Graphical Analysis
OF
Roof Trusses

WILEY & SONS

120-5

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Duchemins formular

$$n = \frac{\rho \cdot 2\pi\alpha}{1 + \cos^2\alpha} = \text{normal pres}$$

$\Delta\alpha$

Graphics for Engineers, Architects, and Builders:

A MANUAL FOR DESIGNERS, AND A TEXT-BOOK FOR TECHNICAL SCHOOLS

TRUSSES AND ARCHES

ANALYZED AND DISCUSSED BY GRAPHICAL METHODS

BY

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IN THREE PARTS.

I.

ROOF-TRUSSES: DIAGRAMS FOR STEADY LOAD, SNOW, AND WIND.

II.

BRIDGE-TRUSSES: SINGLE, CONTINUOUS, AND DRAW SPANS; SINGLE AND MULTIPLE SYSTEMS; STRAIGHT AND INCLINED CHORDS.

III.

ARCHES, IN WOOD, IRON, AND STONE, FOR ROOFS, BRIDGES, AND WALL-OPENINGS; ARCHED RIBS AND BRACED ARCHES; STRESSES FROM WIND AND CHANGE OF TEMPERATURE; STIFFENED SUSPENSION BRIDGES.

PART I.—ROOF-TRUSSES.

THREE FOLDING PLATES.

REVISED EDITION.

THIRD THOUSAND.

NEW YORK

JOHN WILEY & SONS

LONDON

CHAPMAN & HALL, LTD.

1898.

Press of J. J. Little & Co.
New York, U. S. A.

PREFACE TO PART I.

THE use of Graphical Analysis for the solution of problems in construction has become of late years very wide-spread. The representation to the eye of the forces which exist in the several parts of a frame possesses many advantages over their determination by calculation. The accuracy of the figures is readily tested by numerous checks. Any designer who fairly tries the method will be pleased with the simplicity and directness of the analysis, even for frames of apparently complex forms. Those persons who prefer arithmetical computation will find a diagram a useful check on their calculations. Being founded on principles absolutely correct, these diagrams give results depending for their accuracy on the exactness with which the lines have been drawn, and on the scale by which they are to be measured. With ordinary care the different forces may be obtained much more accurately than the several parts of the frame can be proportioned.

It is advisable to draw the figure of the frame to quite a large scale, as the lines of the stress diagram are drawn parallel to the several pieces of the frame. If it is objected by any that a slight deviation from the exact directions will materially change the lengths of some of the lines, and therefore give erroneous results, it may be suggested that just so much change in the form of the frame will produce this change in the forces; one is therefore warned where due allowance for

such deformation should be made by the proper distribution of material. The comparison of different types of truss for the same locality can be made with ease, and the changes produced in all of the forces in any frame by a modification of a few of its pieces can be readily shown. By applying each new principle to a new form of truss, quite a variety of patterns have been treated without an undue multiplication of figures.

The method of notation used was introduced by Mr. Bow, in his "Economics of Construction." The diagrams, as here developed, are credited in England to Prof. Clerk-Maxwell, and the method is known by his name. The arrangement of the subjects, the application of the method, and the minor details have been carefully studied by the author. A very limited knowledge of Mechanics will enable the reader to understand the method of treatment here carried out.

NOTE TO REVISED EDITION.

THE reception of this Part at the hands of teachers and designers, since its first appearance as a reprint of a series of articles in "*Engineering News*," has been so hearty and sustained, that it has been thought best to put ROOF-TRUSSES in a uniform dress and agreement with BRIDGE-TRUSSES and ARCHES. The opportunity has been seized to arrange the material in a more systematic order, introduce some additional problems, and improve, as it is thought, in some matters of detail.

Quite a modification has been made in the way of regarding trusses which exert horizontal thrust, and Chapter VIII., Special Solutions, is new. The solution by *reversal of a diagonal* has been used in the author's class-room for several years. The concluding example of this chapter will afford a good test of the reader's mastery of the preceding principles.

C. E. G.

ANN ARBOR, MICH., March 11, 1890.

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