CHAPTER XVI.

The Ship's Ventilator.

The ship's ventilator as illustrated at Fig. 63, should be of interest to the prospective pattern cutter, chiefly for the reason that it suggests principles and methods which

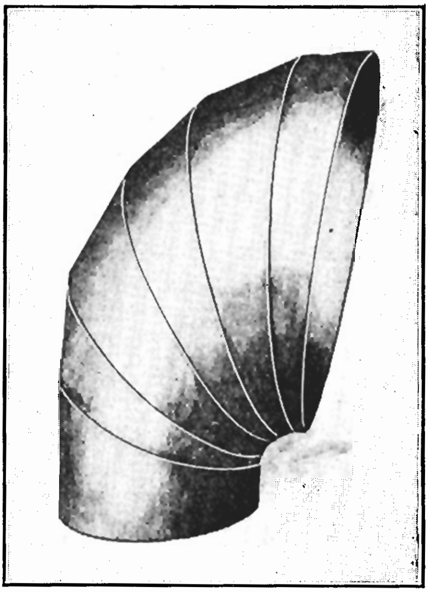

Fig. 63. Photographic View of a Ship's Ventilator with a Round Mouth.

may be introduced in the development of patterns for many fittings of a similar nature.

To the reader who has followed this work it should have become evident that the form of the ends of the object for which a pattern is required must first be established. The author was at one time asked: "How shall I proceed to secure the pattern for a ship's ventilator?" The reply was: "First determine what form it shall be at the miters; beyond this your patterns are but simple examples in triangulation."

This is a point which is often overlooked by those who are slow to realize that in practically all examples where triangulation is to be applied the form of the ends of the object must first be established. This is precisely what is accomplished when a formula is introduced for the construction of the diagrams to represent a ship's ventilator. When the diameter of base, or pipe to which it is to be connected, is the known quantity, the formula which follows has been used to some extent:

Formula for a Ship's Ventilator With a Round Mouth.

Diameter of base × 2 = diameter of mouth.
Diameter of base × 1½ = radius of back.
Diameter of base × ¼ = radius of throat.
Angle of mouth to the horizontal 80 degrees.

The form of all pieces to be round at each end, and of diameters equal to the lengths of miter lines shown in the resulting elevation.

This formula has been worked out in Fig. 64 to the scale appended, presuming the base to have a diameter of 16 inches, and the fitting to be made in six pieces. It will be noted that the back and throat have been divided into the same number of parts, i.e., into as many parts as the fitting is to have pieces. Lines drawn between these points of division represent the miter lines. As has been previously explained, each miter line may now be looked upon as the edge elevation of a circle whose diameter is equal to the length of the line. There must be as many patterns as pieces in the ventilator, although one-half of each piece may be duplicated for the other half.

To Reduce the Problem to Its Simplest Form.

The most desirable course to pursue in examples of this class is to construct separate elevations of each piece, with one end parallel to the intersecting line (*I L*) as shown at Fig. 65.

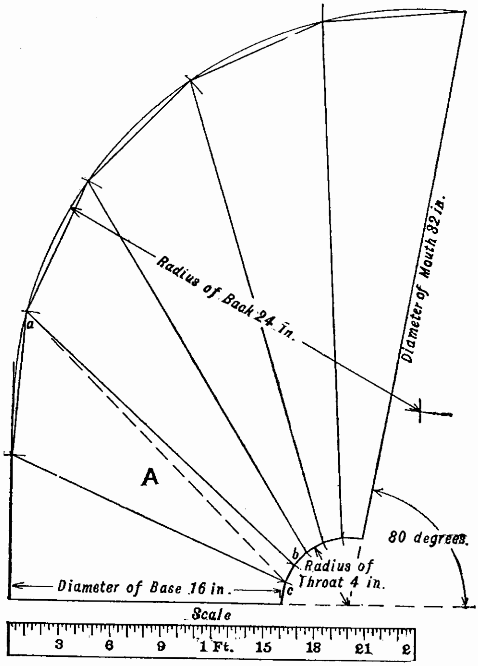

Fig. 64. Side Elevation of a Ship's Ventilator.

The elevation in Fig. 65, as will be noted, is an elevation of that portion of the object marked *A* in Fig. 64, it having been revolved in such a manner as to place the line *a b* of Fig. 64 parallel to the intersecting line. To transfer that diagram is but a simple matter if we draw, or presume to draw, the line *a c* Fig. 64, which then divides that section into triangles, and may be transferred by the use of our compasses and straight edge.

