DESCRIPTION OF WIRE AND WIRE ALLOWANCES

OBJECTIVES OF UNIT

1. To describe and give the uses of wired edges.
2. To describe and give the common fractional sizes of iron and steel wire.
3. To give the edge allowance for a wired edge.
4. To explain how to compute the length of wire needed for a job.

INTRODUCTORY INFORMATION

FIG. 1 WIRED EDGE

The edges of some jobs are folded around wire to strengthen, to stiffen, and to eliminate sharp edges. Wired edges can be made by either the hand or machine process. The hand process is used when a machine is not available or when the work is too large or the material too heavy for the capacity of the machine available. A sheet metal worker is often called upon to do hand wiring.

Round stock obtained in coils is usually called wire while stock in straight lengths is usually called rod.

IRON AND STEEL WIRE

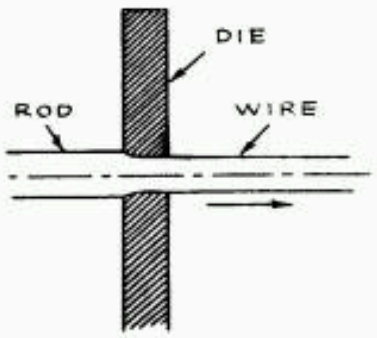


FIG. 2 DRAWING WIRE

Rod larger than 7/32" is hot rolled. To make wire, rod is drawn cold through a series of consecutively smaller holes in plates called dies until the required size is obtained. (Fig. 2).

Wire can be made of iron, steel, copper, aluminum, stainless steel, nickel, etc. Iron wire is very soft and seldom used while annealed steel wire is stronger and is the type used by the sheet metal trade. Hard drawn (not annealed) steel wire which is very strong can be obtained for special purposes. Iron and steel wire may be obtained plain or coated with tin, zinc, copper, or other metals. Coating reduces the tendency of the wire to corrode, and makes the wire easier to solder.

Wire is used in sheet metal work to reinforce edges, to support furnace pipes, and to make handles and hinges. Usually uncoated wire is used for jobs of black iron. Tinned or copper coated wire is used for tin ware and galvanized wire for galvanized jobs.

SIZES OF IRON AND STEEL WIRE

Wire diameters are designated in fractions of an inch or by a series of gage numbers corresponding to the diameter of the wire in decimals of an inch. While the American Steel and Wire (Washburn and Moen) gage is used for iron and steel wire, there are so many series of gage numbers for the various kinds of wire that, in order to avoid mistakes, it is best to order wire by either the fractional or decimal size.

Wire can be obtained in coils of various weights and rods (1/16" and up) in straight lengths of 10 to 20 feet. Rod can be used for jobs in which straight lengths are required. Wire can be used for straight jobs if it is straightened in the slip roll forming machine or with a mallet. Rod is more expensive than wire and so wire should be used whenever possible. Wire and rod are sold by the pound.

A table of standard fractional sizes of wire is given below. The corresponding decimal equivalent and the weight of each size wire in pounds per foot is also given.

TABLE OF WIRE SIZES

Exact Size of Wire	Size of Wire		Weight of Wire in lbs. per foot
	Fractions	Equivalent Decimal	
•	1/16	.0625	.0104
●	3/32	.09375	.0234
●	1/8	.1250	.0416
●	5/32	.15625	.0651
●	3/16	.1875	.0937
●	7/32	.21875	.1276
●	1/4	.250	.1667

ALLOWANCES AND PREPARATION FOR WIRED EDGES

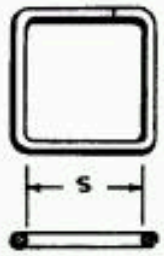
For 24 gage and lighter, material $2\frac{1}{2}$ x the diameter of the wire is added to the pattern for the wired edge.
Example: Allowance for 1/8" wire = 1/8 x $2\frac{1}{2}$ = 5/16".

The wired edge is always put on the outside of the job unless otherwise specified. This edge can be made on a turning machine, bar folder, standard hand brake, or by hand. (Fig. 3).

