A REVIEW OF THE LITERATURE OF REINFORCED CONCRETE

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649333028

A Review of the Literature of Reinforced Concrete by Leon S. Moisseiff

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

LEON S. MOISSEIFF

A REVIEW OF THE LITERATURE OF REINFORCED CONCRETE

Trieste

A Review of

The Literature of Reinforced Concrete

Reprint of Article in
The Engineering Digest
(New York)
BY

LEON S. MOISSEIFF
A. M. Am. Soc. C. E.
Engineer, Department of Bridges, New York City

to which is added

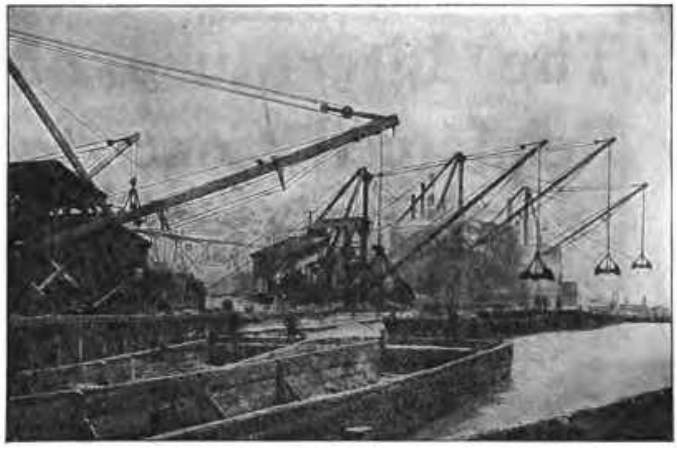
A List of Current Books on

CEMENT, CONCRETE, LIMES

and Allied Subjects, with Descriptive Notes

COMPILED BY
THE ENGINEERING NEWS BOOK DEPARTMENT
220 BROADWAY, NEW YORK

Hayward Buckets



Handling Sand, Gravel and Crushed Stone in the construction of the Pittsburgh Filtration Plant, Aspinwall, Pa.

Our new bucket catalog No. 35 just out. Send for it.

THE HAYWARD COMPANY

50 CHURCH STREET, - - - NEW YORK

PREFACE

ALTHOUGH reinforced-concrete construction in America began about thirty years ago, it is only during the last quarter of this period that its rate of increase has become so great as to compel the active attention of other engineers, architects and contractors than those directly engaged in its development. The increasing scarcity of timber and the difficulty of securing steel in structural shapes within moderate time limits has materially aided the development of this interesting type of building construction.

Previous to 1904 the literature in the English language on reinforced concrete consisted of scattered articles in technical periodicals, and of papers in the transactions of engineering and other allied societies, but during that year the growing need for a comprehensive and systematic treatise was supplied by the publication of three books within a few months of each other. Since that time there has been such a vast amount of literature on the subject that it is difficult for those interested to select the book that best suits their special requirements.

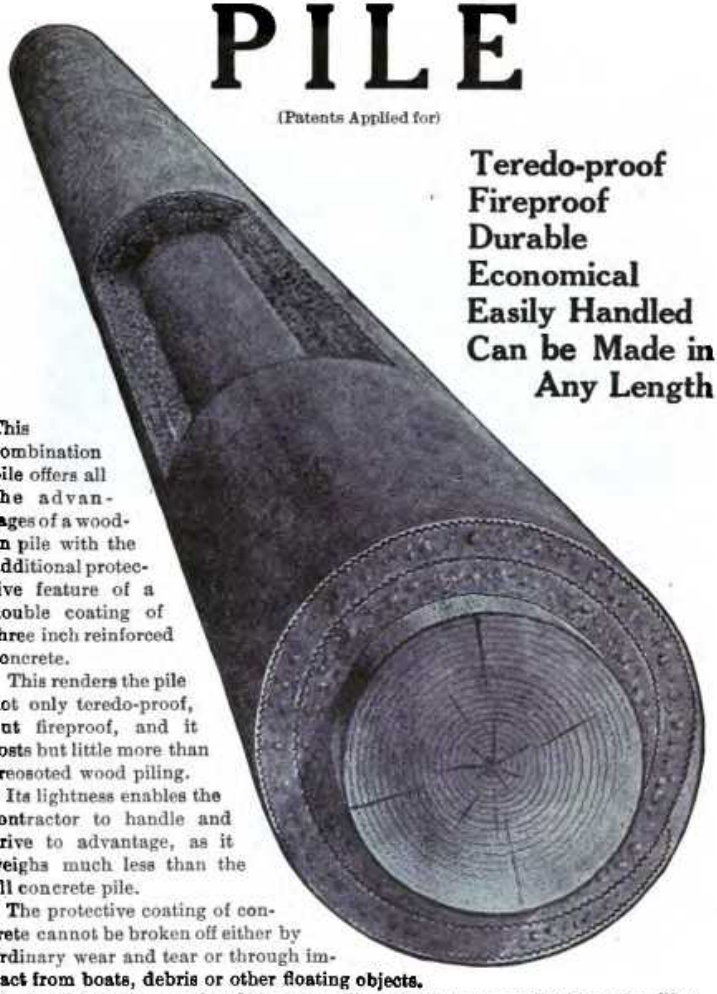
Hundreds of requests have been received by the Engineering News Book Department for information as to the "best" books or regarding the value of some special book or for a comparison of two or more books, and the impossibility of satisfactorily entering into such details in correspondence has led to the preparation of the following list of current works, with brief descriptions, sufficient, however, to give some idea of the scope of each.