Having drawn the elevation of section *A*, Fig. 64, as shown at Fig. 65, the plan is secured by drawing semi-circles as shown, i.e., we draw a semi-circle in plan whose diameter is equal to the length of the base line, for a plan of the base. To secure a plan of the top, a supplementary oblique plane is assumed whose intersecting line in this instance is the oblique line *9 1* of the elevation. Above this line, as shown, a semi-circle is drawn whose diameter is equal to the length of line *1 9*.

Divide each semi-circle into the same number of equal parts as shown. Draw lines from the points of division of the semi-circle representing the true form of the top, perpendicular to the oblique line *9 1* to intersect that line as shown in points *1, 2, 3, 4,* etc. From these points, i.e., *1, 2, 3, 4,* etc., upon the oblique line *9 1* of the elevation, draw indefinite lines perpendicular to the line *I L*. Set off distances upon these lines below the line *I L* equal to the length of similarly numbered lines which cross the semi-circle representing the true form of the top. A line traced through points thus secured supplies a plan of the top, together with a number of points which are utilized in developing the pattern.

Draw full lines between points of the same number in plan as shown. This supplies plans of lines presumed to be upon the surface of the object. However, since these lines do not divide the surface into triangles, additional lines must be assumed. Plans of these are secured when the broken lines are drawn, as *1 2, 2 3, 3 4,* etc.

If the reader has any difficulty in comprehending this, he may cut from sheet metal or cardboard a form as indicated by the semi-circle in plan, the elevation, and the true form of the top, Fig. 65. When this is cut, it may be bent at an angle of 90 degrees upon the lines which represent the base and top in elevation. He will then have a form which is illustrated to some extent in Fig. 66, although it is there represented as a solid. By placing this in the angle formed by the two planes which are at right angles to each other, also shown in Fig. 66, and remembering that the plan of a point is always directly

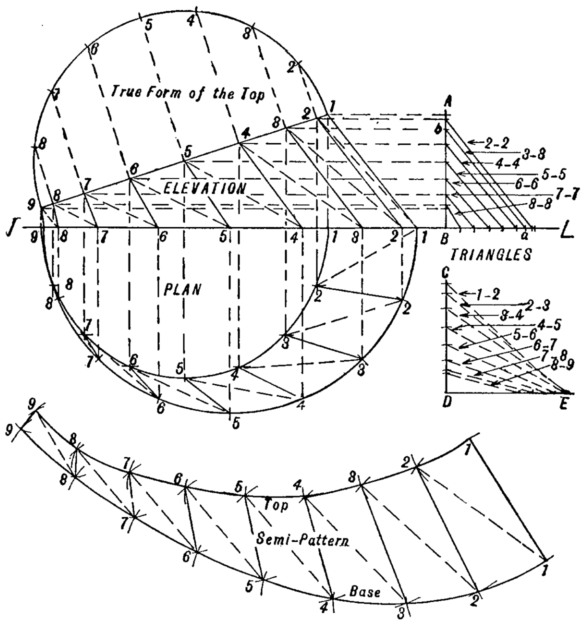

Fig. 65. Plan, Elevation, Diagram of Triangles and Semi-pattern for One Piece of a Ship's Ventilator.

beneath it, and that the elevation of a point is always back of it, the reader will have before him an illustration which should enable him to fully comprehend the plan and elevation shown in Fig. 65.

Fig. 66 also shows, in a pictorial way, both the full and broken lines presumed to be upon the surface of the object. However, it should be remembered that Fig. 66

is purely pictorial, and will not supply the true lengths of those lines. These true lengths must be secured, as in all other examples of triangulation, i.e., by the use of the right angled triangle.

The Pattern by Mechanical Methods.

We sometimes hear of instances where the worker has formed the sheet metal or cardboard as suggested above, and then wrapped paper about its face to secure the pattern. This mode of procedure will, of course, supply the pattern, since our patterns may always be looked upon as the envelopment of a solid whose form is that of the required object.

The True Length of Lines.

Having before us the plan and elevation as shown at Fig. 65, we must determine the true lengths of lines whose positions are indicated in that diagram. To accomplish this we may draw indefinite horizontal lines, i. e., parallel to the line *I L,* from points along the oblique line *9 1* of the elevation, and in a convenient position erect a perpendicular line as *A B* of the diagram of triangles. This determines the lengths of the perpendiculars of all triangles. The lengths of lines as found in plan are set off from *B* along the line *B L,* as shown. As for example, the length of line *3 3* of the plan is set off from *B,* thereby locating a point as at *a.* A glance at the elevation shows us that the upper extremity of line *3 3* is at a distance above the horizontal plane equal to the length of line *B b,* therefore upon drawing a line as *a b,* the true length of line *3 3* is determined.

