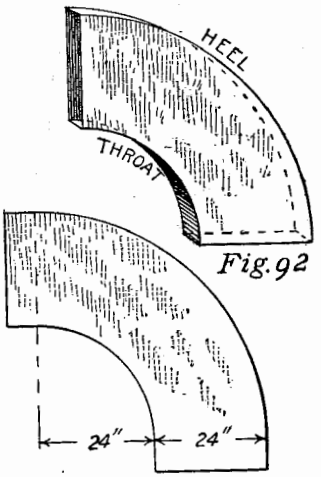
CHAPTER VI.

Methods of Laying Out and Constructing the Elbows

Elbows

The heel and throat of an elbow are shown in Fig. 92, the heel being the outer and the throat the inner curve. If possible, the radius for describing



Figs. 92 and 93—Laying Out the Inner Curve of Elbows

the throat of the elbow used for heating and ventilating should be equal to the width of the duct, as is shown in Fig. 93.

Adjoining Elbows

When a number of ducts adjoin one another the elbows are laid out as shown in Fig. 94, in which a′ is the radius of the throat of elbow 1, being equal to the width of the duct a; the various elbows, 1, 2 and 3 are then struck from the common center, the

heel of the first thus becoming the throat of the second, and the radius for the heel of the second

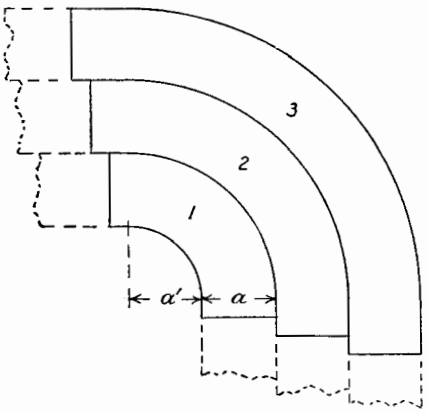


Fig. 94—Method of Laying Out Elbows When a Number of Ducts Adjoin

elbow becoming the radius for the throat of the third elbow, etc.

Finding Unknown Size in Double Elbow

Supposing that two ducts each 12 in. deep by 24 in. wide are to be connected by means of a double elbow to a single duct having a depth of but 8 in., the unknown width of the duct is found by making the following calculation: Assuming that the two ducts A and B in Fig. 95 are each 12×24 in. in size, then $12 \times 24 = 288$ sq. in. and $288 \times 2 = 576$ sq. in., the combined area in both ducts. As the given depth of the third duct is 8 in., then $576 \div 8 = 72$ in., or the width of the third duct. Thus the area of the third duct is made equal to the combined areas of the other two. This rule is applicable, no matter

whether the first two ducts are the same size or not. Having found the width to be 72 in., the double elbow is laid out as shown in the diagram. With C as center and a radius equal to 24 in. or the width of the duct, draw the quadrant **a b**. Extend C **a** and C **b** indefinitely and make **a e** equal to 24 in. and set off on C **b** extended the 72 in. width just found, as shown from **b** to **c**, which bisect, obtaining the point **d**, and through **d** draw the vertical line shown. Now with radius equal to **b c**, or 72 in., set off this distance on **e** C extended, obtaining the point **f**, and using **f** as center and **f e** as radius describe an arc, **e, h,** cutting the center line at **h**. Then **a, b, d, h, e** is one-half the elbow, which is duplicated on the opposite side in the same manner.

Laying Out Large Elbows

When the elbows are of such size that they cannot be laid off on a single sheet of iron, a diagram of the elbow may first be laid out on the floor by means of a trammel and crayon as shown. Assuming that the radius of the throat is to be 36 in. and the radius of the heel 72 in., making the width of the elbow 36 in., then, in case a steel trammel is not at hand, an emergency trammel can be made as shown by A B in Fig. 96. This is bent up from sheet metal to a right angle, each side being about 1½ in. wide, with a hem edge as shown in the profile at Y. A nail can be driven through the corner of the trammel at **a** into the floor, and from **a** are measured off on the radius rod, or trammel, the two distances of 36 in. each as shown at **b** and **c**. By using the scribe awls as shown, quadrants are drawn upon the floor, and over these marks white crayon

lines are drawn, using a sharpened crayon indicated at X. The trammel can now be removed, and using the steel square, with the corner placed on the center **a,** a right angle is drawn in crayon as shown by **e, i, a, h, f.** A straight part to the left of **e, i** and below **h, f** is always added to the quadrant, to make

