

# **RAILWAY TUNNELLING IN HEAVY GROUND**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649368952

Railway tunnelling in heavy ground by Charles F. Gripper

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](http://www.triestepublishing.com)

**CHARLES F. GRIPPER**

**RAILWAY  
TUNNELLING IN  
HEAVY GROUND**



# RAILWAY TUNNELLING

IN

## HEAVY GROUND.

BY

CHARLES F. GRIPPER,

CIVIL ENGINEER AND CONTRACTOR.



LONDON:

E. & F. N. SPON, 46, CHARING CROSS.

NEW YORK: 446, BROOME STREET.

1879.

186. L. 101.



## PREFACE.

---

THIS book, or treatise on Tunnelling, is not supposed by the author to contain anything new or unknown to Engineers or Contractors generally, nor does it contain formulæ or positive rules for constructing such works, as none can be laid down, no two Tunnels ever being exactly similar in conditions affecting their construction. The author believes, however, that his practice and experience as a Civil Engineer and Contractor will enable him to give such information to assistant Engineers and Contractors' assistants as will materially help them, and by describing the general methods and requirements to be adopted in commencing and carrying out Tunnel works, place young Engineers, who may not have much experience in this class of work, in a position to understand what is wanted or what is going on, when called upon to commence a Tunnel, or to take charge of and superintend the works of one already commenced; and so that they may not become tools in the hands of the foreman miner or bricklayer, who in many cases have the work let to them by sub-contract, and who will immediately take advantage of inexperience, to the detriment of the work, disgrace to the management, and loss to the chief Contractor and all concerned in the well-being of the line of Railway.

1



## CONTENTS.

	PAGE
CHAPTER I.	
LIGHT AND HEAVY GROUND	1
CHAPTER II.	
ON SINKING WORKING SHAFTS	6
CHAPTER III.	
ON HEADINGS	12
CHAPTER IV.	
ON SETTING OUT LINES, DRIVING HEADINGS, AND FIXING POSITION OF WORKING FACES	17
CHAPTER V.	
ON MINING AND TIMBERING	32
CHAPTER VI.	
ON LINING THE LENGTH	44
CHAPTER VII.	
DRAWING THE BARS, ETC.	57
CHAPTER VIII.	
ON COST	61



# RAILWAY TUNNELLING

IN

## HEAVY GROUND.

---

### CHAPTER I.

#### LIGHT AND HEAVY GROUND.

TUNNELS are works to be sparingly used in the construction of railways: they require great care and honest work in construction, any giving way causing great expense and delay to traffic while undergoing repair.

A Tunnel, well and carefully constructed, will last for many years without repair, so one of the first considerations is to ensure good superintendence of the works while in progress.

There are cases where they must be introduced. In England all the main lines, and most branch lines, may now be considered as made, and the best and easiest *routes* for them to have been selected, so that any branch or link now to be made will generally have to pass through a rough and difficult country, probably necessitating Tunnelling.

When a cutting attains 70 feet in depth, it is generally advisable to introduce a length of Tunnel. A cutting of this depth, for a double line of rails, with 27 feet width at formation and  $1\frac{1}{2}$  to 1 slopes, contains about 1027 cubic yards of excavation per yard forward, which, at 1s. 3d. per cubic yard, would cost