MECHANICAL DRAWING FOR COLLEGES AND UNIVERSITIES

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649123377

Mechanical drawing for colleges and universities by James D. Phillips & Herbert D. Orth

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

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SCOTT, FORESMAN AND COMPANY
CHICAGO NEW YORK

PUBLISHERS' NOTE

The present volume is for use in University classes and is complete in itself. It is to be followed, however, by a book for high schools by Professors Crawshaw and Phillips; and the two books will form a complete course in Mechanical Drawing for High School and University work. In this connection the publishers wish to announce their Vocational Series for Schools and Colleges under the editorial supervision of Professor F. D. Crawshaw of the University of Wisconsin. This series is intended to supply an increasing demand for textbooks for use in the vocational courses that are now being so widely adopted as a part of public education.

PREFACE

A drawing is a plan, and sometimes also a specification, for construction work or the assembly of constructed parts. From the beginning of time drawing has been a means of expression and consequently is a form of language. Only within recent years, however, has the art of graphical expression been an important element in the process of developing machinery and structural work. Today a drawing is one of the first steps in the production of practically all machines and structures. Mechanical drawing is the particular form of drawing used for this purpose. The commercial value of mechanical drawing is therefore quite evident.

Drawing has educational as well as commercial value if it is properly taught. It is recognized as one of the best known means of training for habits of observation and perception. As a means of strengthening the imagination and developing coordination between the hand and eye, it has few, if any, equals.

It has been the aim of the authors to arrange a course in drawing which will develop these powers, and which at the same time will give the student an appreciation of the best commercial drafting room practice while making complete, accurate, and well-finished drawings of industrial projects. The course presented in this book is designed for college students who have not had, necessarily, previous experience in drawing. Both the plan and the details of the course have been carefully worked out and repeatedly tested under practical conditions. The present form and content of the course represent the result of years of experience in teaching drawing. The course has fulfilled the educational and commercial requirements as set forth herein.

As an example, each element in drawing is treated separately before the elements are combined. By concentration of thought and effort and by means of repeated performance of similar

operations, the student is enabled to comprehend the theory involved and to develop technique and skill in a minimum of time.

The elements or general divisions in drawing are introduced in the order in which they would naturally occur in a commercial drafting room, as follows: Perspective Sketching, Orthographic Sketching, Pencil Mechanical Drawing, Tracing and Blueprinting. Within these divisions the ideas of progression and concentration are again carried out by introducing lines and conventions in the following progressive order: Straight Vertical and Horizontal Lines, Straight Oblique Lines, Large Circles and Arcs of Circles, Small Circles and Arcs of Circles Tangent to Straight Lines, Arcs of Circles Tangent to One Another, Irregular Curves. It will be noticed that the drawing of tangencies is deferred until the end of Chapter IV. This is done to prepare the student for the necessary conventions used in section views and to give him considerable skill in the handling of instruments in all fundamental operations.

Special attention is called to the subject of Perspective Sketching, as treated in Chapter I. The authors have endeavored to reduce this subject to its lowest terms for use in mechanical drawing where it serves principally to interpret orthographic drawing. In commercial practice the representation of objects by perspective is increasing and hence it would seem that every student of mechanical drawing should become familiar with at least a simple treatment of 45° perspective, the form emphasized in this text. It is assumed that the time devoted to this part of the course will not exceed one-fifth the total time for the work of the first four chapters—approximately one hundred hours.

Every problem given in this course requires thought on the part of the student to reach a solution. The various methods of presenting problems and the solutions required are exemplified in Plates 2, 7, 13, 18, 26, 29, 32, and 35. The problems of the course have been carefully chosen to illustrate principles of representation, dimensioning, etc., and are arranged in accordance with the principle that the more advanced the position of the problem in the course, the more difficult its solution from the standpoint of both the theory and the technique. Groups of

problems are presented for most of the plates, from which problems may be assigned, thus affording a means of suiting the problem to the ability of the student and of lessening the tendency of students to copy from others.

With each orthographic problem a *type problem* is given. This type problem consists of the given data and the solution of a problem similar to that assigned to the student. Example: Figs. 65, 68, and 69 show the given views, constructive stage of pencil mechanical drawing, and the completed drawing. By this method suggestions are given as to methods of representation and dimensioning, while, at the same time, a high standard of technique is set for the student.

It has been the aim in arranging the material and selecting the problems of the course, to distribute the introduction of theory and the use of the various instruments in such a way that the student will comprehend both the theory and its application. The means used to this end is A COURSE IN WORKING DRAWINGS, supplemented by lectures and demonstrations. By applying theory in a well graded, practical problem, immediately after the theory is presented the student should develop a full comprehension of drawing as it is used in commercial practice.

To aid the instructor in securing the viewpoint of the authors in the teaching of the course, Chapter X, The Instructor's Guide, was prepared. It attempts only to emphasize the principal points which the authors have found important. It should reinforce rather than limit the instructor's individual method.

The authors wish to express their appreciation of the cooperation of Professor Crawshaw from the very beginning to the end of the book. He has been a co-author in its production.

THE AUTHORS.