FIG. 3 PREPARED EDGES

The length of wire needed for a wired edge is equal to the perimeter (distance around) of the job with an extra allowance for the thickness of the wire. Formulas and examples are given below.

A. SQUARE



Rule: The length of wire is equal to 4 times one side of the job plus 2 times the diameter of the wire.

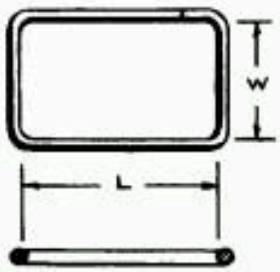
Formula: L. W. = 4S + 2d
L. W. = length of wire in inches.
S = length of one side in inches.
d = diameter of wire in inches.

Example: If S = 18" and d = $\frac{1}{4}$", find L. W.
1. L. W. = 4S + 2d

2. L. W. = 4 x 18 + 2 x $\frac{1}{4}$

3. L. W. = 72 + $\frac{1}{2}$ = 72$\frac{1}{2}$" Ans.

B. RECTANGULAR



Rule: The length of the wire is equal to 2 times the length plus 2 times the width of the job plus 2 times the diameter of the wire.

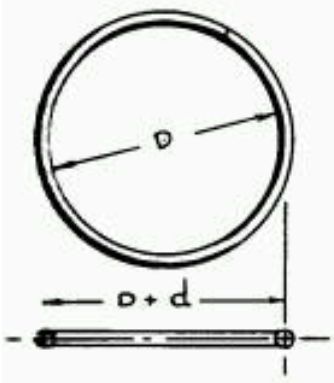
Formula: L. W. = 2L + 2W + 2d
L. = length of job in inches.
W = width of job in inches.
d = diameter of wire in inches.

Example: If L = 10", W = 5" and d = 1/8", find L. W.
1. L. W. = 4S + 2d

2. L. W. = 2 x 10 + 2 x 5 + 2 x 1/8

3. L. W. = 20 + 10 + $\frac{1}{4}$ = 30$\frac{1}{4}$" Ans.

C. CIRCULAR



Rule: The length of wire is equal to the diameter of the job plus the diameter of the wire multiplied by Pi (π) which equals 3.1416.

Formula: L. W. = π(D + d)
D = diameter of job in inches.
d = diameter of wire in inches.

Example: If D = 19-3/4" and d = $\frac{1}{4}$", find L. W.
1. L. W. = π(D + d)

2. L. W. = 3.1416 (19-3/4 + $\frac{1}{4}$)

3. L. W. = 3.1416 x 20

4. L. W. = 62.832" = 62-27/32" Ans.

HOW TO FINISH A WIRED EDGE

OBJECTIVES OF UNIT

1. To explain how to wire straight edges before the job is formed.
2. To explain how to wire an inside or outside radius on a flat job.
3. To explain how to wire a square or rectangular job after it is formed.
4. To explain how to wire a tapered job after it is formed.

INTRODUCTORY INFORMATION

The proper wire or rod is selected by first referring to the drawing for the kind and size specified for the job, and then measuring the wire or rod with a scale. If there are many sizes of wire on hand (differing slightly), it is best to find the size with a micrometer.

After the piece needed is cut from the coil, a piece of small diameter wire is wrapped around the coils to prevent the end of the wire from causing an injury and to prevent the coils from becoming loose. If straight lengths are used, the remaining piece should be returned to the rack. The wire used in Part I of this course will be restricted to small diameters which can be cut with pliers and bent in a vise. The use of wire cutters and benders will be explained later.

Where the wired edge crosses a seam, some of the overlapping metal must be cut away to eliminate a bulge at the seam. This is called notching and must be done carefully before the job is formed and wired; otherwise, a bulge or a hole will be left at the seam.

All wired edges are not made at the same stage in the construction of the job. Some jobs are wired before they are formed while others are wired after they are formed. Cylindrical jobs having straight sides, such as cans or tanks and the small ends of tapering jobs are usually wired while the jobs are still flat, that is, before they are formed into shape. Boxes, machine guards, and the large ends of tapering jobs, such as pails, are wired after they are formed.

