CHAPTER III.

The Oblique Cone.

Attention will now be directed to the Oblique Cone, and the method of securing the pattern for same. This is a simple example containing principles which may be employed in securing the patterns for a variety of forms.

In the compilation of this work, the author has assumed no previous knowledge of orthographic projection on the part of the student. As the examples demand some knowledge of this, an explanation of the principles involved will be entered into as the work progresses.

The Plan.

A plan is defined as being a drawing of anything, showing the parts in their proportion and relation. The surface upon which a plan is drawn is a horizontal one, and in this work we shall presume that the object to be represented is directly above it.

In securing the location of points which it becomes necessary to represent in plan, vertical lines are presumed to be dropped from said points, and their intersections with the surface upon which the plan is drawn, are the plans of those points.

Fig. 15 illustrates an oblique cone with a number of right lines upon its surface, and its plan. Fig. 16 is a geometrical representation of a similar cone, and is looked upon as a plan.

The purpose of Fig. 15 is to convey to the student in a pictorial way, an understanding of the relation the plan bears to the object itself. Here, as will be noted, an oblique cone with a number of right lines upon its surface is suspended directly above the horizontal surface *A B C D*. The method of securing a plan of said cone should be apparent from lines shown. As will be noted, the foot of the perpendicular line *E E′* is a plan of the

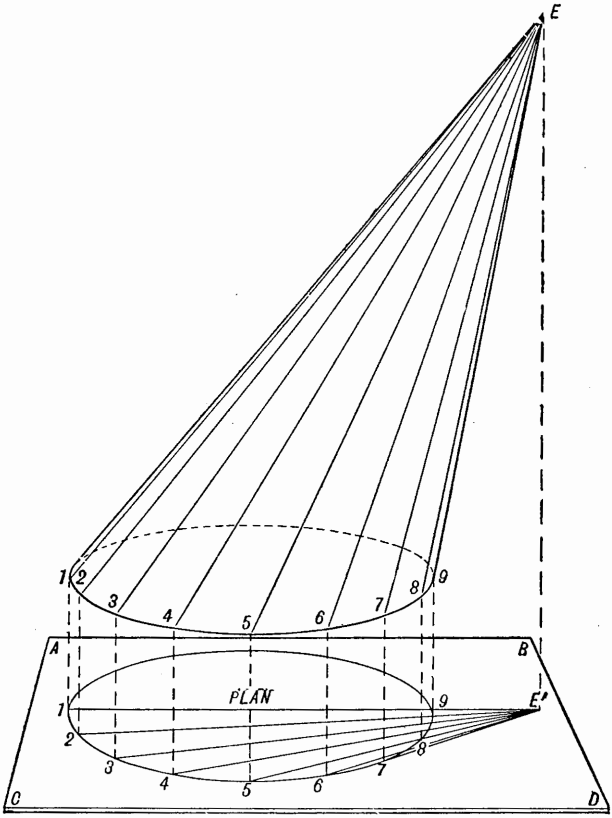

Fig. 15. *An Oblique Cone Having a Number of Right Lines Upon Its Surface, and Its Plan.*

vertex *E,* and the foot of each perpendicular let fall from the numbered points of the base is the plan of its respective point. Since lines shown upon the surface of the cone are right lines, and converge to the vertex *E,* lines may be drawn from numbered points of the plan to E', to secure plans of those lines.

Dividing the Surface of the Oblique Cone.

When called upon for a pattern for an oblique cone, certain data must be at hand in the form of a specification, i. e., the diameter of the base, the vertical hight of the vertex above the plane of the base, and the distance the vertex is removed from a point directly above the center of the base. Presuming these to be known, and to be as shown at Fig. 16, where the circle is drawn equal in diameter to the diameter of the required cone, a line is

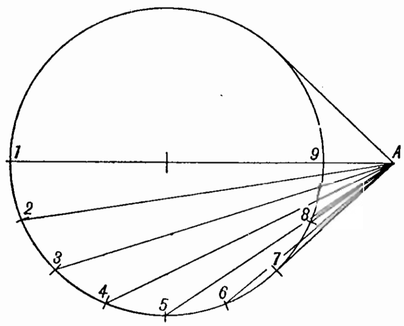

Fig. 16. A Plan of an Oblique Cone.

drawn through the center of said circle as *1 9*. Upon this line a point as *A* is located, which is at a distance from the center of circle equal to the distance the vertex of the cone is removed from directly above the center of the base.