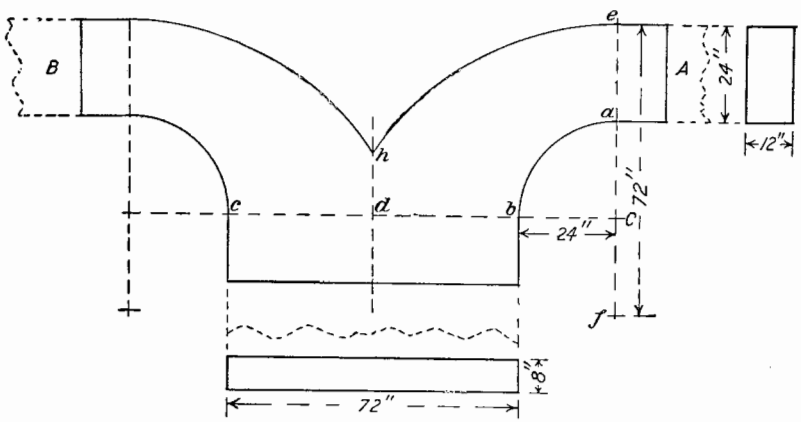


Fig. 95—Laying Out a Double Elbow and Finding the Unknown Size of Third Opening

easy joining to the straight duct. The quadrant is divided into as many sections as will cut to advantage from the sheet of metal, in this case 4, as shown by **l, m** and **n,** and from these points radial lines are drawn to **a.** After this view of the elbow has been laid out in chalk on the floor boards a sheet of iron, shown by T, is laid over one of these sections (as 3) and again using the trammel and straight edge, the section 3, as shown by **m, n, p, o** is reproduced on the sheet metal.

Joining the Segments of the Elbows

The method of allowing edges to these various sections of the elbow for seaming purpose is shown in Fig. 97, where the patterns for 1, 2 and 3 and for 4 are shown, the edges for seaming being indicated by the dotted lines.

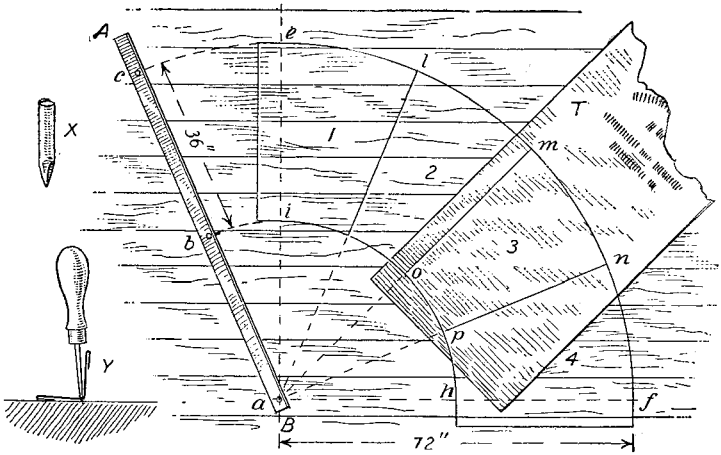


Fig. 96—Laying Out Large Elbows on the Floor and Transferring to the Sheet Metal

The sections of the elbow are joined together in practical work, as shown in Fig. 98, the various sections being joined with a standing locked seam, shown in detail at Z, which gives great rigidity. The edges along the curves at **a** and **a** are turned downward in large elbows, to meet an advanced method of seaming, which will be described.

