CHAPTER X.

THE REPRESENTATIONS OF OBJECTS ON THE VERTICAL, HORIZONTAL, PROFILE AND OBLIQUE SUPPLEMENTARY PLANES OF PROJECTION.

Having explained in Chapter IX the principles involved in the representation of a single point upon the vertical and horizontal planes, attention will now be directed to the representation of that solid known as a

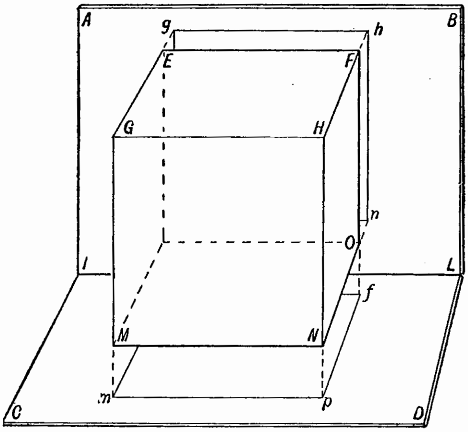

Fig. 47. A Pictorial View of the Vertical and Horizontal Planes, together with a Cube Located Within the First Angle.

cube upon these planes. It will be remembered that a cube is a solid bounded by six equal faces or squares and having all its angles right angles.

Fig. 47 is a pictorial view of the vertical and horizontal planes in their assumed positions, with the cube suspended in space in front of the vertical and above the horizontal plane, with two of its faces parallel to each. If the cube be viewed from above, with the point of sight moving over the object so as to place every point viewed in a line perpendicular to the horizontal plane of projection, a square equal to one of its faces would represent it as shown at *a b c* and *d,* Fig. 48.

Perhaps this will be more fully comprehended if we presume to drop plumb lines from the vertice of angles E F G and H, Fig. 47, to intersect the horizontal plane

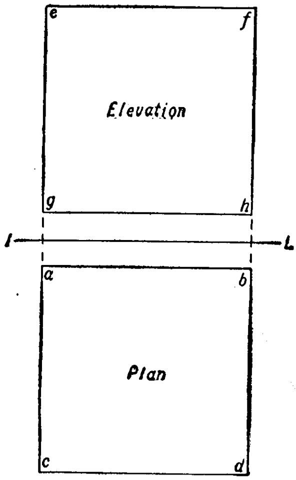

Fig. 48. The Plan and Elevation of a Cube.

in points *m p* and *f,* where lines are drawn to connect them, thus forming a square equal to one face of the cube. It should be noted that point *m* is not only the plan of point *G,* but the plan of point *M* as well, also the plan of line *G M,* or any number of points along the line *G M.* This deduction is not confined to the line *G M,* but can be applied to all lines which are perpendicular to the horizontal plane of projection. Line *m p,* Fig. 47, is not only the plan of line *G H,* but of the line *M N* also, or a plan of any line which may be drawn upon the surface *G H N M,* and intersecting lines *G M* and *H N.*

Thus it will be noted that a point in plan may represent a point in space, or a line which is perpendicular to the horizontal plane of projection. Likewise a line in plan may represent a line in space either parallel or oblique to the horizontal plane, or it may represent a plane which is perpendicular to the horizontal plane of projection.

The elevation of the object is secured by drawing a square equal to one of its faces, directly above the square which is looked upon as a plan, as shown at *e f g* and *h,* Fig. 48. This is also illustrated at Fig. 47, where the lines *G E, H F,* and *N O* if produced, would intersect the vertical plane *A B I L* in points *g h* and *n,* thus locating points which may be connected to form an elevation as shown at *g h* and *n.* Here the point *g* is not only the elevation of points *G* and *E,* but of any number of points along the line *G E,* likewise the point *h* is an elevation of points *H* and *F,* or of any number of points along the line *H F.* Similar conclusions may also be drawn for the line *N O.* The line *g h* is not only an elevation of *G H,* but the elevation of line *E F* as well, and line *g h* is also an elevation of the face *E F H G,* or of any line which may be drawn upon that surface which intersects lines *E G* and *F H.* Therefore a line in elevation may represent a line in space which is parallel or oblique to the vertical plane of projection, or it may represent a plane which is perpendicular to the vertical plane of projection.

In proof of the above, we may presume to draw a line from *G* to *F* upon the upper face of the cube, Fig. 47. It will then be noted that the line *g h* is its elevation, and a line drawn from *m* to *f* would then be its plan, thus showing that this line is oblique to the vertical plane of projection.

It should be remembered that Fig. 47 is a pictorial view of the cube and planes of projection, which is introduced for the purpose of giving a clearer understanding of the principles involved, while the plan and elevation proper is at Fig. 48, presuming the cube to be of a size as shown.

If the reader has become sufficiently interested he will do well to provide himself with a drawing board and a few accessories, which he may obtain from almost any dealer in artist's materials. The drawing board should be of convenient size, say 23 x 31 inches. He will also require a T-square which has a blade about equal in length to the drawing board; two triangles, one 8 inch 45 degrees, and one 10 inch 60 and 30 degrees, a few thumb tacks, a lead pencil and rubber. Almost any grade of paper may be used. In regard to drawing instruments, a pair or two of compasses will be all that is required.

If the student will perform a few experiments which the foregoing should suggest, by the aid of pieces of cardboard, and remember that the plan of a point or line will always be found directly beneath it, and that the elevation is always found directly back of it, the above will no doubt be made quite clear, and place him in a position to grasp additional facts which will aid him as a pattern cutter.

