CHAPTER IV

FORMING, GROOVING, BEADING, AND CRIMPING

This chapter will treat of the various processes used in the construction of conductor pipes, stove pipe, furnace pipe, and air ducts. Although work of this kind is chiefly used in building construction and heating and ventilating systems, the following will apply as well to forming and seaming sheet metal articles cylindrical in form, where the longitudinal seam is made with the usual grooved seam.

When constructing pipes and cylinders the student must first find the circumference by multiplying the diameter by 3.1416, and to this dimension add the amount of material necessary for making the grooved seam, as shown in Figure 22. This will give the exact length to cut the material.

Constructing Sheet Metal Pipe.—When constructing pipes an allowance should be made for the thickness of metal used. This is necessary to permit the small end of the joint to fit snugly into the large end of the adjoining joint of pipe. The usual method is to cut the small end of the joint $\frac{1}{8}''$ less in circumference than the large end when using tin plate and light iron up to No. 26 gauge, and $\frac{1}{4}''$ for No. 24 to No. 20 gauge. The best practice is to make a difference of seven times the thickness of the metal between the large and small end of pipe.

When making pipe it is customary to place the sheets of metal on a bench behind the squaring shears (Figure 9). Then set the front gauge back from the cutting blade of the shears, having the left end of the gauge equal to the length of the large end of the pipe and the right

end equal to the length of the small end. The sheet of metal is then passed between the shears blades. The student should extend his fingers and press down upon the middle of the sheet while holding it firmly against the gauge, and then cut the joint. Notch one corner of the small end. This notch will show which is the small end after the pipe is formed up.

After all the sheets have been cut, the joints are placed behind the folding machine (Figure 16) with the notched

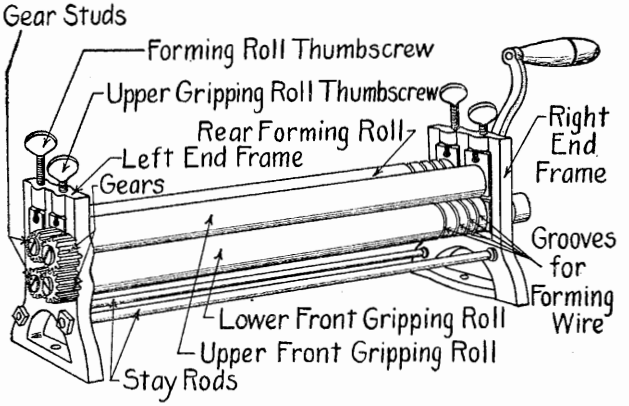


Figure 24.—Forming Machine with Solid Housings.

end to the right of the machine, and the single edges are turned as shown in Figure 17.

Forming Cylinders.—The next step in the construction of the pipe is to form it into shape on the forming machine (Figures 24, 25). This machine is easily adjusted by means of the adjusting screws on each end of the machine, and the rolls can be set for forming any desired size of cylinder. The upper front roll is slightly raised, to allow the folded edge of the sheet to pass between the rolls without closing the lock. The sheet with the folded

edge on the under side is inserted in the machine just far enough to allow the front rolls to grip the edge, as shown in *a*, Figure 26. Then holding the handle of the machine

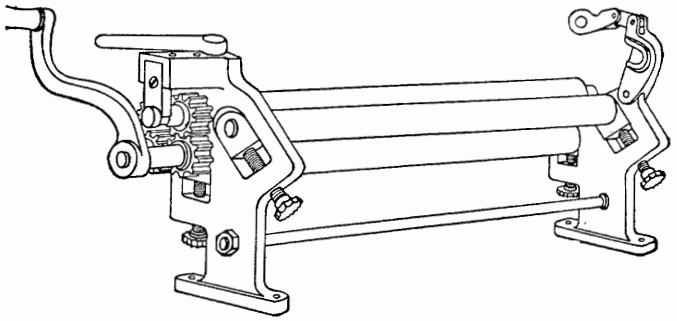


Figure 25.—Forming Machine, Slip Roll Pattern.

