

## CHAPTER IV.

## PIPE BENDS IN SEGMENTS.

IN the two previous chapters we dealt with several examples of the striking out of patterns for circular pipe joints, we now extend the methods there shown to the cases of bends made up in segments.

**Quarter-Bend for Round Pipes.**

The exact shape of the bend is first set out, as in Fig. 16, and then divided up into any convenient number of segments.

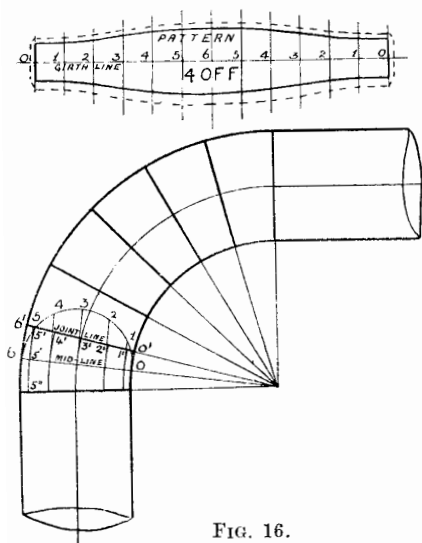


FIG. 16.

In the present case there are six. The smaller the segment the less work there will be in stretching and hollowing into shape, but at the same time it should be remembered that small segments mean a large number of joints; hence some reasonable mean should be chosen. A mid-line is drawn in for one of

the segments, and a semicircle described on it as shown, this being divided into six equal parts, and perpendiculars dropped on to the mid-line.

For the pattern, a girth line is laid out equal in length to the circumference of the pipe, this being divided into twelve equal parts, and perpendiculars run up through each division point as shown. The compasses are now set respectively to the lengths of the perpendiculars between the mid-line and joint line and these transferred to the similarly numbered line on the pattern, and marked off both above and below the girth line. In each case these construction lines will be a shade too long, as will be seen by reference to the figure. To take one line only; instead of using the perpendicular  $5' 5'$  for the pattern line, the length of the arc  $5' 5''$  should have been used, and so with all the others. But manifestly the difference in length between the straight line and the arc is so small, that in nearly all practical work it is hardly worth taking into account. In all cases where there is no intention of working the segment into shape, by hollowing the back and stretching the throat, the straight line should be used.

The methods of fastening the segments together are various. They can be simply slipped over and soldered, either with or without sinking the seam, riveted together by having the segments alternately inside and outside, panned down or knocked up. The allowances on the pattern are shown for the latter two methods. If the segments are to be put together with one inside, the next outside, etc., then it will be necessary to take the thickness of the sheet metal into account, and have two patterns, the outside one being about seven times the thickness of the metal longer than the inside segment, as explained in Chapter XXXII.

In shaping the strips for small pipes, the usual plan is to hollow up the back part of the segment before bending the ends of the strip around to form the throat. Having



this out, it should be remembered that A G is a diagonal of the square pipe, the length of a side being equal to A F.

The shape of the bend is built up in a somewhat peculiar manner, for we may consider each part as a portion of the surface of a cone (Chapter XII.). Remembering this, the development of the patterns becomes a very simple matter. Draw C B square to, and equal in length to, A C. Join A to B. Draw E F and G H square to A C. Then, with B as centre, and B A as radius, describe the arc A D, this being made equal in length to the back curve A *d*. The length of the arc A D may also be determined by calculating the angle A B D, and setting this out with a protractor, or otherwise.

$$\text{Angle A B D} = \frac{90^\circ \times \text{A C}}{\text{A B}}$$

In the present case A C = 22 in., and A B by calculation or construction will be nearly 31 in., therefore:

$$\text{Angle A B D} = \frac{90 \times 22}{31} = 64^\circ \text{ (nearly).}$$

The arcs F K and H L are next described, and the two figures, as shown, will give the patterns for the back and throat-pieces respectively. It should be noticed that no direct measurement along the arcs F K and H L is necessary, as when A D is obtained, the others will be cut off proportionately. The back, side, and throat seams may be made by either lapping over and soldering, or riveting, or knocked up, the allowance on the pattern, of course, being such as to suit the kind of joint chosen.

The plates or sheets will be shaped by rolling or bending in the same way as all other conical work.

### Double Bend for Round Pipe.

Where it is necessary to join together two lines of piping, so that the flow of liquid or gas passing through the pipe

may be interfered with as little as possible, it is a good plan to make a connecting pipe of the form shown in Fig. 18. This shape of bend gives no abrupt break in the pipe, and

maintains the full cross-sectional area throughout its length.

It is most important that the exact shape of the bend should first be set out. This can be done by setting down the distance between the lines of pipes and the length of the bend (18 in. and 30 in. respectively in this case), thus obtaining the points A A. The line A A is now divided into four equal parts, and perpendiculars drawn through the end division points, D D, to meet A C in C. This gives the centres for the curves. If a line, C C, be now drawn, this will determine the points where the two curves of the pipe outline should join together. Each half of the bend is now divided into a convenient number of segments (in this case, four), and the pattern

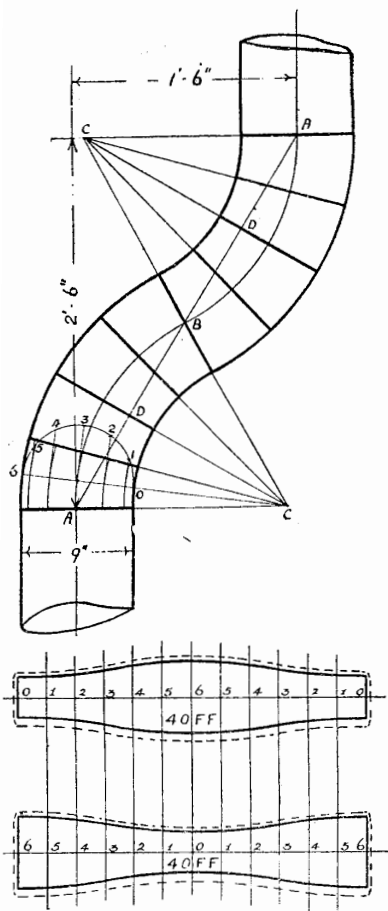


FIG. 18.

for one segment set out, as explained in connection with Fig. 16.

If for the sake of appearance it is required to run the seams in a line, or to alternate the longitudinal seams, then two patterns will be necessary, one giving the seam on the outer curve, and the other on the inner curve.

In jointing up pipes of this description, some care should be exercised, so as to get the bend without twist, and to the exact shape.