

**THE RUDIMENTS OF
HYDRAULIC
ENGINEERING,
VOL. III, PART II**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649169856

The rudiments of hydraulic engineering, Vol. III, Part II by G. R. Burnell

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

G. R. BURNELL

**THE RUDIMENTS OF
HYDRAULIC
ENGINEERING,
VOL. III, PART II**

7
TEM
32

THE

RUDIMENTS

OF

HYDRAULIC ENGINEERING.

BY G. R. BURNELL,

CIVIL ENGINEER.

VOL. III. PART II

London:

JOHN WEALE, 59, HIGH HOLBORN.

M.DCCC.LXX.

107923
27/1/11

LONDON:
GEORGE WOODFALL AND SON,
ANGEL COURT, SKINNER STREET.

PREFACE.

THE lengthened delay which has taken place in the publication of the third volume has been occasioned by the small portion of time which my professional engagements have allowed me to devote to literary pursuits, and which time has been obliged to be divided between this and several other works. In order that no further delay should occur, I have relinquished the task of completing that portion of the present volume relating to Hydraulic Engineering to Mr. Baruell.

HENRY LAW.

6, Duke Street, Adelphi.
19th May, 1852.

In accepting the task of completing the portion of the deservedly popular Treatise on Civil Engineering which Mr. Law's engagements have forced him to decline, I would fain request the public to extend to me the indulgence usually accorded to those who find themselves called upon to endeavour to fill in an outline sketched by another hand. In this particular instance it has been my aim to confine my observations within the range of the synopsis inserted by Mr. Law at the commencement of the first volume. Insensibly they have far exceeded the limits he had proposed, and this branch of the work has attained a development perhaps greater than it merits in proportion to the remainder. But the very nature of the phenomena connected with Hydraulic Engineering is so complex that these appeared absolutely to require to be examined in detail, in order to arrive at a correct general view of the subject; and, lengthy as this portion of the Treatise may appear, it is to be feared that much has still been

omitted—many objects of study and investigation rather hinted at than explained.

To facilitate the researches of those who may be disposed to pursue the investigation of this most interesting branch of the profession of Civil Engineering, a list of the most celebrated authors who have treated of its details has been annexed. The list is far from being complete, but it contains the names of all who have fallen under my own personal observation. I have drawn from many of these sources largely, and have endeavoured to quote my authorities when there seemed to be any originality in the observations. Yet there are doubtlessly many instances in which I may not have acknowledged the full extent of my obligations. The fact is, that, in the domain of the exact sciences, so many discoveries have become public property, so to speak, that they seem to form the staple of our knowledge, and to be used without reference to their authors. By a species of tacit consent, when a law has once been admitted, it seems that it is the right of the next comer to use it with the same freedom as the discoverer; and so many such laws are being every day added to our stock, that in the end a kind of confusion prevails as to the parties to whom we are really indebted. It has, however, been my object in all cases to render honour to whom it was due.

Personally, I regret that the limits of the Treatise did not allow a more lengthened investigation of the subject of the supply of water to towns, and the application of the sewage. These are subjects so prominently before the public at present, and so many questionable doctrines have been promulgated at the expense of the nation, with respect to them, that it behoves every engineer, as far as lies in his power, to counteract the mischief it has been endeavoured to effect, and to recall the attention of the public to the real merits of the case. To do so completely would require another field than a Rudimentary Treatise; nevertheless, even in it, there is both room and reason to call attention to some of the theories

propounded by incompetent persons. The misfortune in England is, that if an investigation into any subject be undertaken, it is usually made in the manner so pleasantly described by Beaumarchais, and "if a mathematician be required we take a dancing master;" or literally, if an inquiry be made, and any subsequent measures adopted, in subjects connected with engineering, the parties it has lately been the custom to consult, are the omniscient barristers-at-law, not those who have devoted their whole lives to the study of the questions it may be desirable to elucidate. And it is also to be observed, that the two professions of Engineer and Barrister-at-Law are precisely the only two learned professions which can be taken up without examination or diploma. The remedy to so great an evil is hard to discover, unless it lie in the freedom of the press. Unfortunately, the action of the latter is slow, and much mischief is done before the public can be fairly roused to the consequences of following the instructions of its blind guides. Nevertheless, "Magna est veritas et prevalebit!"

GEORGE R. BURNELL.

14, Lincoln's Inn Fields,
July 15th, 1852.

CONTENTS.

HYDRAULIC ENGINEERING.

	Page
Supply of Water to Towns	1
Collection of Water from Surface of Ground	5
Use of Springs	8
Mode of ascertaining the Amount of any Source	14
Mode of Distribution	15
Marine Engineering	39
The Winds	40
Waves	41
Tides	53
Currents	62
Effect of Waves, Tides, and Currents upon Sea Coasts	69
Defence of Shores	78
Construction of Piers and Breakwaters	84
Works beyond Jetties	113
Improvement of Rivers	127
Appendix. Table 1	162
" 2	162
" 3	163
Bibliography	178

ILLUSTRATIONS.

	Page
Section of water-course of Aqueduct of Pont du Gard	31
Souterrazici of Constantinople	33
Section of heading or tunnels	33
" of Aqueduc de Ceinture	34
Diagrams to illustrate mode of calculating the dimensions of mains	36, 37
Sections of Cherbourg and Cette Breakwaters	52
" of Plymouth Breakwater	53
Curves of tide at Rochefort	58
" on south coast of England	59
Diagram to illustrate effect of spurs	74
Dutch timber groin	79
Various enclosure banks	80, 81
Fazio's open piers or jetties	88
Plan of Nieuwe Diep	89
Entry of Dieppe, cross section	93
Cross section of wooden jetty	94
" of stone "	97
" of jetty at Havre	98
" of hollow stone jetty	100
" of jetty at Honfleur	101
" " at Kingston	103
Various sections of Cherbourg Breakwater	106
Section of Delaware Breakwater, United States	111
" Buffalo " "	112
Transverse section of quay walls	115
Best plan of sluicing reservoir	120
Plan of flashing sluice	138
Section of stone pitching	144
" timber-faced river-banks	145
" Magistrini's weirs	145