CHAPTER II.

A Simple Transitional Fitting from Square to Round.

When the sheet metal worker is called upon to secure the pattern for a fitting as illustrated at Fig. 11, i. e., from square to round, with the center of the top directly above the center of the base, he may employ the principles explained in Chapter I.

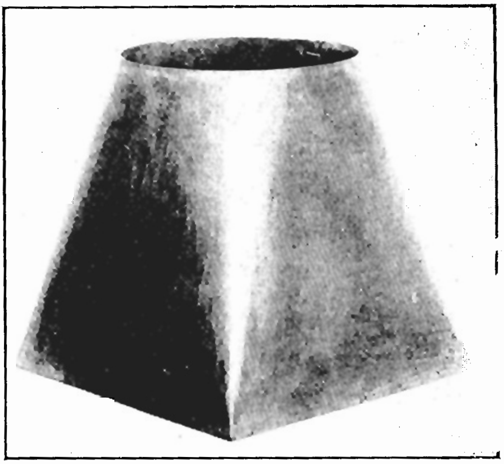

Fig. 11. Photographic View of a Fitting of [illegible]ion Occurrence in the Sheet Metal Shop.

In all examples of pattern development, where some portion of the object for which a pattern is required is represented by a circle, said circle must be divided into parts. The points of division forming t[illegible] parts, are in reality, the vertices of angles forming a polygon of as many sides as the parts into which the circle has been divided. The vertices of angles at points *e f g h,* etc., of Fig. 8, Chapter I, may be looked upon as points of division in a circle whose diameter is equal to the major diameter of the polygon. However, since eight parts are too few to divide a circle into, we would have divided that circle into a greater number. The author has found sixteen to be quite effective, although a still greater number will more closely approximate the circle.

A Plan Drawn to Given Dimensions.

Presuming that it is required to secure the pattern for a fitting as illustrated at Fig. 11, to given dimensions, the square *A B C D,* Fig. 12, is drawn to the size of the

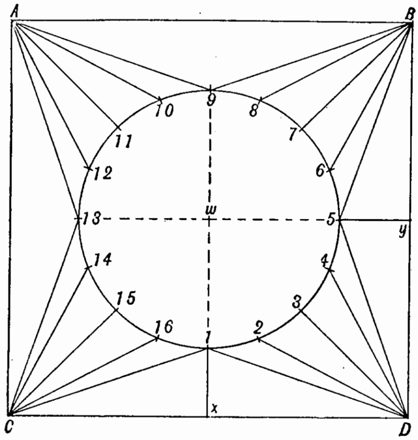

Fig. 12. *The Plan of the Fitting Illustrated in Fig.* 11.

base, and its center located as at *w.* With point *w* as center, a circle is drawn equal to the required diameter of the top, as shown at *1 2 3 4,* etc. Since this is an example of Triangulation, the surface of the object is presumed to be divided into triangles.

To secure the plans of said triangles, the circle is divided into parts as shown. This is accomplished by first dividing the circle into four parts by lines parallel to the sides of the square, as shown by the dotted lines, *1 9* and *5 13*. Each quarter of the circle is then divided into four equal parts. This forms the points of division of the circle into four groups, as *1 5, 5 9, 9 13,* and *13 1*. Lines drawn from the points of division in each group to the vertex of the adjacent angle as shown, will complete a plan of the fitting, together with the plans of triangles, which in reality, form the required pattern.

Size and Form of Triangles.

Since, as has been previously explained, the triangles whose plans are shown in the diagram, Fig. 12, form the pattern, we must determine their exact size. This is accomplished by securing the lengths of lines which form said triangles. As will be noted, the plan supplies the length of one side of each, i. e., there are four whose bases form the square, and the length of one side of each remaining triangle is found in the distances the points of division of the circle are from each other. Therefore we have simply to determine the true lengths of lines forming the remaining two sides of each triangle shown. This is still further simplified in examples where the form is symmetrical as in this case, inasmuch as corresponding lines in each quarter of the plan are of the same length.

Upon examination, we find that lines *1 D* and *5 D* are equal in length, also *2 D* and *4 D*. Therefore there are but three lengths to be determined, as *1 D, 2 D* and *3 D,* unless we introduce two additional lines as *1 x* and *5 y*, to locate one-quarter of the plan, or the seam, thus making one additional length to be determined, as *1 x*.