TOOLS AND EQUIPMENT

Flat Plate
Hollow Mandrel Stake
Bench Vise
Setting Hammer
Pliers
Mallet

PROCEDURE

A WIRING STRAIGHT EDGES BEFORE THE JOB IS FORMED

1. Make the edge (Fig. 1) equal to $2\frac{1}{2}$ x the diameter of the wire.

PREPARED BY HAND OVER A CURVED BLOCK | PREPARED IN THE STANDARD HAND BRAKE | PREPARED IN THE BAR FOLDER

FIG. 1

2. Cut the wire to the correct length with a pair of pliers or wire nippers. To find the length of the wire, see Unit 1SM-T21.

   NOTE: Wire should not be cut with snips or on the squaring shear as it will nick the cutting edges.

3. Lay the job on a flat plate or a work bench.

   NOTE: If the job has a grooved seam, fold the edges for the grooved seam before inserting the wire.

4. Straighten the wire and place it into the fold.

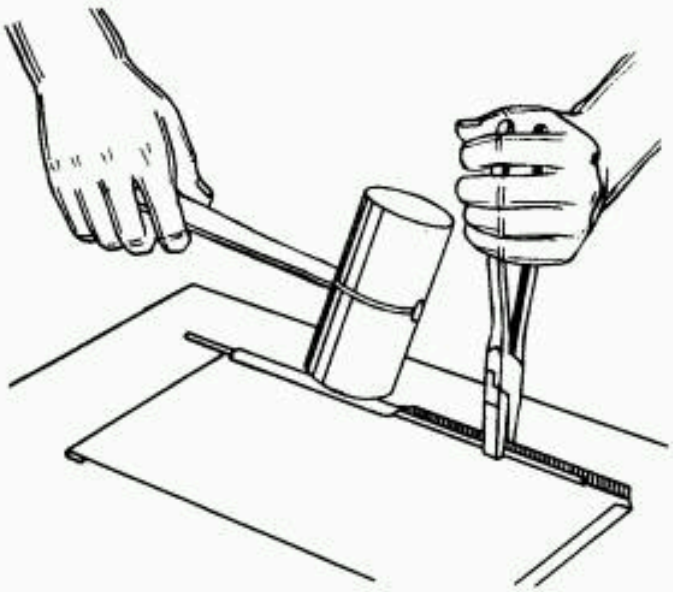


FIG. 2 HOLDING WIRE WITH PLIERS

   NOTE: For a cylinder, extend the wire 1" to 2" from the under fold end. This is done to strengthen the seam and reduce the possibility of an opening remaining after the job is formed.

5. Start the fold over the wire the entire length of the edge, using a mallet and pliers. (Fig. 2).

FIG. 3 STEPS IN MAKING A WIRED EDGE

   CAUTION: Use pliers to prevent injury to your fingers.

6. Bend the metal over the wire as far as possible with the mallet. Fig. 3 shows the three steps necessary to make a wired edge.

7. With the peen of the setting hammer, complete the wired edge by peening the metal down tightly over the wire. (Fig. 4).

NOTE: Be careful not to mar the job with the mallet or the setting hammer.

NOTE: The work must be backed with a rail or a flat plate during the entire wiring operation.

