CHAPTER VII.

A Transitional Fitting from Oblong to Round.

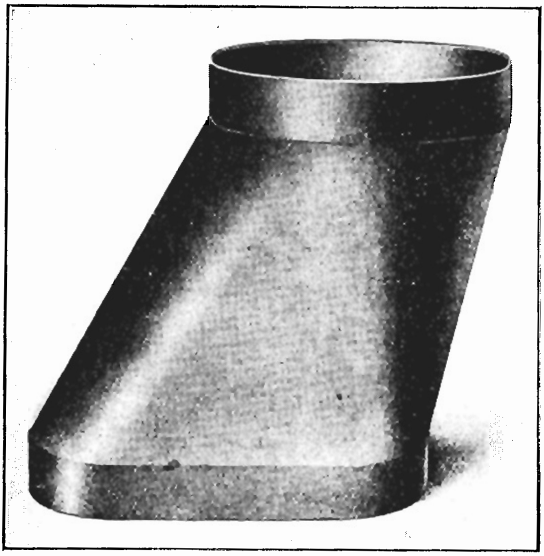

Fig. 35. A Fitting Making a Transition from Oblong to Round.

Methods have been explained in foregoing Chapters which may be employed to secure the patterns for practically all irregular forms whose ends are parallel. However, for the purpose of conveying to the student an understanding of the application of those methods to a variety of forms, one or two additional examples will be introduced before entering into a discussion of those forms whose ends are not parallel.

Fig. 35 illustrates a fitting making a transition from oblong to round. This, or a modification of it, is a form which is frequently demanded, i.e., we find it in many branches of sheet metal work, and made from all gauges of material. It is a fitting making a connection between two pipes whose axes are parallel, but not in one line. A change in the relative position of its ends demands little or no change in the methods to be employed in securing its patterns. We could as consistently look upon the oblong end as the top. It is, in a measure, a combination of forms which have been discussed.

The Plan.

The plan is secured by drawing diagrams which represent cross sections of pipes to be connected in their correct relative positions. The surface is represented as

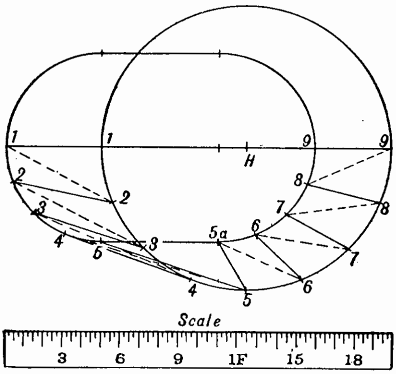

Fig. 36. The Plan.

being divided into triangles by dividing these diagrams into parts, and drawing lines between points of division.

Presuming the pattern is required for a fitting as described above, whose diameters of oblong end are 10 and 16 inches, diameter of round end 15 inches, and 18 inches in hight, also making an offset of 4 inches, or, in other words, the round end is required to project 4 inches beyond one end of the oblong, we would proceed as follows: Draw the oblong diagram to those dimensions as shown in plan, Fig. 36, in which a scale is given to verify measurements as given. Draw a line as *1 9* through the points from which the semi-circles have been drawn which constitute the ends of the oblong. Extend this line from point *9* of the oblong, a distance equal to the required offset (4 inches), as at *9* of the circle.

Locate a point upon line *1 9* at a distance from point *9* of the circle equal to one half the diameter of the top (7½ inches) as at *H*, then will point *H* be a center from which a circle is drawn to represent a plan of the top as shown. Since the line *1 9* divides the plan into equal parts, as has been previously explained, it is only necessary to consider one part, as it may be duplicated for the other equal part.

Divide the semi-circle representing one-half of the round end into a number of equal parts, as at *1, 2, 3, 4*, etc., then will a point as *5* divide the semi-circle into two equal parts. Determine the length of the straight line which constitutes one side of the oblong, as between points *5* and *5 a* of that diagram. Divide the curved portions of the oblong diagram, i.e., those semi-circles included between points *1* and *5,* also between *5 a,* and *9*, into the same number of equal parts as each half of the semi-circle representing the round end has been divided into, as shown. Draw lines *1 1, 2 2, 3 3, 4 4, 5 5, 5a 5, 6 6*, etc., as also shown in plan, Fig. 36. These lines are now looked upon as plans of lines presumed to be upon the surface of the object.

As will be noted, the above lines are not sufficient to represent the surface as being divided into triangles; However, upon drawing lines as *1 2, 2 3, 3 4, 4 5, 5a 6, 6 7,* etc., we find the whole surface of one-half of the object represented has been divided into triangles.

Right Angled Triangles.

Our next operation is to determine the true lengths of these lines, or the true distances between designated points of the base and top. This is accomplished by the use of the right angled triangle, as has been frequently explained, and here shown at Fig. 37, where, to avoid confusion two sets are employed.

