

VALVE-GEARS: ANALYSIS BY THE ZEUNER DIAGRAM

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Valve-Gears: Analysis by the Zeuner Diagram by H. W. Spangler

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H. W. SPANGLER

**VALVE-GEARS:
ANALYSIS BY THE
ZEUNER DIAGRAM**

WORKS OF PROF. H. W. SPANGLER

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VALVE-GEARS.

BY

H. W. SPANGLER,

Whitney Professor of Mechanical Engineering in the University of Pennsylvania.

Analysis by the Zeuner Diagram.

ONE HUNDRED AND NINE ILLUSTRATIONS.

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TO THE
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PREFACE.

THE writer, needing a book for class use which would give in one volume those parts of the theory of valve-gears necessary to a clear understanding of the subject, has prepared the following work.

All the standard text-books on the subject, the current periodicals, and working drawings have been called on for data and methods, and the works of Zeuner, Auchincloss, Rankine, Whitham, Halsey, Marks, Reulcaux, Bilgram, and the files of *Engineering* and the *Engineer* have been freely used in preparing the text; but the matter has been put in its present shape by the author.

A few of the methods are original, but others confronted with the same problems have probably solved them in the same or in a better way.

The designing of valve-gears is entirely a drawing-board process; and in all but radial gears, and to a great extent even there, the actual method of laying down the work is given.

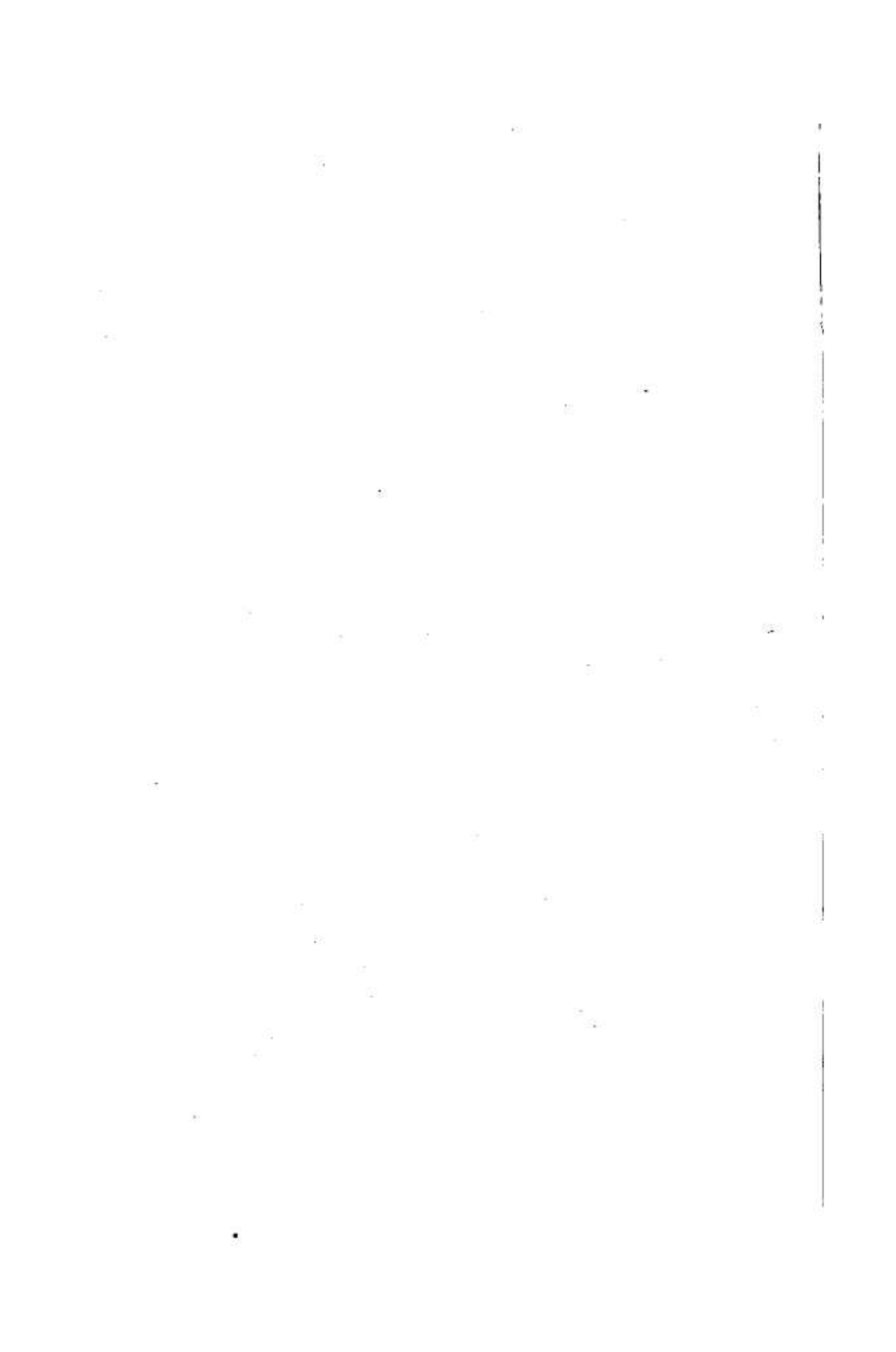
The mathematical proof of the methods and results used is given whenever possible.

The problems are in most cases made up from the data of engines actually in use.

H. W. SPANGLER.

UNIVERSITY OF PENNSYLVANIA,
PHILADELPHIA, PA., August 20, 1890.

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