

## CHAPTER XIII

### PIPE INTERSECTIONS AND TEE JOINTS

*Pipes of the Same Diameter.*—Figure 118 shows the method of developing the patterns for a T, or tee joint, or the intersection of two cylinders of the same diameter at right angles. Draw the half plan and elevation, making both pipes 3 inches in diameter. Make the height of the vertical pipe *A* 6 inches, and the short side of the horizontal pipe *B*  $1\frac{1}{2}$  inches. Draw the half section of the horizontal pipe *B* and divide it into a number of equal parts, as shown in 1 to 7 in *D*. Then divide the half plan into the same number of spaces, placing the numbers in their proper positions, as shown.

In the half section *D* of the horizontal pipe the points 1 and 7 are on the top and bottom, while the point 4 is on the long side of the pipe, and when looking down upon the end of the vertical pipe, point 4 will intersect the vertical pipe on the side, as shown by point 4 in the half plan. Now draw horizontal lines from the points in section *D*, which are intersected by vertical lines drawn from similar numbered points in the half plan *C*. Lines traced through these points of intersection will give the miter line. The two pipes being of the same diameter, the miter is represented on the drawing by straight lines at an angle of  $45^\circ$ , shown by *abc*.

To obtain the pattern *E* for the horizontal pipe *B*, draw the stretch-out line *mn*, upon which step off twice the number of spaces contained in the half section *D*. From the various points on the stretch-out line of the pattern, draw horizontal measuring lines which intersect by vertical lines drawn from similar numbered points

on the miter line *abc*. Trace a line through these intersections, shown by *defg*, and the desired pattern is secured.

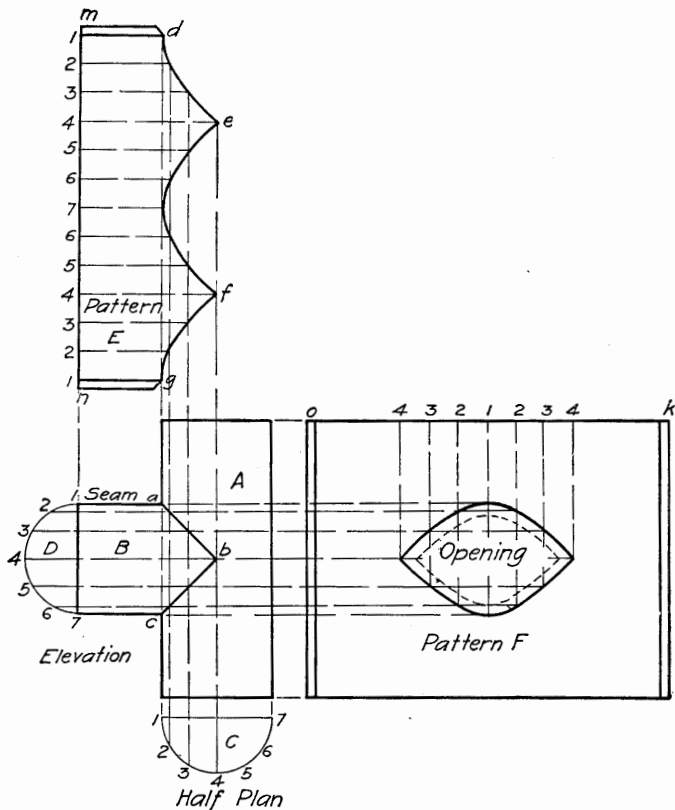


Figure 118.—Development of Patterns for a T or Tee Joint.

The pattern *F* for the vertical pipe *A* is simply a rectangular piece of metal, the width being equal to the height of the pipe and the length equal to its circum-

ference. The pattern for the opening to be cut in pattern *F*, to receive the pipe *B*, is laid out in the following manner:

Upon the upper edge of the pattern, shown by the line *ok*, locate point *1*, which will be the center of the opening. On each side of point *1* step off the spaces shown from *1* to *4* in the half plan *C*, which will give the length of the opening. From these points on line *ok* draw vertical lines, which intersect by horizontal lines drawn from similar numbered points on the miter line *abc* in the elevation. A line traced through these

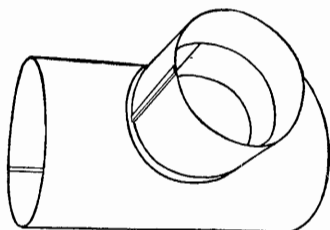


Figure 119.—T-Joint in Pipes of Different Diameters, Angle of 90°.

points of intersection will give the pattern for the opening. An allowance added for seaming is shown by the dotted line drawn parallel to the outline of the opening.

