without a rigid framework, with the inevitable result that they could not be fitted together.

A geodetic framework is therefore essential in any large survey, but there are a number of other activities, all of these ultimately utilitarian, which can be suitably combined with it and the following are some of those which have been carried out in India:

Precise levelling for the determination of heights;

Tidal predictions and publication of Tide Tables for forty-one ports between Suez and Singapore;

The Magnetic survey;

Observation of the direction and force of gravity;

Astronomical observations to determine latitude, longitude and time;

Seismographic and meteorological observations at Dehra Dūn

Indian geodesy has disclosed wide-spread anomalies of the gravitational attraction in the earth's crust, which have recently led to a reconsideration of the whole theory of isostasy. Systematic gravity investigations, which may be said to have been initiated in India, are now being carried out intensively in all civilized countries.

Topographical Surveys.—In the past this department used to carry out the large scale revenue surveys for most of India, and was still conducting this work for Central and Eastern India and Burma in 1905.

Though revenue survey is primarily a record of individual property boundaries and is unconcerned with the surface features, ground levels and exact geographical position essential to a topographical survey, it was on the whole found economical to carry out both surveys together.

By 1905 however, the small scale topographical surveys compiled from the large scale revenue maps had fallen seriously in arrear, owing to the relatively slower pace and incompleteness of the latter, on which "waste" non-revenue-paying areas are normally shown blank.

An authoritative Survey Committee appointed by the Government of India considered the position in 1905. It was feared that a separation of the topographical and revenue surveys might result in a wasteful duplication of work and two overlapping but mutually discrepant systems of mapping. These objections were met by a ruling that the basis of both systems of survey should be identical and provided either by the Survey of India or under its supervision.

Subject to this principle, the remaining revenue surveys were handed over to the provinces, who had always paid for them as part of the overhead charges of revenue collection, and the Survey of India was enabled to concentrate its energies on a complete new series of modern topographical maps in several colours on the 1-inch to 1-mile scale.

This new series had been rendered necessary by the natural demand for more detailed information to be shown on maps, especially as regards the portrayal of hill features by contours, proper classification of communications and—more recently—air traffic requirements.

It was intended that this 1905 survey should be completed in twenty five years, and then revised periodically every thirty years. Owing however to the war and more recent retrenchments, only about two thirds of the programme had been completed by 1936, in spite of the reduction of scale for the less important areas.

Although new surveys are carried out every year, covering from thirty to sixty thousand square miles—an area roughly that of England—the maps of a large part of the country are still over 50 years old, printed mostly in black only, and have hill features shown by roughly sketched form lines or hachures; such changes in town sites, canals and communications as have been embodied in them have not been surveyed on the ground, but are entered from data gathered from outside sources.

Owing to the serious financial situation in 1931, the establishment of the department was severely cut down and its annual expenditure halved, in consequence of which the modern survey of India cannot now be completed before 1950.

The obsolescence of the present series of modern maps of India is shown in Index B at the end of this report.

Large Scale Surveys.—Surveys and records of international, state and provincial boundaries have always formed an important item of topographical work, and in recent years numerous Guide Maps have been published of important cities and military stations where the 1-inch to 1-mile scale is inadequate.

Miscellaneous.—While expending on topographical and geodetic work all funds allotted by imperial revenues, the department is prepared to undertake or aid local surveys, on payment by those concerned, such as

Forest and cantonment surveys;

Riverain, irrigation, railway and city surveys;

Surveys of tea gardens and mining areas, with such control levelling as is necessary for these operations.

Administrative assistance is also given, and executive officers lent, in aid of the revenue surveys of various provinces and states.

The Printing Offices at Calcutta and Dehra Dūn are always at the disposal of other Government departments, for such work as the printing of special maps, illustrations for reports and all diagrams for patents.

The Mathematical Instrument Office of this department assists all Government departments, as well as non-officials, by maintaining up-to-date instrumental and optical equipment and by manufacturing and repairing instruments which would otherwise have to be replaced from abroad.

Military Requirements and Air Survey.—The Department is also responsible for all survey operations required by the army, and is in a position to meet the rapidly increasing complexity of modern military requirements, especially in air survey.

In view of its high military importance, air survey work for civil purposes is receiving all possible assistance, and continuous research is being carried on in the latest methods of mapping from photographs taken from the ground and in the air.

The flying and photography for air mapping done by this department are at present carried out by the Royal Air Force or the Indian Air Survey Company, a commercial firm with headquarters at Dum-Dum.

Administration is in the hands of the Surveyor General under the Education, Health and Lands Department of the Government of India.

The Headquarters Office is at Calcutta under the Assistant Surveyor General, and there are four Directors, one for the Map Publication and other technical offices at Calcutta, and three for three of the five Survey of India Circles into which the country is divided; the other two Circle areas (covering Burma and South India) are administered personally by the Surveyor General.

Of the three Circle Directors, one also administers the Geodetic Branch at Dehra Dūn in addition to his topographical survey Circle.

Nomenclature.—Although the terms "Irān" and "Irānian" are now to be used in all correspondence in supersession of "Persia" and "Persian" respectively, the latter are used throughout this report in order to conform with the maps published by the Survey of India, on which the old names are to be retained.

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E. India and Adjacent Countries Series, 1/M scale	"
F. Carte Internationale du Monde, 1/M scale	"
G. Southern Asia Series, 1/2M scale	"

GLOSSARY.

Scales are referred to as follows:—

- (i) by their representative fraction, e.g. "1/25,000",
- (ii) for scales which are multiples of 1/1,000,000—"1/M scale", "1/6M scale" &c., which mean "1/1,000,000 scale", "1/6,000,000 scale" &c.,
- (iii) for scales smaller than 4 miles to one inch—"50-mile scale", "8-mile scale" &c., which mean "scale of 50 miles to one inch" "scale of 8 miles to one inch" &c.,
- (iv) for scales of and larger than 4 miles to one inch—"¼-inch scale", "½-inch scale", "4-inch scale", "16-inch scale" &c., which mean "scale of ¼ inch to one mile" &c., &c.

Serial numbering of Survey of India maps.

Sheets 65, 78 &c. are sheets on the 1/M scale;

Sheets 65 K, 78 F &c. are ¼-inch sheets;

Sheets 65 K/N.W., 78 F/S.E. &c. are ½-inch sheets;

Sheets 65 K/1, 78 F/16 &c. are 1-inch sheets.

The system of numbering is fully explained in the Indexes at the end of this report.

Abbreviations.—U. S. S. denotes Upper Subordinate Service.

L. S. S. denotes Lower Subordinate Service.

U. S. Officer denotes Upper Subordinate Officer.

L. S. Officer denotes Lower Subordinate Officer.

P. L. O. denotes Photo.-Litho. Office (Calcutta).

P. Z. Section denotes Photo.-Zinco Section (Dehra Dūn).

D. O. denotes Drawing Office.

F. O. U. O. denotes "For Official Use Only".
