CHAPTER IV.

A Transitional Fitting from Rectangular to Round Which Makes An Offset.

Fig. 11, Chapter II, illustrated a fitting making a transition from square to round, with the center of the top directly above the center of the base. The sheet metal worker is frequently called upon for a fitting making a similar transition, but whose top is not in the same relative position, i. e., it may be what is ordinarily termed straight on one side, or it may be required to offset. In examples of this description, there is little or no variation in the methods to be employed. The same principles are involved, providing the ends are parallel.

The Specification.

From the specification a conception of the object is secured. This is purely a mental process; clear conceptions may be formed in the dark, or by one blindfolded. Some difficulty may be experienced by the novice in forming clear conceptions of the objects from their specifications, although the power of doing so is essential in pattern development, since before an object can be represented, it must be known what that object is. This power may be cultivated and increased by practice. The conception is formed from the specification, by knowing the size and form of the base, the size and form of the top, and the distance the plane of the top is above the plane of the base, also the position the top is required to occupy as regards the base.

The student is advised to look upon Fig. 19 as the specification for a fitting, the pattern of which is required. As indicated, the base is to be rectangular and 12 x 16 inches in size, the fitting to have a round top 10 inches in diameter. The vertical hight of the object is to be 16 inches, i. e., the perpendicular hight between the planes of the top and base, is 16 inches. The center of the top is located directly above a line which divides the rectangle longitudinally into two equal parts as shown, but 7 inches from its central point.

To Draw the Plan.

The student may picture the above conditions in his mind, and we will proceed to draw the necessary plan. To represent the base in plan, draw the rectangle *A B*

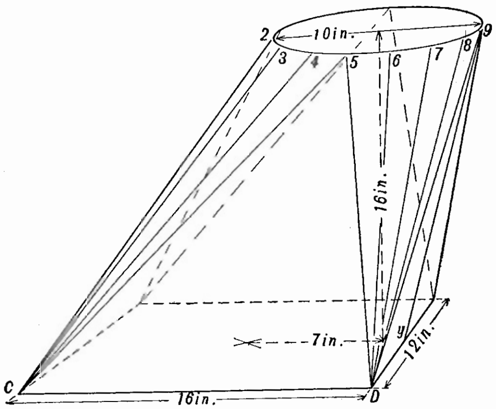

Fig. 19. A Pictorial Specification for a Fitting.

D C as shown at Fig. 20, with lengths of sides of 12 and 16 inches. Fig. 20 includes a scale to which the diagrams in this problem have been drawn (i. e., Figs. 20, 21 and 22), and if the student desires, he may take measurements as there shown, and apply to those diagrams as we proceed with the explanation.

A line is drawn through the center of the rectangle, and parallel to its longest side as *x y*. The center of the rectangle is, of course, the center of the line *x y*, as shown at *z*. Locate a point upon line *x y*, 7 inches from point *z* as *w*, then will point *w* be a plan of the center of the top, or a point to be used as a center about which a 10 inch circle is to be drawn. This circle is a plan of that end, and completes a plan of the fitting.

Plans of Triangles.

To secure the plans of triangles, which when combined constitute the surface of the fitting, or its pattern, the circle is first divided into four equal parts by lines parallel

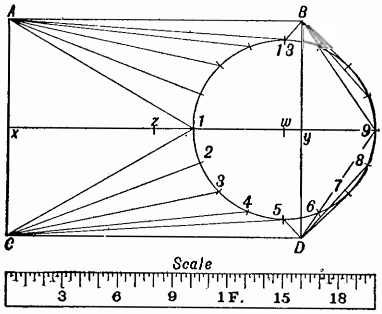

Fig. 20. The Plan of a Fitting, together with the Scale to which it has been Drawn.

to the sides of the rectangle, as shown in points *1 5 9* and *13*. Divide each quarter of the circle into the same number of equal parts as also shown. Draw lines from all points thus secured in each quarter of the circle, to the vertex of its adjacent angle of the rectangle, as shown at *1 C, 2 C, 3 C, 4 C, 5 C, 5 D, 6 D*, etc. This completes the plans of the above spoken of triangles, which constitute the whole surface of the fitting. However, since the line $x\ y$ divides the plan into two equal parts, the covering for one part will, when reversed, or formed in the opposite direction, supply a covering for the remaining part, therefore it is only necessary to consider one half of the plan. Several of these triangles are shown in perspective in Fig. 19, and by the aid of this figure the student should have little difficulty in comprehending the positions of said triangles upon the surface of the fitting.

The Value of Perspective.

The object of the author in presenting Fig. 19 has not only been to present a specification in a pictorial way, but to illustrate triangles whose plans are shown in Fig. 20. With the plan of each triangle before us, which when combined with all the others, will constitute the surface of the fitting, or its pattern, the next step is to determine the true form and size of each, and place them upon the surface, a portion of which will constitute the pattern.

Another logical deduction which may be applied to examples in pattern development, is to consider each line separately, and determine their true lengths and relative positions.

To Determine the Size and Form of Each Component Triangle.

The size and form of a triangle can be determined if the lengths of the three sides of which it is composed are known. Thus the question rests upon our ability to determine the true lengths of lines shown in plan, and the relative position these lines should occupy when placed upon the plane of development. Here, as in foregoing examples, the true lengths of a considerable number of the lines are shown in plan, i. e., those lines which form the outline of the top and base. However, those lines which connect points of the base with points of the top are not shown in their true lengths and must be determined by the use of the right angled triangle, as shown at Fig. 21.

To Determine the True Lengths of Lines.

