INSTRUCTIONS ON MODERN AMERICAN BRIDGE BUILDING. WITH PRACTICAL APPLICATIONS AND EXAMPLES, ESTIMATES OF QUANTITIES, AND VALUABLE TABLES

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Instructions on modern American bridge building. With practical applications and examples, estimates of quantities, and valuable tables by G. B. N. Tower

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Trieste

INSTRUCTIONS

ON

MODERN AMERICAN

BRIDGE BUILDING.

WITH

PRACTICAL APPLICATIONS AND EXAMPLES,

ESTIMATES OF QUANTITIES, AND
VALUABLE TABLES.

Illustrated by Four Plates and Thirty Figures.

By G. B. N. TOWER,

CIVIL AND MECHANICAL ENGINEER,

Formerly Chief Engineer U. S. Navy, and late Chandler Instructor in Civil Engineering Rensselaer Polytechnic College.

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PREFACE.

This little treatise was written for the purpose of supplying a want felt by the author while giving instruction upon the subject. It was intended for an aid to the young Engineer, and is not to be considered as a complete substitute for the more elaborate works on the subject.

The first portion of this work mentions the various strains to which beams are subjected, and gives the formulæ used in determining the amount of those strains, together with a few examples to illustrate their application, and also the method of calculating a simple truss.

The second portion names and explains the various members of a Bridge Truss, and, by means of examples, shows the method of calculating the strains upon the various timbers, bolts, etc., as well as their proper dimensions; and gives, in addition, several useful tables.

The explanatory plates, which are referred to freely throughout the work, are believed to be amply sufficient for the purpose intended.

So much has been written on this subject that it is next to impossible to be wholly original, and no claim of that nature is preferred. It is simply an arrangement of ideas, gleaned from the various works of standard authorities, and modified by the author's practice, embodied in book form.

To give a correct list of all the books consulted would be simply impossible; — but it is well to state that the Hand-book of Railroad Construction, by Prof. G. L. Vose, under whom the author served as an Engineer, has been used as authority in many cases where there has been a difference of opinions among other authors. Some parts have been quoted entirely; but due credit has been given, it is believed, wherever such is the case.

It is not claimed that this little work covers the whole ground, but it is intended to describe, and explain thoroughly, three or four of the more prominent styles of Truss, leaving the other forms of Wooden Bridges to a subsequent volume.

Abutments and Piers, as well as Box and Arch Culverts, belonging more properly to masonry, will be treated of hereafter under that head.

Iron Bridges form a distinct class, and may be mentioned separately at some future period.

If this small volume should lead the student of Engineering to examine carefully the best Bridges of modern practice, and study the larger scientific works on this art, the author will feel satisfied that his efforts have not been entirely in vain.

Cambridge, February 23, 1874.

TOWER'S

Modern American Bridge Building.

BRIDGE BUILDING.

The simplest bridge that can be built, is a single beam, or stick of timber, spanning the opening between the abutments—but this is only of very limited application—(only for spans of 20 feet and less) owing to the rapid increase in sectional dimensions which is required as the span becomes greater.

Next comes the single beam supported by an inclined piece from each abutment meeting each other at the middle point of the under side of the beam—or, another arrangement, of two braces footing securely on the beam and meeting at a point above the middle point of the beam, which is suspended from the apex of the triangle formed by them, by means of an iron rod—These arrangements may be used up to 50 feet. For any span beyond 50 feet, modifications of this arrangement are used which will be described hereafter. Now let us investigate shortly the different strains that the various parts of a bridge have to bear—and the strength of the materials used. The theory of strains in bridge trusses is merely that of the Composition and Resolution of Forces. The various strains, to which the materials of a bridge are subjected—are compression, extension and detrusion.

Wood and Iron are the materials more generally employed in bridge construction—and in this pamphlet we shall take the following as the working strength of the materials—per square inch of section.

	Tension.	Compression.	Detrution.
Wood,	2000	1000	150
Wro't Iron,	15000	11000	
Cast Iron,	4500	25000	

Tension. If a weight of 2000 lbs. were hung to the lowest end of a vertical beam, so that the line of action of the weight and axis of the beam formed one and the same straight line—the tension on the beam would be 2000 lbs. But, if the beam were inclined, and the force acted in a vertical direction,