After the pattern for the vertical pipe has been transferred to metal, the opening is cut on the dotted line by means of the circular snips. Using the points of the straight snips, the lap is then notched, making the cuts about  $\frac{1}{2}$  inch apart around the entire opening.

The pipe is now formed up and seamed in the usual manner. Then using the flat pliers, bend the notched lap outward to fit inside the horizontal pipe, which is slipped over the flange thus made and can be soldered or riveted in position.

When constructed from black iron, the short stub is

slipped over the flange and one or two rivets placed on each side at point *b* in the elevation. The flange is then closed tightly against the pipe on the inside by means of the hammer, making a tight, rigid joint between the two pipes.

*Pipes of Different Diameters.*—Figure 119 shows the finished view of a T-joint, the pipes being of different

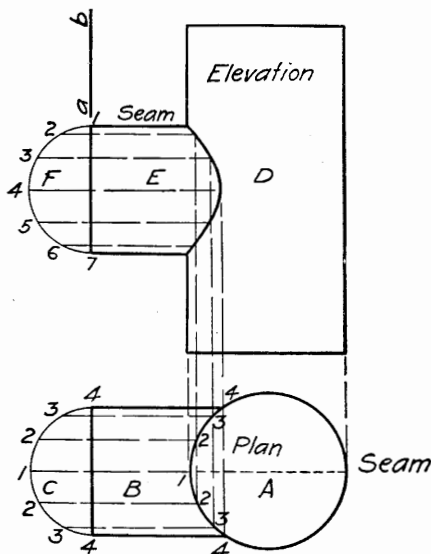


Figure 120.—Plan and Elevation for Right Angled Pipe Joint.

diameters, the horizontal pipe being placed in the center of the vertical pipe at an angle of  $90^\circ$ . Applying the method given in Figure 118, develop the patterns for the inclined pipe, also the opening in the vertical pipe.

First draw the plan and elevation shown in Figure 120; make the diameter of the large pipe *A* 4 inches and of the small pipe *B* 3 inches. The height of the vertical pipe *D* is 7 inches and the length of the shortest side of

the horizontal pipe is 3 inches. After the outline of the small pipe *B* has been drawn in the plan-view, draw the half section *C* and divide it into a number of equal spaces. Then draw horizontal lines from these points, intersecting the large circle *A* as shown in the drawing. Next draw the half section *F* on the end of the small pipe in the elevation, which must be a duplicate of the half circle *C* in the plan, and is divided into the same number of spaces, the points being numbered in their proper position.

From these points in section *F* draw horizontal lines which are intersected by vertical lines drawn from similar numbered points on the large circle *A* in the plan. A curved line traced through these points of intersection will give the miter line between the two pipes.

To develop the pattern for the small pipe, draw the stretch-out line *ab* and proceed in the same manner as explained in the previous problem.

The pattern for the opening in the large pipe is obtained in the same manner as the opening in the vertical pipe shown in Figure 118. The stretch-out of the opening is shown by the figures 4-1-4 in the plan. The spaces being unequal in width, they must be transferred separately to the stretch-out line of the pattern.

*Joining the Pipes.*—The two pipes can be joined together by the method described in the previous problem, but if it is desired to make a more substantial connection, the method commonly used by the sheet metal worker when joining two pipes of unequal diameters is shown in Figure 119, and the joint is made in the following manner:

After the small pipe has been formed up and seamed, turn a flange about  $\frac{1}{4}$  inch wide on the curved end, by means of the rounded end of the riveting hammer and square stake. A collar is now inserted in the end and riveted in several places about  $\frac{1}{2}$  inch above the flange.

The collar is cut slightly smaller in length than the circumference of the stub, and should be wide enough to allow for riveting, and extend about  $\frac{3}{8}$  inch beyond the flanged end after it has been trimmed parallel to the outline of the end.

