

**ROCK BLASTING: A PRACTICAL  
TREATISE ON THE MEANS  
EMPLOYED IN BLASTING ROCKS  
FOR INDUSTRIAL PURPOSES**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649694631

Rock Blasting: A Practical Treatise on the Means Employed in Blasting Rocks for Industrial Purposes by Geo. G. André

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)

**GEO. G. ANDRÉ**

**ROCK BLASTING: A PRACTICAL  
TREATISE ON THE MEANS  
EMPLOYED IN BLASTING ROCKS  
FOR INDUSTRIAL PURPOSES**



TN  
279  
.A55

**ROCK BLASTING.**

Recht © 5-18-55 W. W. W.

## P R E F A C E .

---

DURING the past decade, numerous and great changes have taken place in the system followed and the methods adopted for blasting rocks in industrial operations. The introduction of the machine drill led naturally to these important changes. The system which was suitable to the operations carried on by hand was inefficient under the requirements of machine labour, and the methods which had been adopted as the most appropriate in the former case were found to be more or less unsuitable in the latter. Moreover, the conditions involved in machine boring are such as render necessary stronger explosive agents than the common gunpowder hitherto in use, and a more expeditious and effective means of firing them than that afforded by the ordinary fuse. These stronger agents have been found in the nitro-cotton and the nitro-glycerine compounds, and in the ordinary black powder improved in con-

stitution and fired by detonation; and this more expeditious and effective means of firing has been discovered in the convenient application of electricity. Hence it is that the changes mentioned have been brought about, and hence, also, has arisen a need for a work like the present, in which the subjects are treated of in detail under the new aspects due to the altered conditions.

GEO. G. ANDRÉ.

LONDON, 17, KING WILLIAM STREET, STRAND,  
*January 1st, 1878.*

## CONTENTS.

### CHAPTER I.

#### THE TOOLS, MACHINES, AND OTHER APPLIANCES USED IN ROCK BLASTING.

	PAGE
Section I. <i>Hand-boring Tools</i> .—Drills. Hammers. Auxiliary Tools. Sets of Blasting Gear .. .. .	1
Section II. <i>Machines-boring Tools</i> .—Machine Rock-drills. Borer- bits. Drill Carriages .. .. .	23
Section III. <i>Appliances for firing Blasting Charges</i> .—Squibs, Safety Fuse. Electric Fuses. Cables. Detonators. Electric Firing-Machines .. .. .	42

### CHAPTER II.

#### EXPLOSIVE AGENTS USED IN ROCK BLASTING.

Section I. <i>Phenomena accompanying an Explosion</i> .—Nature of an Explosion. Heat liberated by an Explosion. Gases generated by an Explosion. Force developed by an Explosion .. .. .	64
Section II. <i>Nature of Explosive Agents</i> .—Mechanical Mixtures, Chemical Compounds .. .. .	76
Section III. <i>Relative Strength of the common Explosive Agents</i> .— Force developed by Gunpowder. Relative Force developed by Gunpowder, Gun-cotton, and Nitro-Glycerine .. .. .	88
Section IV. <i>Means of firing the common Explosive Agents</i> .—Action of Heat. Detonation .. .. .	92
Section V. <i>Some Properties of the common Explosive Agents</i> .— Gunpowder, Gun-cotton, Dynamite. Firing Temperatures .. .. .	97
Section VI. <i>Some Varieties of the Nitro-Cellulose and the Nitro- Glycerine Compounds</i> .—Nitrated Gun-cotton. Tonite, or Cotton- Powder. Schultze's Powder. Lithofracteur. Brain's Powder. Cellulose-Dynamite .. .. .	103



## CHAPTER III.

## THE PRINCIPLES OF ROCK BLASTING.

	PAGE
Line of least Resistance. Force required to cause Disruption.	
Conditions of Disruption. Example of a Heading. Economical	
Considerations. Tamping .. .. .	106

## CHAPTER IV.

## THE OPERATIONS OF ROCK BLASTING.

<i>Hand Boring.</i> —Boring the Shot-holes. Charging the Shot-holes.	
Firing the Charges .. .. .	128
<i>Machine Boring.</i> —Boring the Shot-holes. Charging and Firing.	
Removing the dislodged Rock. Division of Labour .. .. .	142
<i>Examples of Drivings.</i> —The St. Gothard Tunnel. The Hoosac	
Tunnel. The Musconetcong Tunnel. Headings at Marihaye,	
Ansin, and Ronchamp .. .. .	154

## CHAPTER V.

## SUBAQUEOUS BLASTING.

Preparation of the Charge. Boring under Water. Submarine Rocks.	
Obstructions in Water-courses .. .. .	164

# ROCK BLASTING.

---

## CHAPTER I.

### THE TOOLS, MACHINES, AND OTHER APPLIANCES USED IN BLASTING ROCKS.

#### SECTION I.—HAND BORING.

*Drills.*—The operations of blasting consist in boring suitable holes in the rock to be dislodged, in inserting a charge of some explosive compound into the lower portion of these holes, in filling up, sometimes, the remaining portion of the holes with suitable material, and in exploding the charge. The subjects which naturally first present themselves for consideration are: the nature, form, and construction of the tools, machines, and other appliances used. Of these tools, the "drill" or "borer" constitutes the chief. To understand clearly the action of the rock drill, we must consider the nature of the substance which has to be perforated. He who has examined the mineral constitution of rocks will have recognised the impossibility of *cutting* them, using that term in its ordinary acceptation, inasmuch as the rock constituents are frequently harder than the material of the tools

employed to penetrate them. As a rock cannot be cut, the only way of removing portions of it is to fracture or to disintegrate it by a blow delivered through the medium of a suitable instrument. Each blow so delivered may be made to chip off a small fragment, and by this means the rock may be gradually worn away. To effect this chipping, however, the instrument used must present only a small surface to the rock, in order to concentrate the force, and that surface must be bounded by inclined planes or wedge surfaces, to cause a lateral pressure upon the particles of rock in contact with them. In other words, the instrument must be provided with an edge similar to that possessed by an ordinary *cutting* tool.

The conditions under which the instrument is worked are obviously such that this edge will be rapidly worn down by attrition from the hard rock material, and by fracture. To withstand these destructive actions, two qualities are requisite in the material of which the instrument is composed, namely, hardness and toughness. Thus there are three important conditions concurring to determine the nature and the form of a cutting tool to be used in rock boring—1, a necessity for a cutting edge; 2, a necessity for a frequent renewal of that edge; and 3, a necessity for the qualities of hardness and toughness in the material of the tool.

In very hard rock, a few minutes of work suffice to