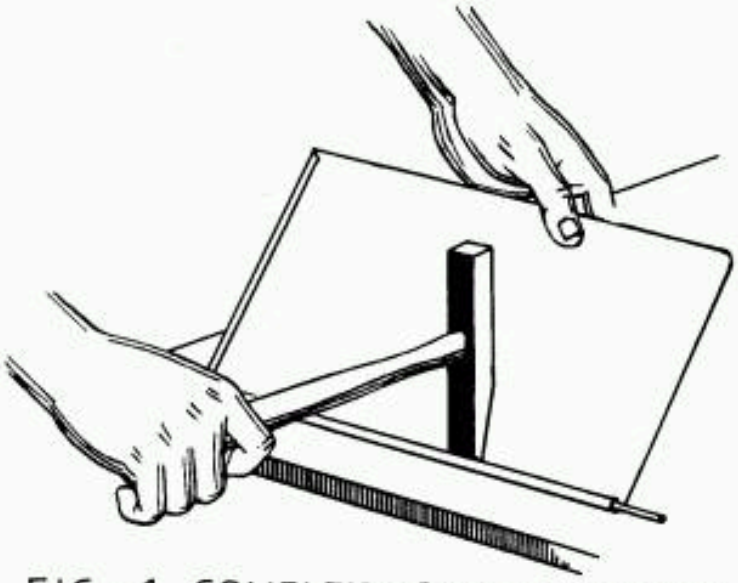


FIG. 4 COMPLETING A WIRED EDGE

B. WIRING AN INSIDE OR OUTSIDE RADIUS ON A FLAT JOB

FIG. 5 TURNED EDGE

1. Turn the edge equal to $2\frac{1}{2}$ x the diameter of the wire. (Fig. 5).

2. Measure the length of the edge to be wired with a flexible rule and cut the wire to this length with a pliers or wire nippers.

3. Roll the wire into the required shape in the groove of the slip roll forming machine.

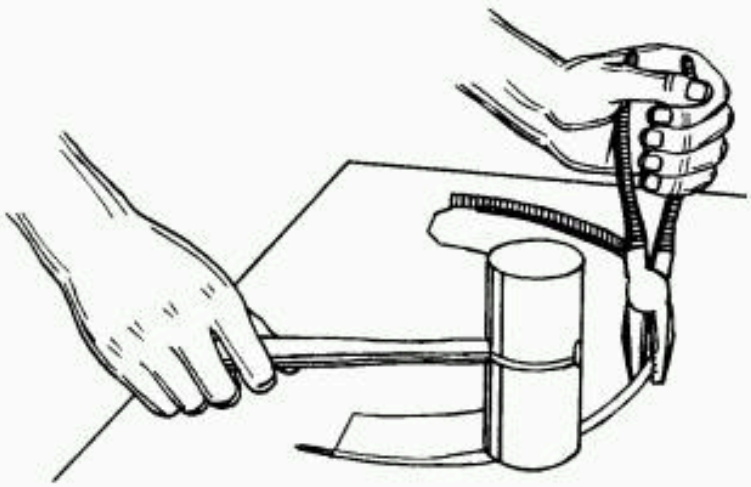


FIG. 6 BENDING METAL OVER WIRE

4. Lay the job on a flat plate or a work bench and place the wire in the fold.

NOTE: If the job is to be rolled, keep the wire at least 1" to 2" from one end.

5. Start the fold over the wire the entire length of the edge, using a mallet and pliers. (Fig. 6).

CAUTION: Use pliers to prevent injury to your fingers.