The projecting edge of the collar is notched and inserted into the opening of the large pipe; the notched edge of the collar is now bent over and fitted closely against the inside of the pipe by means of the hammer. By this

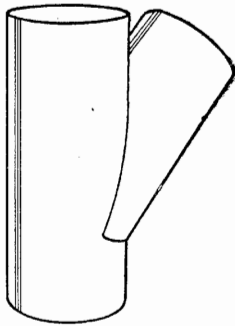


Figure 121.—T-Joint of 45° Angle.

method the large pipe is held firmly between the two flanges of the smaller pipe.

The principles used in the development of the patterns in this problem (Figure 120) are applicable, no matter what diameters the pipes are, or whether the small pipe is placed in the center or at one side of the vertical pipe. The pipes can also be placed at any angle, and differ in profile.

*T-Joint at an Angle of 45°.*—Figure 121 shows the finished view of a T-joint, both pipes having the same diameters, joined at an angle of 45°. The full development is shown in Figure 122. The principles in this problem do not differ from those given in Figure 118. The prob-

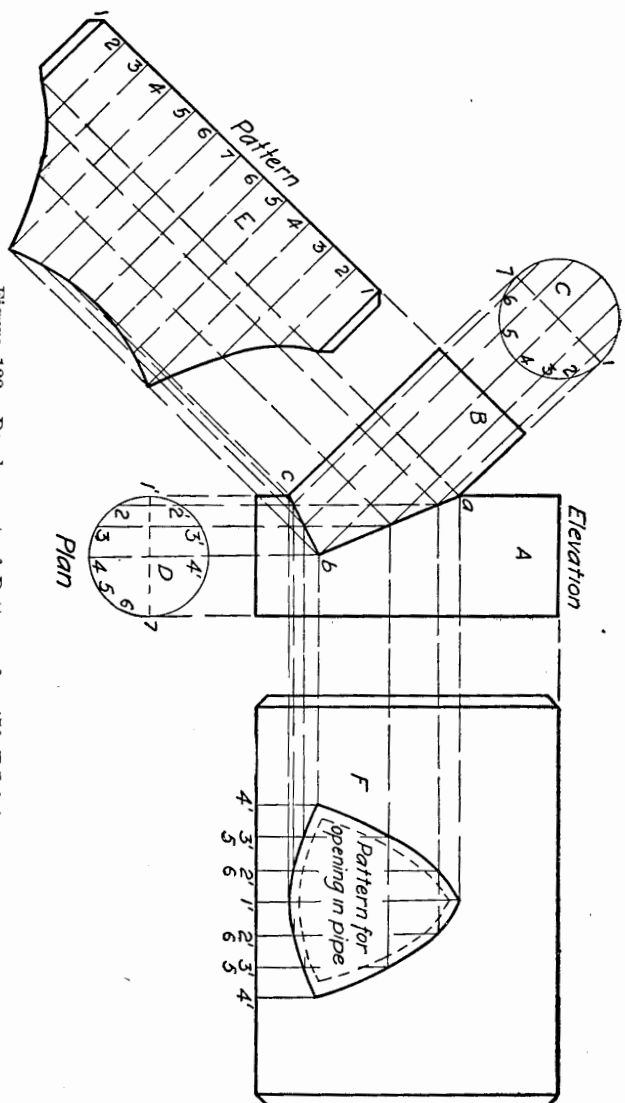


Figure 122.—Development of Patterns for 45° T-Joint.

lems are the same, except in the position of the horizontal pipe *B*.

Draw the elevation and plan, making both pipes 3 inches in diameter, pipe *B* having an inclination of  $45^\circ$ . Space the plan *D*, and section *C* in the usual manner. Draw lines from these points intersecting in the elevation. A line traced through the intersections thus obtained will

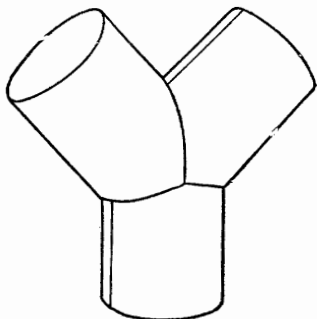


Figure 123.—Y-Joint in Pipes of Equal Diameters.

give the miter line between the two pipes, shown by *abc* in the elevation. Pattern *E* for the inclined pipe and pattern *F* for the vertical pipe are shown fully developed, and will require no further explanation, as the method has been described in the previous problems in this chapter.

