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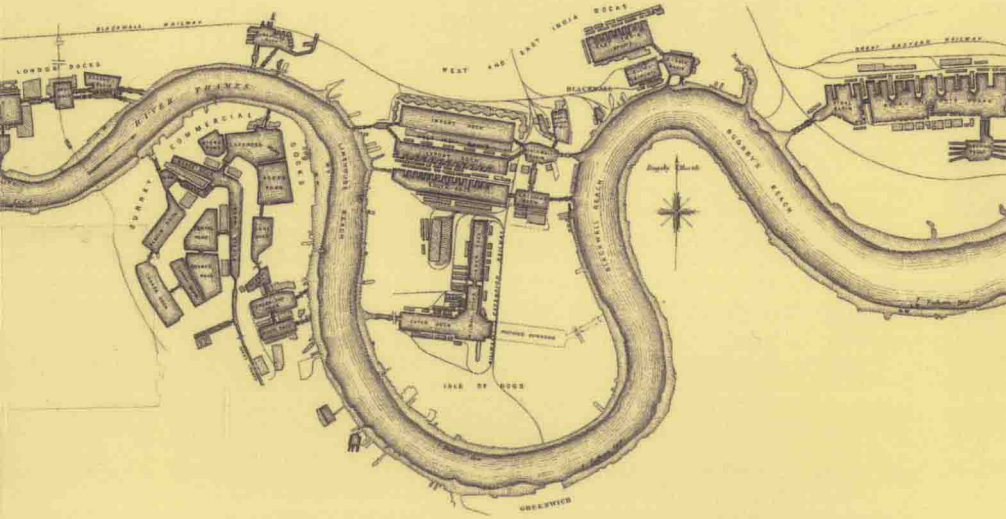
HARBOURS AND Ddocks

Their Physical Features, History, Construction, Equipment and Maintenance with Statistics as to their Commercial Development

Leveson Francis Vernon-Harcourt



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Their Physical Features, History, Construction, Equipment and Maintenance with Statistics as to their Commercial Development

Leveson Francis Vernon-Harcourt

Cambridge University Press

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Technology

The focus of this series is engineering, broadly construed. It covers technological innovation from a range of periods and cultures, but centres on the technological achievements of the industrial era in the West, particularly in the nineteenth century, as understood by their contemporaries. Infrastructure is one major focus, covering the building of railways and canals, bridges and tunnels, land drainage, the laying of submarine cables, and the construction of docks and lighthouses. Other key topics include developments in industrial and manufacturing fields such as mining technology, the production of iron and steel, the use of steam power, and chemical processes such as photography and textile dyes.

Harbours and Docks

Professor of civil engineering at University College London, Leveson Francis Vernon-Harcourt (1839–1907) drew on considerable practical experience, having worked most notably on London's East and West India docks.
The present work was first published in two volumes in 1885. This reissue combines in one volume the text and the plates, including plans and maps of important examples. The topics discussed include natural and artificial harbours; the impact of waves, tides and currents; and general principles of construction. Furthering Vernon-Harcourt's aim to educate readers on both the theory and practice of hydraulic engineering, the work features case studies on specific projects (including their origins and condition at that time), shedding much light on the history and operation of infrastructure that proved essential for the development of modern trade. Of related interest, Thomas Stevenson's *The Design and Construction of Harbours* (second edition, 1874) is also reissued in this series.

Clarendon Press Series

HARBOURS AND DOCKS

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Clarendon Press Series

HARBOURS AND DOCKS

THEIR

PHYSICAL FEATURES, HISTORY, CONSTRUCTION EQUIPMENT, AND MAINTENANCE

WITH

STATISTICS AS TO THEIR COMMERCIAL DEVELOPMENT

BY

LEVESON FRANCIS VERNON-HARCOURT, M.A.

MEMBER OF THE INSTITUTION OF CIVIL ENGINEERS
AUTHOR OF 'RIVERS AND CANALS'

VOL. I.—TEXT

Oxford
AT THE CLARENDON PRESS
1885

PREFACE.