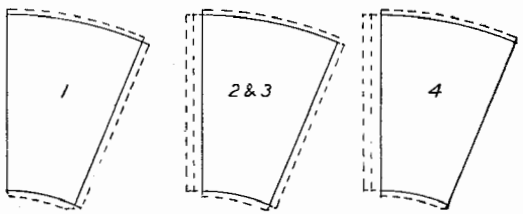


Fig. 97—Patterns for the Segments

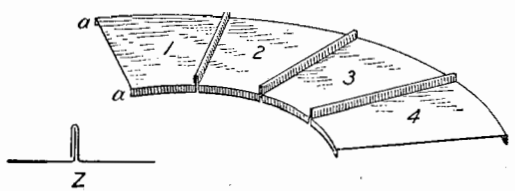


Fig. 98—Showing Sections Locked Together and Forming One Side of the Elbow

Double Seaming the Large Elbows

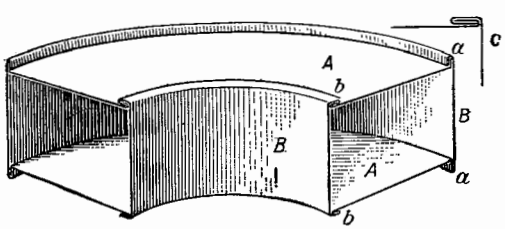


Fig. 99—General Method Employed in Seaming Elbows

The usual method of double seaming the corners of curved elbows is shown in Fig. 99. The curved sides A and A have single edges turned at right angles, as shown by **a a,** and the straight sides B and B have edges which were previously bent in the brake and which are double seamed as at **b b,** by using

double seaming stakes or hand dollys, which have been already illustrated. An enlarged section of the finished seam is shown at C.

Constructing Large Elbows from Sections

The construction of large elbows to be made in more than one section is illustrated in Fig. 100, in which A and A are the curved sides, with a single edge turned inward as shown. The straight sides

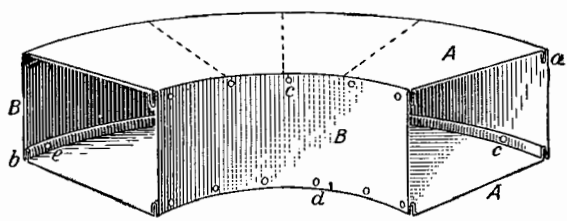


Fig. 100—Seaming and Riveting Large Elbows

B and B are folded as shown at **a** and **b**, so as to receive the single edge of the curved sides, after which a few rivets are placed through the seamed joint, as shown at **c**, **d** and **e**. Care must be taken in bending the straight sides B and B so as not to close the receiving lock. This can be avoided by bending the straight sides as shown in Fig. 101, in which A represents a portion of the straight side on which the double lock **a** has been tightly pressed together. Before turning over the edge **b**, a strip of metal, slightly heavier than the metal from which the elbow is constructed, is placed in position as shown at **c**, when the flange **b** can be clamped down in the brake as shown at **d**. Still leaving these strips **c** in the sides, they are passed through the pipe formers until the desired curve is obtained.

A quick method of seaming the corners of large elbows without riveting is shown in Fig. 102, in

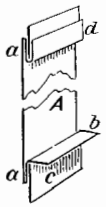


Fig. 101—Bending the Straight Sides of the Elbow

which the curved sides A and A have the single edges and the straight sides B and B the compound

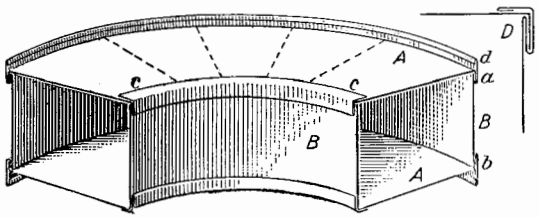


Fig. 102—Quick Method of Seaming Large Elbows, Without Riveting

edges, which are bent as shown from **a** to **b**. The projecting edge at **d** is reinforced with a hem edge as shown, which is turned over the curved face as indicated by **c c**, and shown in detail in the enlarged section at D. This is a simple method of easy construction and makes a tight rigid corner.