6. Bend the metal over the wire as far as possible with the hammer. (Fig. 7).

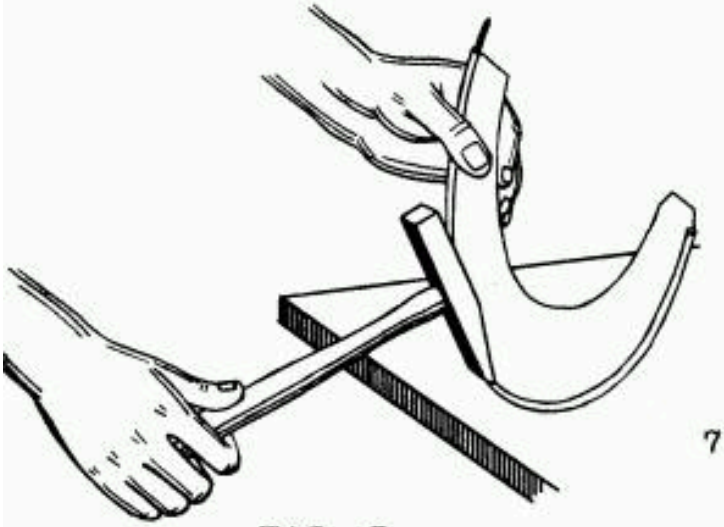


FIG. 8
FINISHING THE EDGE

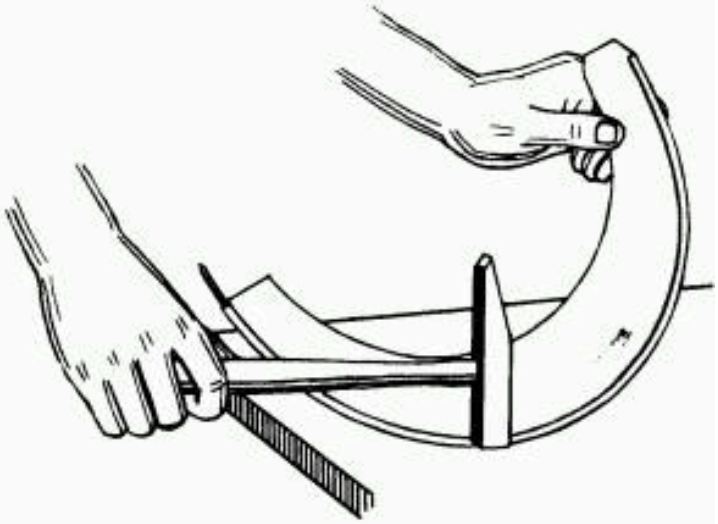


FIG. 7

7. With the peen of the setting hammer, complete the wired edge by peening the metal down tightly over the wire. (Fig. 8).

NOTE: Be careful not to mar the job with the hammer or mallet.

C. WIRING A SQUARE OR RECTANGULAR JOB AFTER IT IS FORMED

1. Make the edge (Fig. 9 or 10) equal to $2\frac{1}{2}$ x the wire diameter.

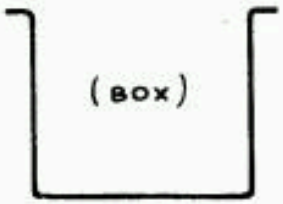


FIG. 9

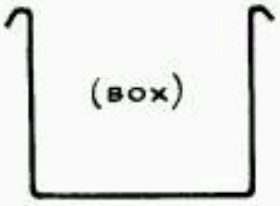


FIG. 10

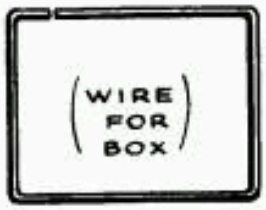


FIG. 11

2. Cut the wire to the correct length with a pair of pliers or wire nippers. To find the length of wire, see Unit 1SM-T21.

NOTE: Wire should not be cut with snips or on the squaring shear as it will nick the cutting edges.

3. Form the wire to the shape shown in Fig. 11 by following operations 4, 5, and 6.

NOTE: When wiring a square or rectangular job, the ends of the wire should meet 1" to 2" from the corner of the job. This strengthens the corner and adds to the appearance.

4. Place the wire in the vise with 1" to 2" extending at one end.

5. Form the wire to a 90° angle with a setting hammer.

6. Place the bent part in the vise and bend the wire to a 90° angle as in Fig. 12.

7. Form the two other sides of the frame by repeating operation 6.

8. Place the wire frame on the box.

9. Lay the job on the square end of the hollow mandrel stake or any other suitable stake.

10. Start the fold over the wire at each corner using the mallet and pliers. (Fig. 13).

    CAUTION: Use pliers to prevent injury to your fingers.