The student should have little difficulty in comprehending the lines shown in plan, i. e., *1 x, 1 D, 2 D* and *3 D,* inasmuch as they are presumed to be upon the surface of the object. The upper extremities of said lines are at points *1 2* and *3* of the top, and their lower extremities are in points *x* and *D* at the base; therefore in reality these lines are inclined to the base. If we dropped lines from points *1 2* and *3,* perpendicular to the plane of the base, their intersections with that plane will locate points whose distances from point *D* have previously been determined in the plan. The student may refresh his memory upon this by referring to Fig. 6, Chapter I, where perpendicular lines are shown in perspective as *a e* and *b f,* which are in reality equal in hight to the vertical hight of the object. Thus it will be noted that such

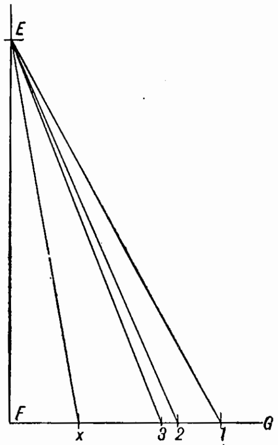

Fig. 13. Diagram of Triangles from which True Lengths are Secured.

lines supply the necessary lengths of perpendiculars for all triangles employed in securing the true lengths of those lines which are in reality inclined to the planes of the top and base of the object.

The distances these lines (i. e., perpendicular lines as shown at Fig. 6) are from point *D* at their intersection with the plane of the base have previously been determined in the plan, Fig. 12; we therefore use the lengths of lines *1 x, 1 D, 2 D* and *3 D* as the bases of said triangles.

On the Construction of Triangles.

To construct the necessary triangles, draw the indefinite right lines at right angles to each other, as *E F* and *F G,* Fig. 13, which intersect at point *F.* Set off upon the vertical line from *F,* a distance equal to the vertical hight of the object, as shown at *E.* Set off also from *F* upon the horizontal line, distances equal to the lengths of lines *1 x, 1 D, 2 D* and *3 D,* found in Fig. 12, as shown by points *x, 3, 2,* and *1,* Fig. 13. From these points lines are drawn to *E* as shown, thus securing the lengths of all lines necessary to develop the pattern, since the plan supplies the remaining lengths.

The Pattern.

To develop one-quarter of the pattern as shown at Fig. 14, draw the line *3 D,* making it of a length as found at *3 E,* Fig. 13. With compasses set to a span equal to distances between points *3* and *2,* or *3* and *4,* of Fig. 12, place one point at *3* of the pattern, and describe small arcs as shown at *2* and *4.* With compasses set to a span equal to length of line *2 E,* Fig. 13, place one point at *D,* and describe small arcs as also shown at *2* and *4,* thus locating these points in their correct relative positions.

From points *2* and *4* as centers, small arcs are drawn with a radius equal to the distance between points *2* and *1,* or *4* and *5.* With point *D* as center, and with a radius equal to the length of line *1 E,* Fig. 13, describe arcs as also shown at *1* and *5*, thus securing the correct relative positions of those points.

Upon referring to the plan, we note that there are two additional triangular surfaces to be added to complete the pattern for one quarter of the object as shown; these are the triangles bounded by lines *1 x*, *x D* and *D 1*, also *5 D*, *D y*, and *y 5*. Since the plan supplies the true lengths of one side of these triangular surfaces, we set our compasses to a span equal to length of line *x D* or *y D* of plan, place one point at *D* of the pattern, and describe arcs as shown at *x* and *y*. With points *1* and *5*

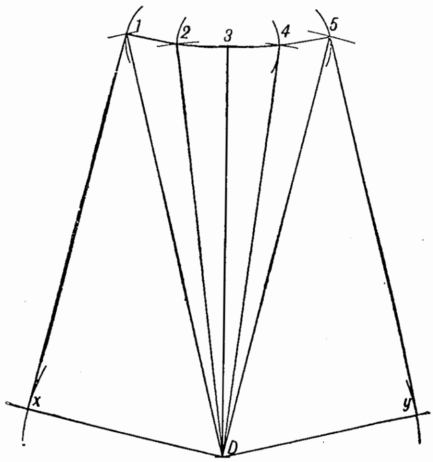

Fig. 14. *Pattern for One Quarter of the Fitting as Illustrated at Fig.* 11.

as centers, and the length of line *E x*, Fig. 13, as radius, place one point at points *1* and *5*, and describe arcs as also shown at *x* and *y*, thereby locating these points. Lines are now drawn as shown, thus locating the boundaries of triangles, which, having been placed in their correct relative positions, supply the required pattern for one quarter of the object, which may be duplicated for the remaining three equal parts.

The Necessity of a Clear Conception of the Principles Involved.

If the student fails to secure a clear conception of the principles as here set forth, he is earnestly advised to review the work, since the author has made an honest endeavor to explain the most elementary principles involved. To the one who aspires to become proficient in this branch of pattern development, a knowledge of those principles is of the utmost importance. The practice has been too often to work from copy rather than to make a study of the principles involved. This is hardly more calculated to make a pattern cutter, than so much time spent in copying music would be to make a musician. It is precisely the same with the subject in question; the various lines employed in pattern development can be copied by almost any novice, but no amount of copying will enable him to understand them. On the other hand, if one becomes thoroughly conversant with the principles involved, and secures a clear understanding of the meaning of every line drawn, the solving of complicated problems is but a simple operation.