THE PORTLAND CEMENT INDUSTRY: A
PRACTICAL TREATISE ON THE BUILDING,
EQUIPPING,
AND ECONOMICAL RUNNING OF A
PORTLAND CEMENT PLANT, WITH NOTES
ON PHYSICAL TESTING

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649676989

The Portland Cement Industry: A Practical Treatise on the Building, Equipping, and Economical Running of a Portland Cement Plant, with Notes on Physical Testing by William Alden Brown

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

WILLIAM ALDEN BROWN

THE PORTLAND CEMENT INDUSTRY: A
PRACTICAL TREATISE ON THE BUILDING,
EQUIPPING,
AND ECONOMICAL RUNNING OF A
PORTLAND CEMENT PLANT, WITH NOTES
ON PHYSICAL TESTING



THE PORTLAND CEMENT INDUSTRY

A Practical Treatise

OX

THE BUILDING, EQUIPPING, AND ECONOMICAL RUNNING OF A PORTLAND CEMENT PLANT

WITH

NOTES ON PHYSICAL TESTING

BY

WILLIAM ALDEN BROWN

ASSOC.AM. BOC.C.R.; MEMBER BOTTH WALES INSTITUTE OF ENGINEERS;

tormerta

ASSISTANT SUPERINTENDENT COWELL, PORTLAND CEMENT COMPANY, COWELL, CALIFORNIA, U.S.A.; WOLKS MANAGHE MURHAM PORTLAND CEMENT COMPANY (ASSOCIATED PORTLAND CHMENT MANUFACTURERS); WORKS MANAGER ABRUTHAW AND BRISTOL CHANNEL PORTLAND CEMENT COMPANY, SOUTH WALKS



NEW YORK
D. VAN NOSTRAND COMPANY
25 PARK PLACE
1917

2883

PRINTED BY STEPHEN ACSTIN AND SONS, LIMITED, BURTFORD, ENGLAND.

PREFACE

After this terrible War is over, in which we are fighting for the highest conception of humanity, "Right against Might," and our efforts, combined with those of our gallant Allies, have been crowned with success, the industrial war with our trade competitors will dominate and express our national needs. We shall assuredly suffer crushing commercial defeat if advantage is not taken by British manufacturers to study, adopt, and improve methods of economical production which our rivals have long practised. Neglect, delay, or failure in the attempt will lose to Great Britain the markets of the world for Portland Cement.

It is imperative that we should view with detachment the methods of our fathers if we are to be free to rise to the heights of modern practices, and to strive for the mastery in the perfection and dominion of our products.

Let us not sit in our office chairs bemoaning our fate and consenting to our trade passing to other countries, but let us get busy in our industrial departments, and to order add progress. For the cement manufacturer the immediate future has immense potentialities.

Much time and pains have been given to ensure accuracy in this treatise, to divest it of scientific technicalities, and to present a clear, simple, and realistic description of the actual and economical manufacture of a building material which is of fundamental and supreme importance.

I acknowledge indebtedness to the Council of the South Wales Institute of Engineers for permission to include from their Proceedings, vol. xxxi, No. 4, my "Notes on the subject of Testing Portland Coment"; to Mr. H. R. Cox, M.C.I., for kindred matter; and to Mr. J. A. Towers for data on Power Plants.

WILLIAM ALDEN BROWN

RHOOSE, GLAMORGAN.

SUMMARY OF CONTENTS

PREFACE

CHAPTER I

INTRODUCTORY

Portland Cement an important Extractive Industry—The Relative Positions of Great Britain, United States of America, and Germany—Pre-eminence of the United States of America—Great Britain's need to "wake up"—State Assistance required to promote and organize Scientific Research—Machinery now manufactured in Great Britain—Inventions—Transitory Period in Manufacture and Mistakes made.

CHAPTER II HISTORICAL

Lime as a Binding Agent—John Smeaton and Building of Eddystone Lighthouse, 1756 — James Parker's Patent, 1796 —
James Frost's Patent, 1822 — Joseph Aspdin's Patent,
1824 — His first Factory, 1825 — Major-General Sir C. W.
Pasley's Experiments, 1826 — W. B. Elkinson patented
Concrete, 1854—Brunel used Cement for construction of
Thames Tunnel, 1828—Sir Robert Peel proposes Tax on
Roman Cement, 1849—Brunel's testimony as to Uniformity of
Roman Cement, 1839—Robert Stephenson's Testimony in
1843—Great Exhibition, 1851, gave impetus to the Industry—
Mr. John Grant in 1859 uses Portland Cement for London
Drainage Canal—Growth of the Industry on Thames and
Medway—First British Standard Specification, 1904.