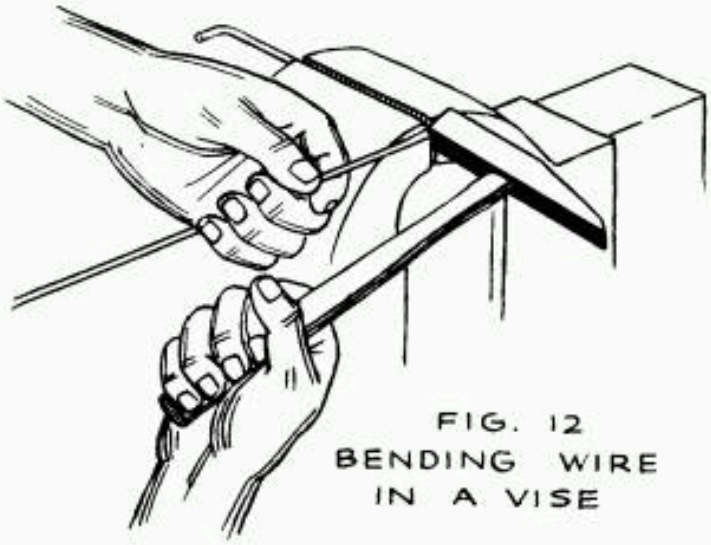


FIG. 12
BENDING WIRE
IN A VISE

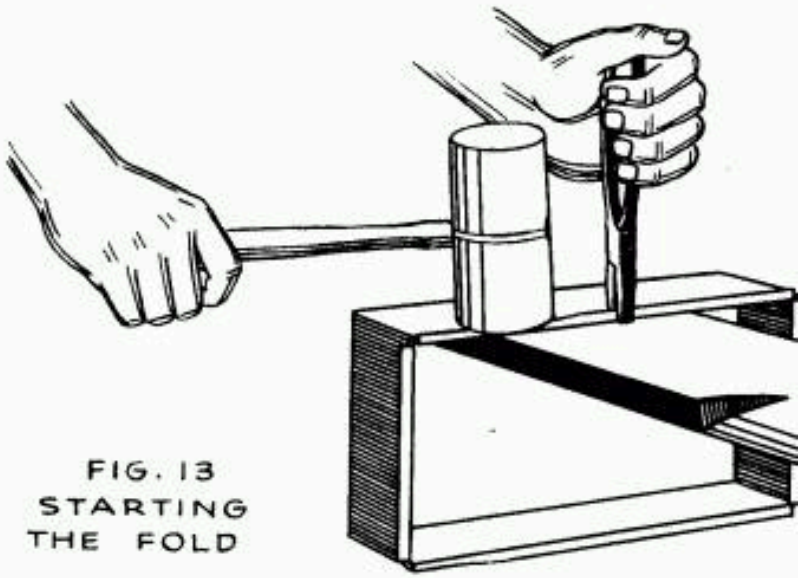


FIG. 13
STARTING
THE FOLD

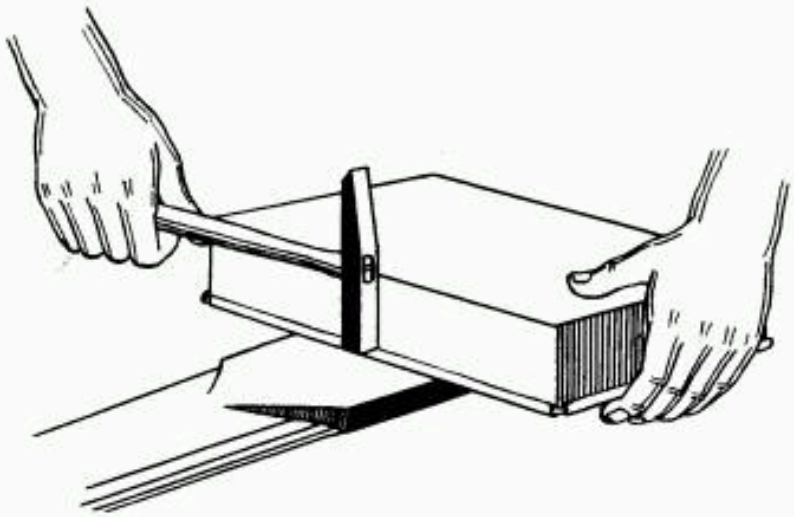


FIG. 14 BENDING METAL OVER WIRE

11. Bend the metal over the wire as far as possible with the mallet.

12. Complete operation 11 on the four sides.

13. Bend the metal over the wire as far as possible with the face of the setting hammer. (Fig. 14).

14. With the peen of the setting hammer, complete the wired edge by peening the metal down tightly over the wire on the four sides. (Fig. 15).

NOTE: Be careful not to mar the job.

NOTE: Solder the corners and file them round and smooth.