The true lengths of lines as shown at Fig. 21 are determined by drawing the lines *E F* and *F G* at right angles to each other intersecting at point *F*. From *F* upon line *E F*, set off a distance equal to the vertical hight of the fitting (16 inches). From *F* upon the line *F G*, set off distances equal to lengths of lines in plan,

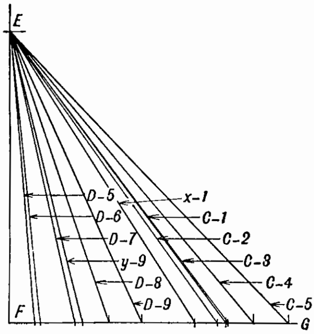

Fig. 21. A Diagram of Triangles from which True Lengths have been Secured.

Fig. 20, as *1 C, 2 C, 3 C,* etc., and from said points draw lines to point *E*. Then will each line represent the true length of its respective line in plan. Upon completing the diagram of triangles as shown at Fig. 21, we may proceed to develop the pattern as follows.

To Develop the Pattern.

The true length of line *1 x* shown in plan, Fig. 20, is found in line *1 x*, Fig. 21, therefore we may place that line in its true length in any convenient position as at *1 x* of the pattern, Fig. 22. The line *x C* of the plan is there shown in its true length, therefore we may set the compasses to a span equal to the length of line *x C*, Fig. 20, and placing one point at *x* of pattern, Fig. 22, describe the small arc as at *C*. With the length of line *C 1*, Fig. 21, as radius, and with point *1* of pattern as center, de-

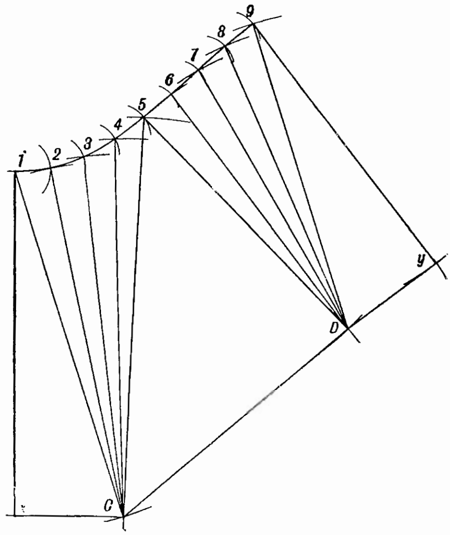

Fig. 22. The Semi-pattern for a Fitting as Illustrated at Fig. 19.

scribe the second small arc at *C* of the pattern, Fig. 22, thereby locating that point, or line *1 C*, in its correct relative position.

Upon referring to the plan, Fig. 20, we note that there are four additional lines radiating from point *C*, and that the distances between the upper extremities of those lines are equal to the distances between points of division of the circle. Therefore we use the lengths of those lines in rotation, i. e., *C 2, C 3, C 4,* and *C 5,* Fig. 21, as radii, with point *C*, Fig. 22, as center, to describe small arcs as shown at *2, 3, 4* and *5* of pattern, Fig. 22, then with distances between numbered points of the circle as shown in plan, Fig. 20, as radii, and using the numbered points of the pattern in rotation as centers, we describe small arcs as also shown at *2, 3, 4* and *5* of the pattern, Fig. 22.

We note that point *D* upon the surface of the object is at a distance from point *C* equal to the length of line *C D* of the plan, Fig. 20. Therefore we may set our compasses to a span equal to the length of line *C D* of the plan, Fig. 20, and placing one point at point *C* of the pattern, Fig. 22, describe the small arc as at *D*. Point *D* of the pattern must then lie in some point of this arc. The true distance from point 5 to *D* upon the surface of the object as shown in perspective at Fig. 19, and in plan, Fig. 20, is the length of line *D 5* in the diagram of triangles, Fig. 21. Thus we may use the length of this line, i. e., *D 5* of the diagram of triangles, as radius, and point *5* of the pattern, Fig. 22, as center, to describe the second small arc as shown at *D*, thereby locating that point, or line *D 5*, in its correct relative position.

The plan, Fig. 20, clearly shows four additional lines radiating from point *D*. The upper extremities of these lines are at a distance from each other equal to the distance between points of the circle. Therefore we may use the true lengths of these lines in rotation, which are found in the diagram of triangles, Fig. 21, i. e., *D 6, D 7, D 8*, and *D 9* as radii, and with point *D* of pattern as center, to describe small arcs as shown at *6, 7, 8* and *9*, and the distances between similar numbered points of the circle, Fig. 20, as radii to be used successively with points *5, 6, 7* and *8* of the pattern, Fig. 22, as centers, to locate these points in their correct relative positions, as shown.

The plan, Fig. 20, or the pictorial view of the object, Fig. 19, shows a triangular surface as *9 D y,* which may now be added. Since the true length of line *D y* is shown in plan, we may use that length as radius, with point *D* of the pattern, Fig. 22, as center, to describe the small arc as at *y,* then will point *y* of the pattern lie in some point of this arc.

We find that the true distance from point *9* to *y,* is the length of line *y 9* of the diagram of triangles, Fig. 21. Therefore we use that length as radius, with point *9* of the pattern, Fig. 22, as center, to describe the second small arc as shown at *y* of the pattern, thus locating that point in its correct relative position, which completes the pattern for one-half the fitting.

The Order of Numbering May Be Reversed.

It may be here explained that while the author has designated one end of the longest line presumed to be upon the surface of the object as *1,* he could as consistently have reversed the order of numbering, thereby placing *1* in the position now occupied by *9,* i. e., it makes no material difference which part of the pattern is first developed.

It may be further explained that each part of the plan, Fig. 20, i. e., those parts included between points *1 C 5,* or *5 D 9,* may be compared to an inverted oblique cone, and that the patterns for those portions are developed in the same general manner as for the oblique cone.