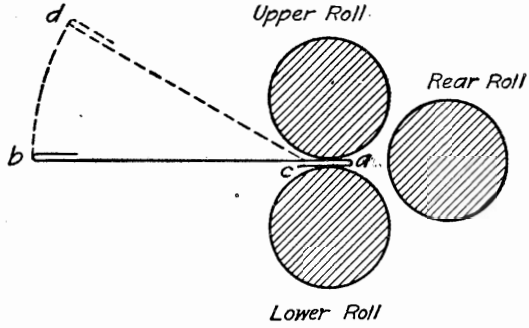


Figure 26.—Inserting the Sheet Between the Rolls of a Forming Machine, to Form a Cylinder.

firmly to keep the sheet in this position, raise the sheet to the dotted position *d*, making a slight bend at *c*. This bend enables the sheet to pass easily over the rear roll, giving it the required curve, as shown in Figure 27.

The adjustment is made by raising or lowering the rear

roll until the required diameter is obtained. A cylinder having a grooved seam should be formed a trifle less than

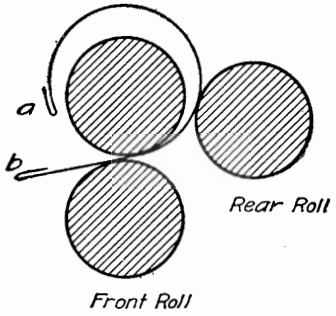


Figure 27.—Position of Sheet When Cylinder Is Nearly Formed.

its full diameter. This will allow the edges to hook tightly together while being grooved.

GROOVING SEAMS

Having formed the pipe properly, it is now ready for the grooving operation, which can be performed either by hand with the hand groover (Figure 28) and mallet

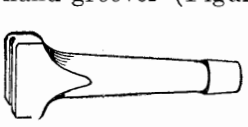


Figure 28.—Hand Groover.

over a mandrel stake (Figure 29) or upon the grooving machine (Figure 30).

Operating the Grooving Machine.—After the edges of the pipe have been hooked together as shown in *a*, Figure 31, the front latch of the machine is raised and the cylinder inserted over the grooving horn, the end of the cylinder resting against the lower adjustable stop, which

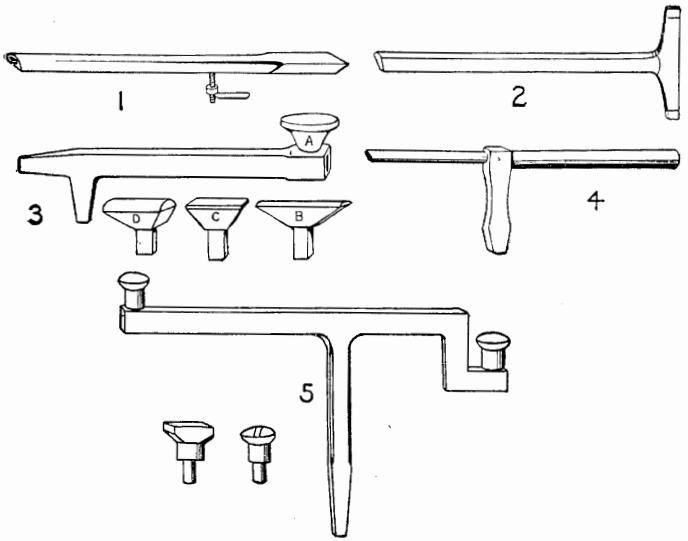


Figure 29.—Bench Stakes.

1, Hollow Mandrel Stake; 2, Mandrel Stake; 3, Double Seaming Stake, with Four Heads, A, B, C, D; 4, Conductor Stake; 5, Tea Kettle Stake with Four Heads. (See also Figures 53, 54.)