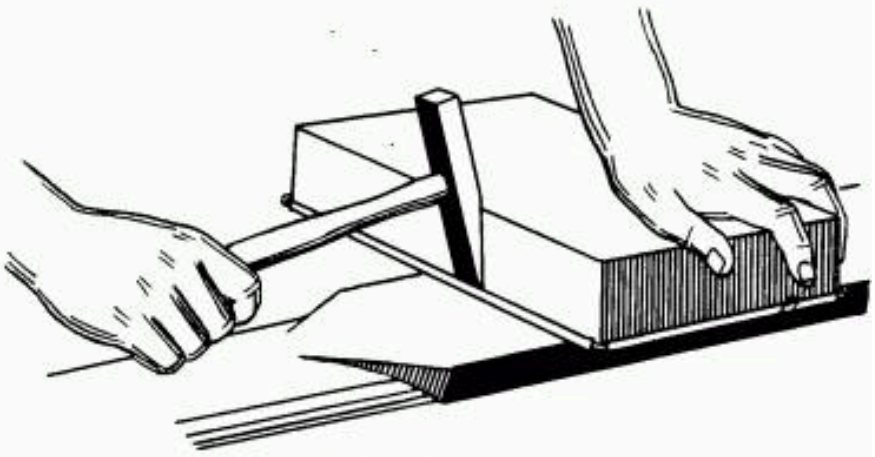


FIG. 15 COMPLETING THE WIRED EDGE

D. WIRING A TAPERED JOB AFTER IT IS FORMED

FIG. 16

1. Turn the edge equal to $2\frac{1}{2}$ x the diameter of the wire on the turning machine. Fig. 16 shows an edge turned on a slightly tapered and on a sharply tapered job.

2. Cut the wire to the correct length with a pair of pliers or wire nippers. To find the length of wire, see Unit 1SM-T21.

NOTE: Wire should not be cut with snips or on the squaring shear as it will nick the cutting edges.

3. Form the wire into a circular shape in the groove on the slip roll forming machine.

4. Place the job on the hollow mandrel stake.

NOTE: When wiring a funnel, use the blowhorn stake.

5. Start the metal over the wire with a mallet and a pair of pliers. (Fig. 17).

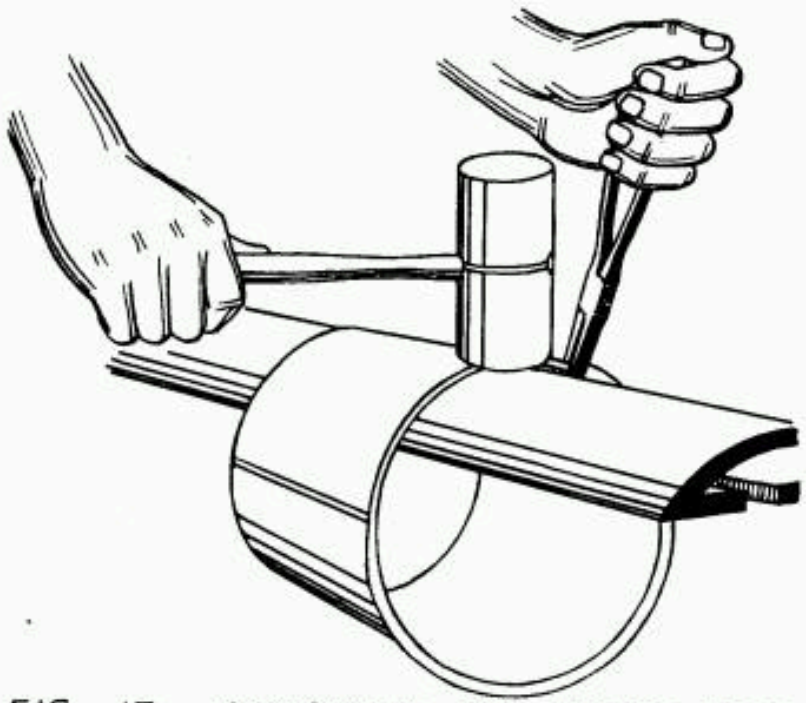


FIG. 17 STARTING THE WIRED EDGE

NOTE: Start the wire 1 to 2 inches from the seam. This is done to strengthen the seam and reduce the possibility of an opening remaining after the job is formed.