It should be understood that methods as above explained must be applied to every line whose plan is not parallel to the line *I L.* The true lengths of those lines whose plans lie in or are parallel to the line *I L*, as *1 1* and *9 9* are found in the elevation, since a triangle has been constructed there whose base is equal to the line in plan, as shown in one instance at *1 1 1*. Therefore it becomes unnecessary to prolong the search for these lengths.

The lengths of broken lines are determined in precisely the same manner, although to avoid confusion in this

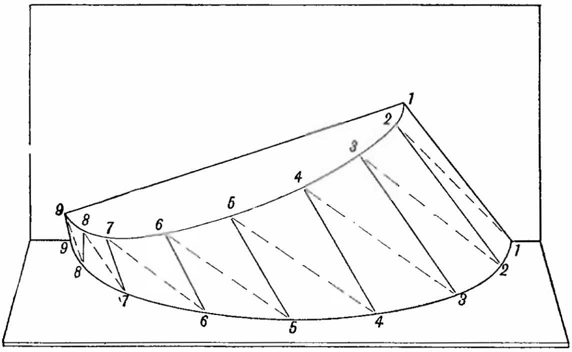

Fig. 66. Scenographic Representation of One-half of One Piece of a Ship's Ventilator, Looked Upon as a Solid.

demonstration a separate diagram of triangles has been constructed, as shown at *C D E*. Here it will be noted that distances from *B* along the line *B A* have been set off from *D* along the line *D C*, thereby locating points which are at the same distance from a common base line, as *D E*. The lengths of broken lines as found in plan are set off from *D* along the line *D E*, when points are connected as shown to secure the true lengths of those lines.

The Pattern.

To develop the pattern we draw upon the plane of development a line whose length is found in the oblique line *1 1* of the elevation, and designate that end of the line which shall be at the base of the pattern. The broken line *1 2* radiates from point *1* at the base, and is distant from point *1* at the top equal to the distance from *1* to *2* of the true form of the top, therefore we set our compasses to that distance, and with point *1* at the top of the pattern as center, describe a small arc as at *2*. With compasses set to a span equal to the length of line *1 2* found in the diagram of triangles, place one point at *1* of the base, and describe a small arc as at 2 of the top.

The intersection of these arcs, i.e., at *2* of the top, locates point *2* of the pattern in its correct relative position, and upon drawing the line *1 2* of the pattern, the triangle shown at *1 1 2* of the plan, has been constructed in its true form. We now add the triangle shown in plan at *1 2 2* by using the distance from *1* to *2* of the circle in plan as radius, and with point *1* at the base of the pattern as center to describe the small arc shown at *2*, then the lower extremity of line *2 2* must lie in some point of this arc.

To locate the exact position of that point, we set our compasses to the length of line *2 2* found in the diagram of triangles, and with point *2* at the top of the pattern as center, describe the second small arc as shown at *2* of the base. Lines may now be drawn to complete what may be termed one section of the pattern. The above operations continued, placing each length shown in the diagram of triangles in its proper position, will complete the pattern as shown at Fig. 65. It may be well to again direct the reader's attention to the fact that the distances between the upper extremities of full lines are found in the semicircle representing the true form of the top and not in the semi-ellipse shown in plan.

On the Division of Circles.

It is a difficult matter to lay down fixed rules for dividing circles to secure the best results; however, for the purpose of avoiding confusion, circles have been divided into sixteen parts throughout this work. In many instances this number is sufficient, especially if care be used when cutting the pattern, i.e., if the outline within which points are situated should be curved we may employ the eye to complete that curve. The old adage, the more points the more accuracy hardly holds good in a greater part of our work. In fact the writer has noted instances where it was folly to employ so many spaces, since some error committed was multiplied to that extent which exceeded the slight discrepancies which would exist had a less number been employed.

It is hardly worth while to consume additional time unless there is hope of increased accuracy. On the other hand, there are instances, as in this demonstration, where an increased number will no doubt increase the accuracy, since we presume the broken lines as *1 2, 2 3, 3 4,* etc., to be right lines, whereas if lines were drawn between these points upon the surface of the object they must become more or less curved, therefore error exists. More points of division would correct this to a considerable extent.