*Y-Joint*.—Figure 123 is the illustration of a Y-joint, the diameter of each branch being the same. The sheet metal worker needs no introduction to this familiar form, as it is used for many different purposes in the trade. This problem is presented to give practice in developing patterns for intersected cylinders having the same diameter.

The elevation, partial development, and dimensions are shown in Figure 124. First draw the elevation *ac*

ording to the dimensions shown on the drawing, making the arms *A* and *B* at an angle of  $90^\circ$ . The miter line *ab* is obtained by bisecting the angle *cad*, as shown.

The pipes being of the same diameter, a half section of the arm *A*, shown at *D*, is all that is required. Divide

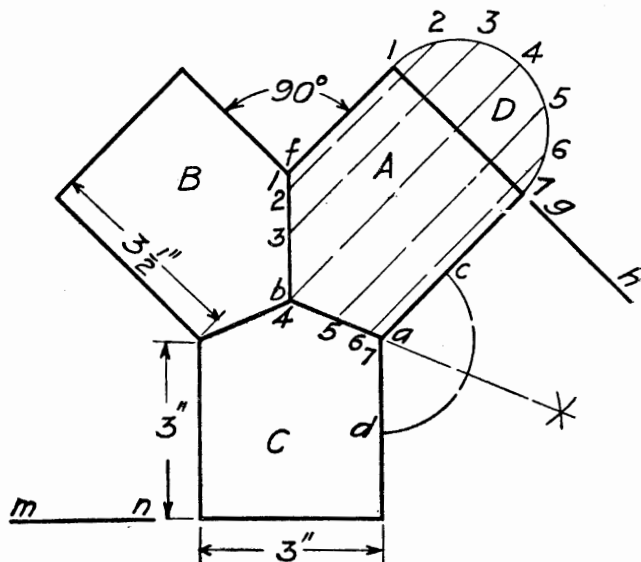


Figure 124.—Elevation and Partial Development of Pattern for Y-Joint.

the half section *D* into a number of equal parts, being careful to place a point on the quarter-circle, as shown by point 4. Draw parallel lines from these points intersecting the miter lines *fb* and *ba* as shown. At right angles to the arms *A* and *C*, draw the stretch-out lines *gh* and *mn*, and complete the patterns as directed in the preceding problems.

*Chimney Cap.*—Figure 125 shows the elevation of a ventilator head, or chimney cap, the pipes being of the

same diameter. This is presented as a test problem, as it involves the development of two problems described in this chapter. The arms *A* and *B* form a T-joint at a right angle, similar to Figure 118, while the arms *B* and *C* are joined at other than a right angle, similar to the problem shown in Figure 122.

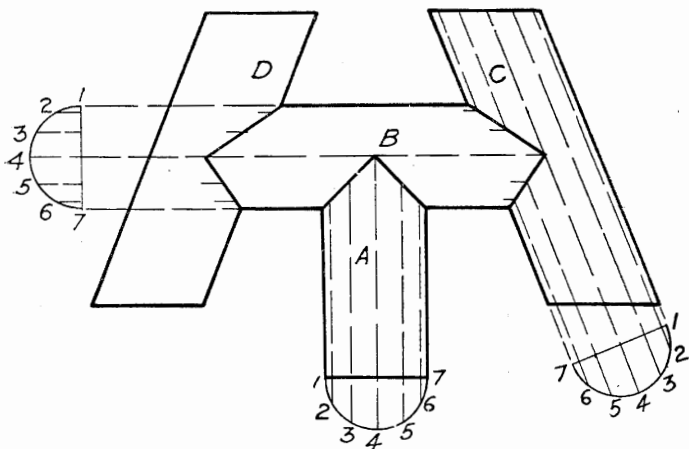


Figure 125.—Elevation of a Chimney Cap, or Ventilator Head.

Draw the elevation and half sections as shown in the drawing. Then develop the patterns for the arms *ABC*. The method of development has been fully explained in preceding cases, so that no further demonstration need be given.