ENGINEERING DESCRIPTIVE GEOMETRY: A TREATISE ON DESCRIPTIVE GEOMETRY AS THE BASIS OF MECHANICAL DRAWING, EXPLAINING GEOMETRICALLY THE OPERATIONS CUSTOMARY IN THE DRAUGHTING ROOM

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BY

F. W. BARTLETT

COMMANDER, U. S. NAVY

HEAD OF DEPARTMENT OF MARINE ENGINEERING AND NAVAL CONSTRUCTION AT THE UNITED STATES NAVAL ACADEMY

AND

THEODORE W. JOHNSON

A. B., M. E.

PROFESSOR OF MECHANICAL DRAWING, UNITED STATES NAVAL ACADEMY

MEMBER OF AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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PREFACE.

The aim of this work is to make Descriptive Geometry an integral part of a course in Mechanical or Engineering Drawing.

The older books on Descriptive Geometry are *geometrical* rather than *descriptive*. Their authors were interested in the subject as a branch of mathematics, not as a branch of drawing.

Technical schools should aim to produce engineers rather than mathematicians, and the subject is here presented with the idea that it may fit naturally in a general course in Mechanical Drawing. It should follow that portion of Mechanical Drawing called *Line Drawing*, whose aim is to teach the handling of the drawing instruments, and should precede courses specializing in the various branches of drawing, such as Mechanical, Structural, Architectural, and Topographical Drawing, or the "Laying Off" of ship lines.

The various branches of drawing used in the different industries may be regarded as dialects of a common language. A drawing is but a written page conveying by the use of lines a mass of information about the geometrical shapes of objects impossible to describe in words without tedium and ambiguity. In a broad sense all these branches come under the general term Descriptive Geometry. It is more usual, however, to speak of them as branches of Engineering Drawing, and that term may well be used as the broad label.

The term Descriptive Geometry will be restricted, therefore, to the common geometrical basis or ground work on which the various industrial branches rest. This ground work of mathematical laws is unchanging and permanent.

The branches of Engineering Drawing have each their own abbreviations and special methods adapting them to their own particular fields, and these conventional methods change from time to time, keeping pace with changing industrial methods.

Descriptive Geometry, though unchanged in its principles, has recently undergone a complete change in point of view. In changing its purpose from a *mathematical* one to a *descriptive* one, or, from being a training for the geometrical powers of a mathematician to being a foundation on which to build up a knowledge of

some branch of Engineering Drawing, the number and position of the planes of projection commonly used are altered. The object is now placed behind the planes of projection instead of in front of them, a change often spoken of as a change from the "1st quadrant" to the "3d quadrant," or from the French to the American method. We make this change, regarding the 3d quadrant method as the only natural method for American engineers. All the principles of Descriptive Geometry are as true for one method as for the other, and the industrial branches, as Mechanical Drawing, Structural Drawing, etc., as practiced in this country, all demand this method.

In addition, the older geometries made practically no use of a third plane of projection, and we take in this book the further step of regarding the use of three planes of projection as the rule, not the exception. To meet the common practice in industrial branches, we use as our most prominent method of treatment, or tool, the auxiliary plane of projection, a device which may be called the draftsman's favorite method, but which in books is very little noticed.

As the work is intended for students who are but just taking up geometry of three dimensions, in order to inculcate by degrees a power of visualizing in space, we begin the subject, not with the mathematical point in space but with a solid tangible object shown by a perspective drawing. No exact construction is based on the perspective drawings which are freely used to make a realistic appearance. As soon as the student has grasped the idea of what orthographic projection is, knowledge of how to make the projection is taught by the constructive process, beginning with the point and passing through the line to the plane. To make the subject as tangible as possible, the finite straight line and the finite portion of a plane take precedence over the infinite line and plane. These latter require higher powers of space imagination, and are therefore postponed until the student has had time to acquire such powers from the more naturally understood branches of the subject.

F. W. B.
T. W. J.

MARCH, 1910.

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