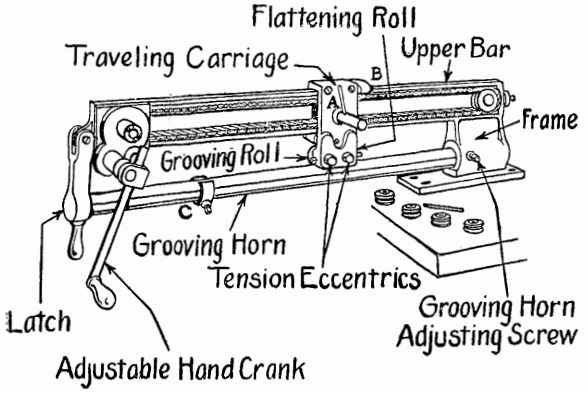


Figure 30.—Grooving Machine.

prevents the work from slipping. The traveling carriage is then brought forward, allowing the grooving roll to run over the seam lengthwise, completing the seam as shown in *b*, Figure 31. The carriage is returned to the starting point by means of a handle. It has two rolls, one for grooving, and one for flattening the seam at the same operation.

Countersunk Grooved Seam.—This seam is used extensively in the construction of stove pipe, furnace pipe,

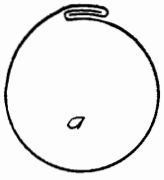
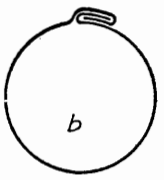


Figure 31.—Pipe Seam Hooked Together and Grooved.



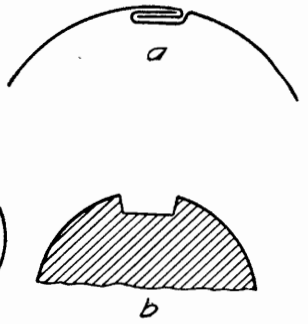


Figure 32.—*a*, Seam Grooved Inside Pipe; *b*, Groove in Horn of Grooving Machine.

and other sheet metal articles. This method of grooving places the seam on the inside, leaving an unbroken surface on the outside of the article, as shown in *a*, Figure 32.

When making this seam on the improved grooving machine (Figure 30), remove the grooving wheel from the traveling carriage, loosen the set screw, then turn the reversible grooving horn, bringing upward one of the grooves which is planed into the horn, as shown in *b*, Figure 32. The cylinder is placed on the grooving horn with the locked edges directly over the planed groove. The traveling carriage containing the flat roll is brought

forward, which presses the seam into the groove and thus completes the operation.

Grooving Seams by Hand.—The ordinary small grooving machine shown in Figure 23, is used for seaming tinware, furnace pipes and articles made from light sheet metal, where a small seam can be employed to advantage. In sheet metal shops not equipped with a grooving machine, when it is required to seam articles made from black and galvanized iron by hand the article to be grooved is placed on the hollow mandrel (Figure 29), or the solid mandrel stake. The edges are hooked tightly together for their entire length. The hand grooving tool (Figure 28) is placed against the edge of the seam and struck with a wooden mallet (Figure 33). In this way

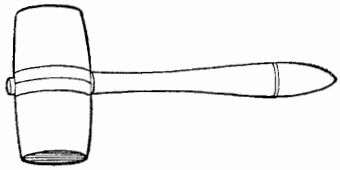


Figure 33.—Tinners' Hickory Mallet.

the seam is grooved at one end for several inches. The other end is then grooved in the same manner, after which the entire seam is grooved by striking the hand groover with the mallet while moving it along the seam. Care must be taken that the groover does not cut or mark the metal on either side of the seam. The seam is completed by flattening it down closely with the wooden mallet.

BEADING AND CRIMPING

In constructing articles cylindrical in form from light sheet metal, they are usually reinforced by being beaded or swaged upon the beading machine shown in Figures 34, 35. When making cylinders or pipe of large diame-

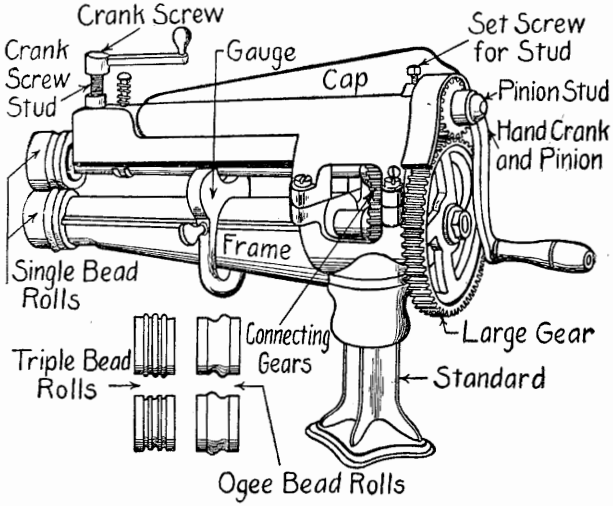


Figure 34.—Beading Machine.