The Profile Plane.

The profile plane is an additional plane assumed to be perpendicular to the principal planes of projection, i.e., the vertical and horizontal. No. 1, Fig. 49 illustrates at *A B L I* the vertical plane, and at *I L D C* the horizontal plane, then *a b c d* is a profile plane, and a representation upon this plane is termed a profile. The profile plane may be presumed to be revolved about a perpendicular axis as the line *b c,* into the plane of the paper, or about a horizontal axis as the line *c d,* and may be located either to the right or left of the assumed position of the object.

The line about which the profile plane is presumed to be revolved becomes an intersecting line when the projection upon that plane is constructed in the same general manner as has been explained for projection upon the principal planes.

The profile plane is often of the greatest use, which is

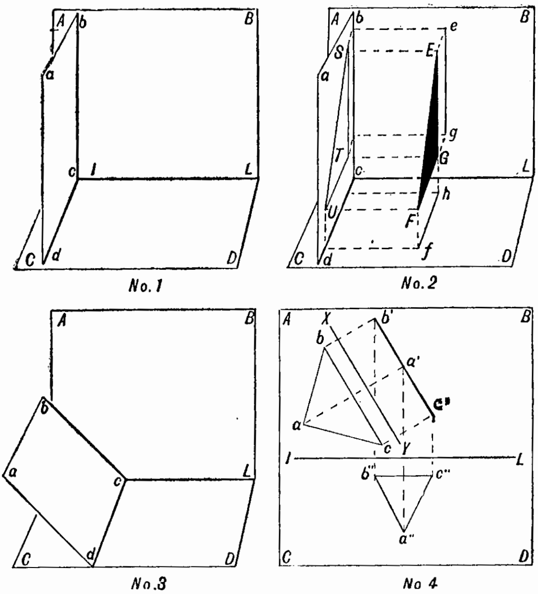

Fig. 49. *Illustrating the Profile and Oblique Supplementary Planes.*

illustrated in a simple example at No. 2, Fig. 49. A triangle as *E F G* is presumed to be suspended in space so that its surface is perpendicular to the vertical and horizontal planes of projection. The line *f h* is a plan of said triangle, and the line *e g* is its elevation. To secure the true form of the triangle or the length of its longest side, it must be revolved until it becomes parallel to the plane upon which it is represented, or an additional plane assumed, which is here shown as the profile plane *a b c d.*

This plane being parallel to each of the three sides of the triangle, its representation upon that plane will be its true form, as shown in a pictorial way at *S T U*.

SUPPLEMENTARY OBLIQUE PLANES.

It is frequently found convenient to make use of what is known as oblique planes. The object is represented upon these, its position being fixed as regards the principal planes. The positions of such planes are determined by conditions of convenience, and therefore depend upon the nature of the object, but they are, in most cases, such that these planes are perpendicular to one of the principal planes. The oblique plane is shown pictorially at No. 3, Fig. 49. For example, *A B L* is the vertical and *C D L* the horizontal plane of projection, then *a b c d* is the oblique plane.

To illustrate the use of the oblique plane, let it be presumed that the surface *A B D C* of No. 4 in Fig. 49, is a surface upon which a right angled triangle is to be represented in plan and elevation, when its position is as follows: The surface of the triangle is at an angle of 60 degrees to the horizontal plane, with its longest side parallel to the vertical plane. If a line as *X Y* be drawn at an angle of 60 degrees to the line *I L*, this line, i.e., *X Y*, may for the moment be looked upon as the intersecting line between the vertical and a supplementary plane which makes an angle of 60 degrees to the horizontal plane, then draw the triangle upon this plane in its true form, keeping its longest side parallel to line *X Y* as shown at *a b c*. Draw upon the vertical plane to the right of line *X Y* a line as *b′ a′ c′* parallel to line *X Y*. Project points *a b c* as shown at *b′ a′ c′*, then will the line *b′ a′ c′* be a representation of the triangle upon the vertical plane.

Its plan is secured by dropping lines from points *b′ a′ c′* perpendicular to *I L,* and locating points upon these lines at distances from *I L* as found from the line *X Y* to points *a b c,* as shown at *b″ c″ a″,* after which lines are drawn to complete the plan as shown. It will be noted that the line *b c* as shown in plan at *b″ c″* is considerably foreshortened for the reason that this line as at an angle to the horizontal plane of projection.

As has been previously stated, the principles employed to secure patterns for forms whose ends are not parallel are somewhat complex. On the other hand, if one secures a clear understanding of the principles employed to secure the patterns for one form, he may employ those principles for all. He who considers the art of pattern cutting worthy of attention will find that a study of its principles is of the utmost importance.

The work may here seem to be somewhat extended; however, the student is cautioned not to turn it aside and wait for something which seems for the moment to be more in the line of this work, since, if the principles as herein explained are not fully comprehended by the pattern cutter, he can never become a master of his art. The study of individual pattern demonstrations, and the pursuit of this or that one's methods may enable one to develop a considerable number of patterns, but at what moment something which we have never seen may come before us no one can foretell. There are but few principles to be understood which may be applied to those forms which are secured by triangulation, and since the writer has undertaken the task of explaining those principles, he trusts that the student will withhold judgment until he has given the work considerable attention, thus placing himself in a position to comprehend the principles involved in the pattern problems which follow.