HARBOURS and Docks are treated of in this book in a somewhat similar manner to that adopted for Rivers and Canals in my previous work, with the hope that the two books together may furnish a fairly complete exposition of the principles and practice of hydraulic engineering, as applied to navigation and commerce, both inland and marine.

The two subjects of Harbours and Docks are separately dealt with in two distinct parts; and in each case, general principles, the different methods of construction, and the various accessory works, are first considered; and then concise descriptions are given of several of the most important harbours and docks, both at home and abroad, comprising their early history, progress, development, maintenance, and present condition.

Harbours are classified, both in respect of their form and their method of protection, and also more especially with reference to the types of breakwaters by which they are sheltered; so that comparisons may be more readily instituted between the separate groups, and also between the several examples in each group. The different systems of construction

are thus easily contrasted; and the causes of the success, or failure, of special examples of works, resembling each other in construction, can be properly investigated.

Docks do not admit of the same distinct classification as breakwaters; but, nevertheless, a broad distinction can be drawn between tidal and tideless ports. Moreover, the dimensions and details of locks and entrances, the sections and composition of dock walls, the arrangement of quays, and the various appliances for facilitating trade afford ample scope for comparison. Statistics also, concerning the growth of trade and the relative importance of ports, furnish valuable evidence of the general lines of traffic, the conditions favourable to the development of a port, the comparative capabilities of docks, and the prospects of a demand for further extension.

Illustrations are so invaluable for the due comprehension of engineering works, that I devote a special volume to Plates, in addition to several woodcuts dispersed throughout the text. These Plates, moreover, present a novel feature which I trust will materially add to their value; namely, that, in most cases, the various figures in each plate are drawn to the same scale, and several of the plates also are similar in scale; so that not only are the different figures on the same plate comparable at a glance, but also in some instances two or three plates can be likewise contrasted. The scales also are given

definite proportions, so that the relation between them is at once perceived. Thus all the Plans on Plates 2, 3, and 5, are drawn to $\frac{1}{3000}$th of the natural scale, and the Plans on Plates 1, 4, 10, 11, and 13, are made half as large again; whilst the Plans on Plate 12 are double the same scale. All the sections of breakwaters, forty-five in number, are drawn to $\frac{1}{600}$th; whilst the sections of dock walls, comprising thirty-two examples, are all made $\frac{1}{200}$th of the natural scale; and the other illustrations are similarly arranged.

Besides embodying in the book the results of personal observation, experience, and practice, extending over a period of twenty years, I have freely sought the co-operation of my professional brethren, which, with rare exceptions, has been most readily given, and for which I beg to tender my most grateful thanks. The assistance thus received, which greatly enhances whatever value the book may possess, is duly acknowledged in the notes; but a few instances of special help demand special recognition. Mr. Druce of Dover, Mr. Cay of Aberdeen, Mr. Broadrick of Leith, Mr. T. J. Long of New York, Col. Mansfield of Galveston, and M. Barret of Marseilles, sent me specially written particulars about their respective ports, which have proved of great service; whilst General Wright the Chief of Engineers of the United States, afforded me similar information about Delaware Harbour. Many details about Madras Harbour were given me by Mr. Parkes; and Mr. J. G. Gamble

sent me several reports from Cape Town relating to Table Bay Harbour.

I am indebted to the Library of the Institution of Civil Engineers, and Mr. James Forrest the Secretary, for official records and reports from which descriptions of Portland and Colombo Harbours have been framed. I must also add my best thanks to M. Schwebelé, the Librarian of the Ecole des Ponts et Chaussées at Paris, for the ready aid he has given me in directing my inquiries about French ports.

The limits necessarily imposed on such a book have prevented my entering into very detailed accounts of the various works described, or from alluding to all the principal ports of the world; and my chief aim has been to dwell upon the prominent features, or peculiarities, of the various examples selected, so as to give a comprehensive view of this important and difficult branch of engineering, such as I hope may aid the student in his inquiries and the engineer in his practice, and may offer interesting general information to the trader and the public at large.

L. F. VERNON-HARCOURT.

6 Queen Anne's Gate, Westminster.
October, 1884.

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