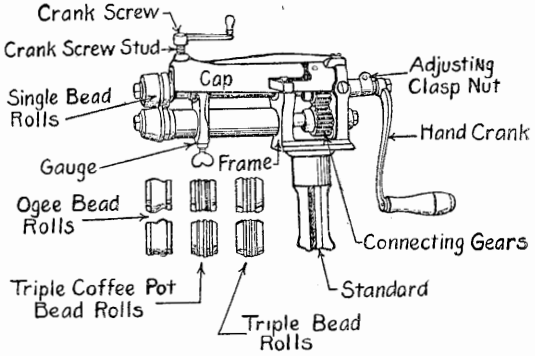


Figure 35.—Light Beading Machine.

ter, several beads are usually placed close together near the ends of the cylinder. This tends to strengthen the body, keeping it round in form.

The beading machine is furnished with several sets of rolls, consisting of the single bead, ogee bead, triple bead, and the triple coffee pot bead rolls. The single and ogee bead rolls are generally used in beading the ends of pipe and large cylinders made from sheet iron. The triple bead and coffee pot bead rolls are used in swaging articles of tinware, both round and flaring in form. When mak-

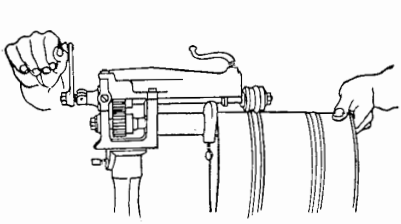


Figure 36.—Beading a Cylinder.

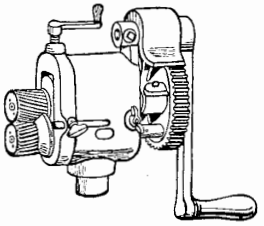


Figure 37.—Crimping Machine.

ing pipe of various sizes, a single or ogee bead is usually made on the small end of the pipe. This bead serves to stiffen the pipe and aids in keeping the pipe straight when riveting the joints together.

Operating the Beading Machine.—When beading pipe the gauge is moved back about 1½ inch or 2 inches from the beading roll and fastened by means of the set screws. The small end of the pipe is then inserted between the rolls, with the end resting against the gauge. The rolls are now pressed together by means of the hand screw on top of the machine. The pipe is held in a horizontal position with the left hand while the machine is being turned with the right. The large end of the pipe should be allowed to pass easily through the fingers while being revolved in the machine, and care should be taken that

the small end of the pipe is against the gauge at all times during the operation. A mistake often made by the student is to depress the upper roll too much. If this is done, there is great danger of cutting through the material. The beading process is clearly shown in Figure 36.

Crimping Pipe.—After the pipe has been beaded, the next step is to draw in the small end with the mallet on the mandrel stake, or crimp the edge about ½ inch in

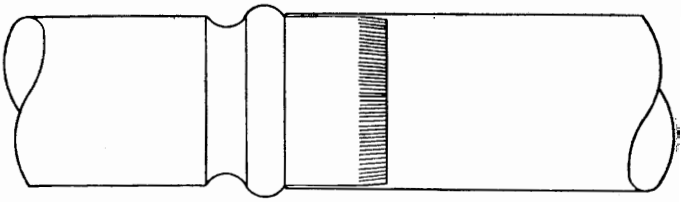


Figure 38.—Plain Lap Pipe Joint, Showing Crimped Edge.

width on the crimping machine shown in Figure 37. This operation contracts the edge of the pipe so that it will enter the next joint easily, as shown in Figure 38. The illustration shows a plain lap joint, having a lap of about 2 inches, and can be either riveted or soldered, or both as required.