Since the line *1 9* divides the diagram into two equal parts although opposite, we shall only consider one part, as it may be duplicated for the other. One-half of the circle is divided into a number of equal parts as shown, and lines drawn from these points of division to point *A*.

In this manner the plan is secured of not only the cone, but of a number of right lines upon its surface, which divide said surface into triangles.

The work of securing the pattern is a matter of determining the dimensions of these triangles, and placing them upon any surface, a portion of which will then constitute the pattern. Since the distance between points of the circle is the true length of one side of each triangle, the remaining measurements are secured by de-

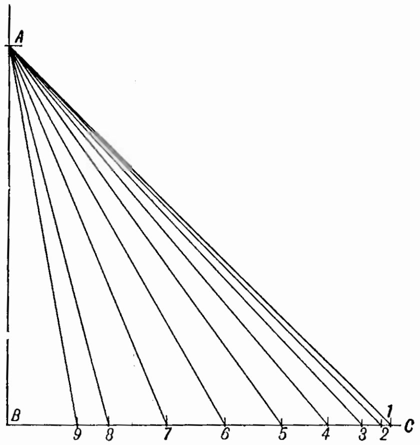

Fig. 17. *Diagram of Triangles.*

termining the true lengths of lines which connect points of the base and the vertex. As said lines intersect at point *E,* Fig. 15, the true length of each will be found in the hypothenuse of a right angled triangle, whose perpendicular is equal to the vertical hight of the required cone.

Constructing Necessary Triangles.

The method of constructing these triangles is clearly shown at Fig. 17, where indefinite right lines *A B* and *B C* have been drawn at right angles to each other, and intersecting at point *B*. The vertical hight of the required cone is set off from *B* upon the line *A B,* as at *A*. Since each line shown in plan, Fig. 16, i. e., *A 1, A 2,* etc., supplies the true length of the base of a triangle, whose hypothenuse is the line in its true length, we may set off from *B* along line *B C,* distances found from *A,* Fig. 16, to points *1, 2, 3,* etc., as shown in similarly numbered points of Fig. 17. The distances found from point *A,* Fig. 17, to the numbered points upon line *B C,* are the true lengths of similarly designated lines whose plans are shown in Fig. 16. Thus all necessary data is at hand to enable us to complete the pattern.

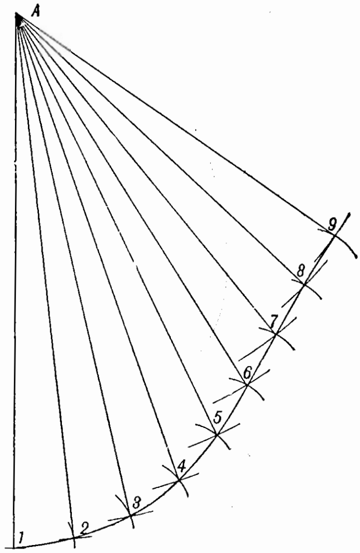

Fig. 18. *Semi-pattern for an Oblique Cone.*

The vertices of all triangles of which the surface of the cone is composed, are at the apex of said cone, therefore the lines forming two sides of each of those triangles will radiate from point *A* of the plan, or pattern, as shown.

To Secure the Pattern.

To develop the pattern as shown at Fig. 18, draw the line *A 1* in any convenient position, making its length equal to the length of line *A 1*, Fig. 17. Since line *A 2* also radiates from point *A* of the pattern, the compasses may be set to a span equal to the length of line *A 2*, Fig. 17, and with point *A* of the pattern as center, the small arc is drawn as shown at *2*, Fig. 18. Then will one extremity of line *A 2* lie in said arc, and at a distance from point *1* equal to the distance between points *1* and *2* of the plan, Fig. 16. Therefore, if the second arc is drawn as shown, with point *1* as center, and the distance between points *1* and *2* of the plan, Fig. 16, as radius, the exact location of said line is established. The true size, form, and position of the remaining triangles of which the surface of the cone is composed, may be determined in a similar manner. For example, point *A* of the pattern, Fig. 18, is a constant center from which small arcs are drawn whose radii are equal to lengths of lines *A 3, A 4, A 5,* etc., Fig. 17. Successive numbered points of the base are used as centers, with the distance similarly numbered points are from each other as shown in plan, Fig. 16, as radii, to locate those points as shown, Fig. 18.

Fig. 18 shows the pattern for one-half the cone which may be duplicated for the remaining equal portion. Had it become desirable to secure the pattern in one piece, points and lines as here shown could have been duplicated upon the opposite side of line ***A 1***.