

**A PRACTICAL COURSE IN
MECHANICAL DRAWING. FOR
INDIVIDUAL STUDY AND SHOP
CLASSES, TRADE AND HIGH
SCHOOL**

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A Practical Course in Mechanical Drawing. For Individual Study and Shop Classes, Trade and High School by William F. Willard

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WILLIAM F. WILLARD

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**A Practical Course in
Mechanical Drawing**

A Practical Course in Mechanical Drawing

For Individual Study and Shop Classes,
Trade and High Schools

BY

WILLIAM F. WILLARD

FORMERLY INSTRUCTOR IN MECHANICAL DRAWING AT THE
ARMOUR INSTITUTE OF TECHNOLOGY

With 131 Illustrations, a Reference Vocabulary
and Definitions of Symbols

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By
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THE attention of the student is called to the *Reference Glossary* and also to the *Definitions of Symbols* which are printed near the end of this volume. A careful reading at first and occasional reference to these pages as the study progresses will be found of great assistance.

PRACTICAL MECHANICAL DRAWING

CHAPTER I

INTRODUCTION

MECHANICAL drawing is one of the most popular and most profitable subjects of study for the boy or young man of today. It is an essential qualification in most lines of engineering, an almost indispensable accomplishment in many occupations, and often the secret of successful advancement. It is founded upon the science of geometry, which, as applied to drawing, becomes a delightful and interesting subject, and not the difficult study the beginner fears. For illustration, a farmer wishes to know how many gallons of water will fill a tank, the diameter and height being known; how many bushels of wheat will fill a bin, or how many acres there are in a field a quarter of a mile square. These examples, like many others, illustrate the practical application of geometry, a subject no less important to the mechanic than the farmer, but a thousand times more interesting to the student than the usual text book.

In preparing this manual the author was ever mindful of the many circumstances and limitations which have so often combined to deny to aspiring youth the advantages of a complete education. In this day and age competition and industrial conditions demand the best training and skill for every productive effort. What the artisan or mechanic does to improve himself

intellectually, to this end, increases his efficiency and value to his employer in every respect.

In geometry a student is concerned with the theorem of a problem, and the proof, or why it is so. In mechanical drawing the mechanical operations of construction—the actual doing of a problem, graphically, by the use of compass, triangles and other instruments—is considered essential and sufficient. However, this course does not preclude a master's knowledge of the principles of geometry. Any live, wide-awake boy can apply, to a good advantage, these geometric exercises to some project which he desires to work out or invent, without first having studied the subject.

The surveyor with his tape and transit, the architect or mechanical engineer with his slide rules and formulas, must know these exercises also. If a craftsman desires a brace or bracket for a plate rail, he must know how to "lay out" the desired curves and angles. If a boy desires to make a taboret or jardiniere-stand with a hexagonal or octagonal top, he must *first* solve the geometric problem or consequently be unhappy with the results.

One reason for not accepting a freehand perspective sketch as a substitute for the geometric drawing lies in the fact that the sketch seldom shows all the information required for the workman. The sketch deals with outward appearances only and from one viewpoint. The mechanical drawing of an object delineates the actual facts, within or without, and from as many viewpoints as the object has dimensions. Any hidden or detailed information is considered as important as that which is visible, and these details are represented accordingly by suitable conventions, the word convention,