

**EARTHWORK AND ITS
COST, WITH A CHAPTER
ON DITCHING AND
TRENCHING MACHINERY**

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Earthwork and Its Cost, with a Chapter on Ditching and Trenching Machinery by Halbert Powers Gillette & E. E. R. Tratman

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HALBERT POWERS GILLETTE & E. E. R. TRATMAN

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BY

HALBERT POWERS GILLETTE

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DITCHING AND TRENCHING MACHINERY

BY

E. E. R. TRATMAN

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TO
HENRY S. MUNROE
PROFESSOR OF MINING ENGINEERING
AT THE SCHOOL OF MINES,
COLUMBIA UNIVERSITY,
AS A MARK OF APPRECIATION
AND ESTEEM,
THIS VOLUME IS DEDICATED
BY THE
AUTHOR

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PREFACE

There are few engineering works of magnitude that do not involve the excavation of earth. Indeed the cost of earthwork forms one of the greatest of cost items in canal, in reservoir and in railway construction, nor is it an inconsiderable item in the construction of roads, sewers or water works. What will this excavation cost? This is a question that the engineer first asks himself in making his preliminary estimates. Later the same question confronts the contractor. To the engineer an erroneous answer may mean loss of reputation, to the contractor it assuredly means ruin where the work is extensive. A glance at the wide range in contract bids for most earthwork jobs will convince anyone that few contractors do more than guess at costs. While the numberless engineering structures that have cost more than the preliminary estimates prove quite as conclusively that engineers too often guess also.

In this the first published volume treating of earth economics in a comprehensive way, I have given all that my own notes could furnish and all that I have found in print in American technical literature. But I have not confined the exposition to a bare recital of facts and figures, since the principal aim has been to outline rational methods and rules to be used in cost calculation.

As yet many of our teachers of engineering have not impressed upon the students that a truly economic design of a structure can be made only by an engineer who knows every item of actual cost. This in turn can be known only by a study of the tools and methods used in construction. In using the expression "every item of actual cost," I do not mean the items that commonly appear in bidding sheets; but I mean those smaller elements that are so commonly ignored in estimating costs. Thus the cubic yardage of earth excavation is given in a bidding sheet, but the number of square yards of trimming, or "sand-papery," usually does not appear at all. Nevertheless this element of

trimming may amount to several cents per cubic yard of earth handled, and its cost should be known to the engineer as well as to the contractor. Only by a knowledge of such details of cost can the engineer hope to design economic structures and predict their actual cost with accuracy.

HALBERT P. GILLETTE.

NEW YORK CITY,
April 17, 1912.