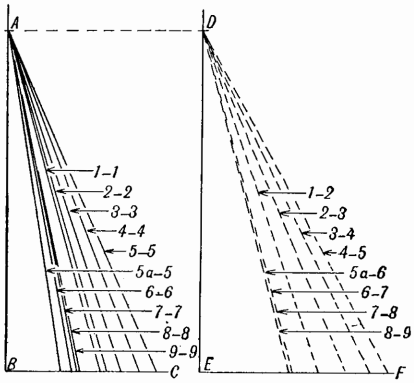

Fig. 37. Diagram of Triangles.

As will be noted, the perpendiculars of all triangles, Fig. 37, are equal to the vertical hight of the object, or 18 inches, as shown at *A B* and *D E*. The bases of said triangles being equal to lengths of lines in plan, as shown in spaces from *B* and *E* along lines *B C* and *E F*, thus locating points between which lines may be drawn to secure the true lengths of those lines shown in plan which divide the surface of the object into triangles, and connect points of the base with points of the top.

The Pattern.

As has been explained, we may look upon the lengths of lines in the diagram of triangles as the distances between points of the base, and points of the top. Since the plan supplies the distances between these points along the base and top, all necessary measurements are before us to develop the pattern, and the mental process may run through our minds somewhat as follows: Draw in any convenient position upon the plane of development, a line whose length is equal to the length of line *1 1* found in the diagram of triangles, Fig. 37. Decide which end of this line shall be at the base of the fitting and mark accordingly, as shown. The distances between points *1*

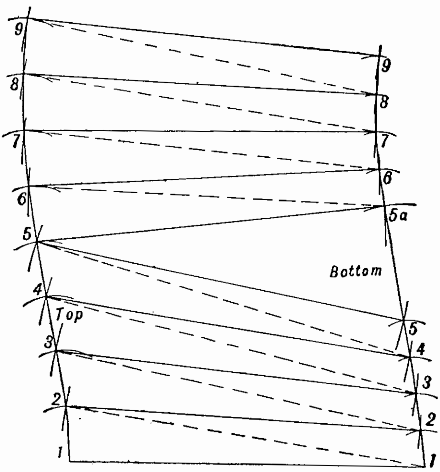

Fig. 38. The Pattern for One-half of the Fitting.

and *2* at the base and top of the object are shown in plan, therefore we describe arcs with these distances as radii, and with points *1* and *1* of the pattern as centers, when points *2* and *2* must lie in these arcs.

We have the true distance between points *1* of the base and *2* of the top, in the length of line *1 2* of the diagram of triangles, therefore if we describe an arc with this radius, and point *1* at the bottom of the pattern as center, its intersection with the first small arc at *2* must be the exact location of point *2* at the top of the fitting, or pattern.

With the compasses set to a span equal 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 at the bottom of the pattern when the line *2 2* may be drawn, thereby completing what may be looked upon as one section of the pattern or covering of the object, as shown in plan Fig. 36, at *1 2 2 1*.

The next step is to draw two additional arcs with points *2* and *2* of the pattern as centers, and with distances as found between points *2* and *3* of the plan as radii. The distance between point *2* at the base and point *3* at the top of the object is shown in the length of line *2 3* of the diagram of triangles, which we may use as before to secure the exact location of point *3* at the top. In a similar manner we use the length of line *3 3*, found in the diagram of triangles, to locate point *3* at the bottom of the pattern.

Two more small arcs are added as before, using points *3 3* of the pattern as centers, when points *4 4* of the top and base may be located by transferring the distances as found in the lengths of lines *3 4* and *4 4* of the diagram of triangles. In the same general manner as has been explained, points *5 5* of the pattern may be located as shown.

We find, upon referring to the plan, that there are two lines radiating from point *5* of the circle, which are the plans of lines which connect point *5* of the top to *5* at the base, also *5* at the top with *5a* at the base, and including two sides of a flat triangular surface upon the side of the object. The diagram of triangles supplies in the length of line *5a 5,* the distance from point *5* to *5a* upon the surface of the object, therefore we may use that distance as radius, with point *5* at the top of the pattern as center, to describe a small arc as shown at *5a.* The plan supplies the distance from point *5* to *5a* at the base of the object, and using that distance as radius, with point *5* at the bottom of the pattern as center, we may describe an arc, cutting the first at *5a,* thereby locating point *5a* upon the pattern in its correct relative position.

Since the remaining points shown upon the pattern are located in the same manner as heretofore explained, it seems that one will have little difficulty in completing the pattern as shown. Those who have given this work the attention that the subject demands, beginning with the first Chapter, should now be in a position to develop the patterns for a variety of forms whose ends are parallel, although some care must be exercised when designing them.

Forms of Fittings.

When the centers of the ends are approximately in one line which is perpendicular to the planes of said ends, the fitting may be made comparatively short. However, in every instance a moderate length is more convenient since the change of form is less per unit of length, therefore the metal responds more readily when forming it to its required shape. When the offset is considerable, and it is desirable to preserve the capacity of the fitting, i.e., the area of its cross section, it becomes necessary to increase its length. For example, Fig. 39 illustrates transitional offsets, or connections between round and rectangular pipes, where the offset is as shown. If the fitting is made as shown at *A*, its capacity at *a b* will be considerably reduced. However, if its length is in-