ELEMENTS OF DESCRIPTIVE GEOMETRY, WITH APPLICATIONS TO ISOMETRIC PROJECTION AND OTHER FORMS OF ONE-PLANE PROJECTION; A TEXT-BOOK FOR COLLEGES AND ENGINEERING SCHOOLS

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ELEMENTS OF DESCRIPTIVE GEOMETRY

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A TEXT-BOOK FOR COLLEGES AND ENGINEERING SCHOOLS

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PREFACE

The aim of this treatise is to make a clear presentation of the theory of projection, to show the application of this theory as a medium of expression, and by the discussion and proof of a great variety of problems to enable the student to make a ready and intelligent use of this medium in the representation of all forms of magnitudes.

As by far the greater part of practical drafting is done from the standpoint of the third quadrant, there seems to be no good reason why the principles of descriptive geometry, which are so directly and extensively applied in practice, should not also be presented from the standpoint of the same quadrant.

Therefore, while the student is called upon to work freely in all the four quadrants, the subject-matter is presented primarily from the third quadrant.

In the establishment of principles great effort is made to be explicit; but in the application of these principles, for which purpose a great many unsolved problems are assigned, the student is left largely to his own resources.

As the principles of projection are fundamental in all branches of drafting, it follows that no attempt at extensive application of these principles in such subjects as machine drawing, gearing, architectural drawing, etc., should be made until the principles themselves have been thoroughly established. For this reason the attention of this work is largely confined to theoretical considerations, although a number of simple practical applications such as the student can safely and intelligently make are introduced.

Free use is made of profile and other supplementary planes of projection.

Isometric projection and other forms of one-plane projection are treated as applications of descriptive geometry.

It is hoped that the system of notation which is introduced will be found both simple and expressive; and that the method of locating given parts which may be employed in the assignment of work in the recitation room and in the drafting room will be found useful.

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DESCRIPTIVE GEOMETRY

CHAPTER I

DEFINITIONS AND ASSUMPTIONS

1. The Subject defined. Descriptive geometry is that branch of mathematics which seeks, through the medium of an exact process of graphic expression, to represent geometrical magnitudes which occupy given positions in space, and also through the same medium of expression to solve such problems as relate to these magnitudes.

2. Representation of Magnitudes of Two Dimensions. A magnitude of two dimensions, such as a plane geometrical figure, may be easily and directly represented, graphically, upon a single plane, since every characteristic of such a magnitude may be determined from a single standpoint of observation, and the whole may be outlined upon the very plane in which the magnitude exists.

The diagrams connected with the statement and solution of problems in plane geometry furnish an illustration of this fact.

3. Representation of Magnitudes of Three Dimensions. A magnitude of three dimensions does not exist in a single plane, neither can its characteristics be completely determined from a single standpoint of observation; therefore the process of representation must necessarily be different from that employed in connection with magnitudes of two dimensions.

4. Projection. Since the points and lines of magnitudes of three dimensions do not exist in a single plane, as is the case with magnitudes of two dimensions, it will be necessary to determine some plane of representation and to establish some process by which reference to this plane may be made.