Any of these books can be supplied by The Engineering News Book Department (220 Broadway, New York) and will be sent prepaid, to any part of the world, on receipt of price, and in every case when the books are in print and available in New York City, they will be shipped the same day that the order is received.

The Engineering News Book Department can also supply any other books published, of a technical or general nature, and will be pleased to give information regarding these, on request.

The Ripley Combination PILE

(Patents Applied for)



Teredo-proof
Fireproof
Durable
Economical
Easily Handled
Can be Made in Any Length

This combination pile offers all the advantages of a wooden pile with the additional protective feature of a double coating of three inch reinforced concrete.

This renders the pile not only teredo-proof, but fireproof, and it costs but little more than creosoted wood piling.

Its lightness enables the contractor to handle and drive to advantage, as it weighs much less than the all concrete pile.

The protective coating of concrete cannot be broken off either by ordinary wear and tear or through impact from boats, debris or other floating objects.

The bond between wood and concrete will stand all strains of driving and pulling.

For Royalty Rights, Address the Company

THE MONKS-RIPLEY PILE CO.

RICHARD A. MONKS, President — **82 Beaver St., New York City** — JOHN W. RIPLEY, M. Am. Soc. C. E., Sec. and Treas.

THE LITERATURE OF REINFORCED CONCRETE

BY

LEON S. MOISSEIFF, A. M. Am. Soc. C. E.

(Reprinted from "The Engineering Digest.")

A dozen years ago reinforced concrete was still in its infancy as a building material and its applications in structures bore largely the imprint of an experimental character. Not that the structures then built were intended to be used for testing purposes or that their owners erected them to demonstrate the fitness of reinforced concrete—that stage was then passed already—but the entire process of designing, contracting and erecting of a reinforced-concrete structure generally partook of the nature of a transaction which was entered into by one of the parties with more or less hesitation. It fell to the share of the promoting enthusiast, who in most cases was also the contractor, to make as brilliant a display of the achievements of reinforced concrete as he possibly could to convince the buyer and his engineer of the wisdom of their investment. With this in view he enumerated the number of various structures successfully erected, illustrated them by as many cuts as he could lay his hand on, and was especially emphatic about a number of load tests of floors, showing sacks of sand or pig iron piled up to an impressive height, or a number of cars extending over a bridge. This was often strengthened by a number of testimonials on the good behavior of the structures.

The competition with steel structures had made it, however, apparent to the reinforced concrete interests that it was not sufficient to be able to point to a number of successfully built structures, which sustained great loads, to convince the engineer who considered the advisability of using the new material. It was pressingly felt that the design and proportioning of reinforced-concrete structures and their parts must be based on a satisfactory theory and the use of rational formulas, to be able to compete with the degree of definiteness and assurance which characterizes steel construction. In other words, the builder of reinforced concrete had to explain the behavior of his structures by assigning to each element its due share in sustaining loads. He had to furnish sufficient data to enable the buying engineer to design and specify his structure with a practical certainty of its safety and fitness to his purposes.

At the same time the engineering profession had come to realize the great possibilities of the new building material, and, surprised by the boldness of some of the structures built with it, began to

The Engineering News Book Department, New York City.

devote much attention and serious study to the new problem. Numerous articles thus made their appearance in the engineering periodicals of the world, supplying the reader with a variety of hypotheses and a still greater variety of formulas. These formulas were either empirical or theoretical. The former mostly originated with the practical builders and contractors and were based on the range of their personal experience, and were intended for ready use in designing and estimating a limited number of structures built by them. The majority of the latter, on the contrary, came from engineers who tried to solve the problem on the broader foundation of the theory of elasticity of solids, and were intended to cover as wide a range as practice may ever require.