CHAPTER III

DEVELOPMENT OF THE INDUSTRY

Rapid Growth of the Industry—Future Development—Many Uses for Portland Cement—Concrete Age—Great Engineering Triumphs due to Concrete—Output of Three Leading Countries—United States' Huge Production—Reason of the Supremacy of the United States—Machinery constructed for Improved Manufacture—Great Britain's Position to-day.

CHAPTER IV

MANUFACTURE-RAW MATERIALS

Classification of Materials—Limestone—Chalk—Marl—Alkali Waste
—Clayey Limestone—Clay—Shale—Blast Furnace Slag—Proportioning the Raw Materials—Synopsis—From Raw Material
to Portland Cement—Composition and Manufacture of Cement
—Processes of Manufacture.

CHAPTER V

DESIGN AND CONSTRUCTION OF A MODERN PORTLAND CEMENT PLANT

Investigation by Investors—Capacity corresponding to Capital Invested — Importance of Consulting Engineers engaged possessing a thorough practical knowledge of the Industry—Site—Raw Materials—Survey of Quarry—Rail and Water Communication — Size of Plant — Simplicity of Design — Machinery to be Installed—Quarry Practice—Big Hole Blasting Drills—Storage of Raw Materials—Crushing and Grinding the Raw Materials—Crushing—General Principles — Types of Crushers—Grinding—Ball and Tube Mills—Centrifugal Mills—Griffin Mills—Fuller-Lehigh Mills—Ring-Roll Mill—Capacity of various Machines used for Crushing, Grinding, and Conveying.

CHAPTER VI

THE ROTARY KILN

Development — Construction — Kiln Lining — Advantages of the Rotary Kiln—Fuel—Coal—Storage—Crushing—Grinding— Crude Oil—Natural Gas—Producer Gas—Cooling—Storing and Grinding the Clinker—Dust Collectors.

CHAPTER VII POWER PLANTS

Types of Transmission—Water Supply—Type of Power Plant—Choice of Power Units—Boiler Plant—Feed Pumps—Steam and Feed-water Pipes—Superheaters.

CHAPTER VIII MISCELLANEOUS

Storing and Packing the Cement—Cement Storchouses—Packing
—Wooden Barrels—Steel Drums—Sacks—Mechanical Equipment—Equipment for Machine Shop—Smithy—Carpenters
and Wheelwrights.

CHAPTER IX

COSTS AND STATISTICS

COSTS OF THE MANUFACTURE OF PORTLAND CEMENT

Cost of Building and Equipping a Modern Portland Cement Plant
—Approximate Real Investment in Portland Cement Plants in
the United States—Labour Cost per Ton of Cement—Supplies
—Cement Productions and Shipments in the United States
during 1913 and 1914—Average Factory Price per Barrel—
Systematic Cost Keeping—Daily Reports—Wages Analysis—
Stores Analysis—Cost Sheet.

CHAPTER X EQUIPMENT

Mechanical Equipment of some Modern Portland Cement Plants erected during the last five years.

PHYSICAL TESTING

CHAPTER XI

DEVELOPMENT OF CEMENT TESTING

General Notes on Gauging Coment—Tests of Cement required for Immediate Use—Comparative Table of English with Metrical Stresses—Comparative Table of English and Metric Measures— Comparative Table of English and Metric Weights.

CHAPTER XII

CHEMICAL COMPOSITION

Standard Specification—Specific Gravity—Tests of little value alone
—Standard Specification—Procedure—Personal Equation,

CHAPTER XIII FINENESS

Standard Specification—Procedure—Observations on Fineness—
Influence on Fine Grinding of Cement upon its Setting Time—
Showing Effect of Fine Grinding of Cement on Soundness—
Showing Increase in Sand Strength due to Fine Grinding—
Personal Equation.

CHAPTER XIV

TENSILE STRENGTH

Standard Specification—Neat Cement—Cement and Sand—Procedure—Testing Neat Cement—Testing Cement with Three Times its Volume of Sand—Proportion of Water for Gauging Sand Briquettes—General Notes.

CHAPTER XV

TIME OF SETTING

Standard Specification—Procedure—Effect of Storage on its Setting
Properties—Influence of various Percentages of Water used to
gauge the Pats on the Setting Time—Influence of Temperature
on the Rate of Setting—Influence of Ageing on the Set—
Showing the Effect of Plaster of Paris on the Setting—The
Effect of Gypsum on the Setting Time—The Effect of Dead
Burned Gypsum on the Setting Time—Personal Equation.

CHAPTER XVI

SOUNDNESS OR CONSTANCY OF VOLUME

Normal Tests—Accelerated Tests—Standard Specification—Le Chatelier Test—Procedure—Other Tests for Soundness—Faija Test—Deval Test—Boiling Test—Cold Water Pats—Plunge Pat Test—The Bottle Test—Air Pat Test.