6. Bend the metal over as far as possible with the flat face of the setting hammer. (Fig. 18).

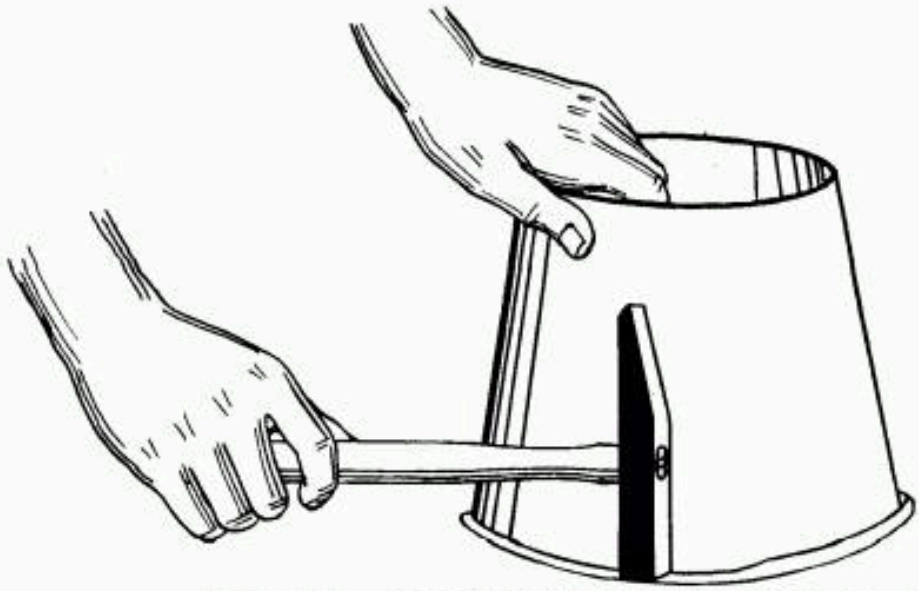


FIG. 18 BENDING METAL OVER WIRE

7. With the peen of the setting hammer, complete the wired edge by peening the metal down tightly over the wire. (Fig. 19).

NOTE: Be careful not to mar the job with the mallet or the setting hammer.

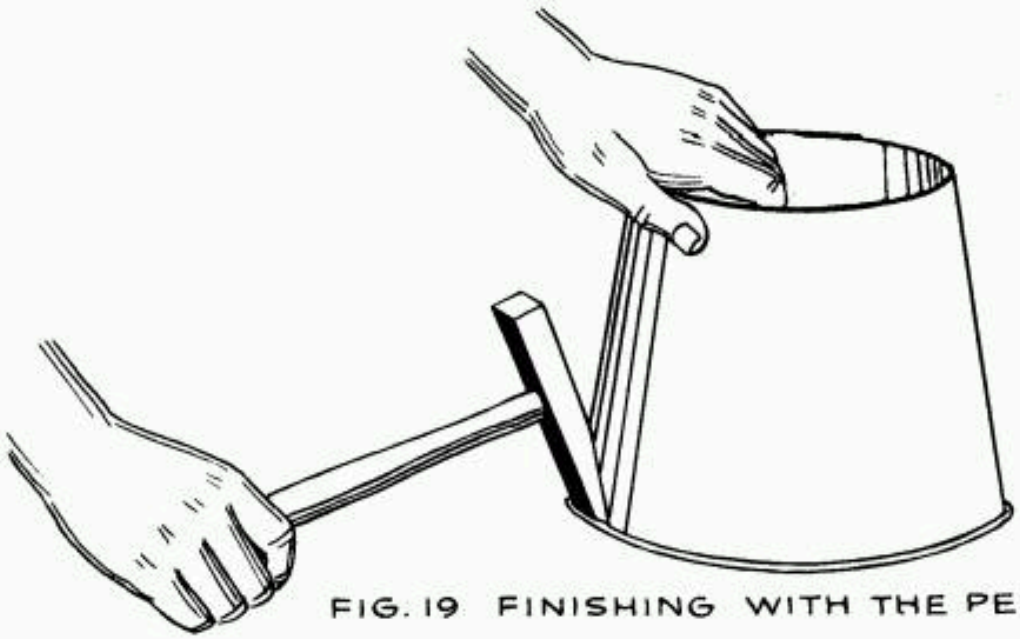


FIG. 19 FINISHING WITH THE PEEN