Both sides lacked at the beginning the most essential data required for the establishment of structural formulas, namely, the information supplied by a thorough knowledge of the resistance of the material and its elastic behavior under stress. Naturally, they reasoned by analogies based on the elasticity of iron and steel, and deduced formulas from the theory of composite structures applicable to metal and timber. Fortunately, the structures themselves were quite simple, and with good material and careful workmanship it was difficult to go wrong.

Gradually the results of carefully prepared and observed tests conducted by experienced experimenters began to appear in the proceedings of the engineering societies and in the technical press, furnishing material for extended discussions and for verifying and correcting the formulas in vogue. The building authorities of many cities were confronted with the new building material for which they had no regulations or ordinances, and were looking for expert advice and deciding tests. Finally, organized engineering bodies, finding it to be of vital importance to the profession, and government boards began to investigate reinforced-concrete construction. Periodicals specially devoted to reinforced concrete were created, several with good success.

All this ever-increasing mass of information was spread like a floating sea over many journals, transactions, reports and trade publications, and the task to condense and filter it down to a book which should form one organic whole, where consecutive thought should separate the wheat from the chaff, required superhuman efforts. Only engineers who attempted to meet this demand even half way, know the amount of labor and time required for it. But the demand for books on reinforced concrete was growing more urgent as the advantages of reinforced concrete were more recognized.

The first extended and consecutive treatise on reinforced concrete was written by the Belgian engineer, Paul Christophe, and published in 1899 in the "Annales des Travaux publics de Belgique" in three successive articles. It met with much appreciation and was enlarged and reprinted in book form in 1902 as the well-known work "Le Béton Armé et ses Applications." It was translated into several European languages, and the form of arrangement of the matter in the book served as a model for most books of this kind. Its almost

eight hundred pages are divided into five chapters, three of which cover more than three-quarters of the book and consist in an assortment of the various systems of construction used, their numerous applications and the theories proposed by the most prominent writers on the subject. One chapter is devoted to the work of construction in the field and another discusses the advantages and disadvantages of reinforced concrete.

Under the difficult conditions discussed in the above, Christophe produced an excellent work, which placed much of the then available matter in a condensed form within the reach of the reader, and while the 300 pages devoted to descriptions and illustrations of the applications of reinforced concrete appear to us to-day as superfluous, this is because they have outgrown their demonstrative value. In general, Christophe used good judgment in his selections and was one of the first to adopt the straight-line formula for the flexure of beams.

The much more voluminous work of Berger and Guillerme, published in French, under the title "La Construction en Ciment Armé" in the same year, follows practically the same arrangement as Christophe, but the reading matter is quite incoherent and one feels the lack of a guiding spirit. It is also much too bulky and unhandy.

No books on reinforced concrete were published in English before the year 1904, when quite a crop of them appeared in the market. It must, however, be stated that in 1902 Prof. W. Cain rewrote much of his little book on "Voussoir Arches Applied to Stone Bridges, Tunnels, Etc.," and changed its title to "Theory of Steel-Concrete Arches and of Vaulted Structures." In it Prof. Cain gives his well-known semigraphical treatment of elastic arches as applied to reinforced concrete, covering the case most fully. It is an excellent little book, which was subsequently made use of both by Marsh and Buel and Hill. While it requires quite some practice to readily handle the method, it can be followed without any knowledge of calculus and has been used advantageously in numerous instances in American practice.

An important book in English was published in 1904 by C. F. Marsh, entitled, "Reinforced Concrete." It has now reached its third revised and enlarged edition. This book is also built on the encyclopedic style, containing among its 652 pages some 260 devoted in one form or another to the enumeration of various systems, structures erected and special methods in use, much of which could be left to trade publications. The 163 pages containing the chapter on "Experimental Research and Data Deduced Therefrom," and the appendix, on the contrary, is most valuable matter. It gives in a well-arranged and condensed form the most important tests on reinforced concrete the world over, and is of great value to anyone engaged in the study of the subject.

To the chapter on calculations, some 140 pages are devoted, and the author covers the subject thoroughly. It is quite of interest to state here, though this is a general review, that in the third edition of the book the author abandons the parabolic stress-strain