SHEET METAL WORKING

Metals can be processed in three ways to make useful products. One way is casting in foundry shop, the second way is machining shop and the third way of metal processing is sheet metal working by forming process.

In third case, deforming the metal sheets plastically process sheet metal. In sheet metal working only those metals can be processed whose mechanical properties favours the plastic deformation. Ductility, malleability, yeild strength and ultimate strength are the important properties that make plastic deformation possible.

Metal working operations are widely used in making utensil, washer, furniture, body of automobiles, metal cabinets, etc. It is also used for decoration work, bending, cutting of metal (shearing), joining of sheet metal. This process is popular due to its dimensional accuracy, high quality of surface finish, capability of mass production and low cost manufacturing.

Types of Sheet Metals / Materials :-

In sheet metal work, the sheet metal used are black iron, galvanized iron, stainless steel, copper, brass, zinc, Aluminium, tin plate and lead. the steel are specified by gauge numbers. [Gauge number is a number that appears in denominator if thickness is expressed in inches, in fraction. For eg. if thickness of sheet is 1/20 inches. it is said of 20 Gauge sheet.] Higher the gauge number of metal sheet lower the thickness of sheet and vice versa.

Different metals are:-

1. Black Iron sheets:- It has a bluish black appearance and is referred to as uncoated sheet since it is uncoated, therefore it corrodes rapidly. The use of this metal is limited to articles that are to be painted such as stove pipes, tanks and pans. Iron sheet are used for cheaper work as they are corrosion prone.

2. Galvanized Iron:- It is soft steel coated with molten zinc. The zinc coating resists rust, improves the appearance of the metal and permit it to be soldered with greater ease. the galvanized iron sheet is used extensively in fabricated products such as buckets, furnaces, cabinets, and in many other articles.

Galvanized iron sheets are widely used due to their good appearance and low cost corrosion resistivity.

3. Copper:- It is a reddish coloured metal and is extensively malleable and ductile. It is used Extensively in Electric field. Since it does not deteriorate rapidly when exposed to atmosphere, this metal is used frequently in the building trades for water pipes roofing and other parts of building.

TOOLS USED IN METAL WORKING :-

Both types of tools Hand tools as well as power operated tools are used in sheet metal working.

Hand tools like hammer, mallet, shear, tongs

Power operated tools like press, die and punch.

Some Marking tools used in sheet metals are Bevel square, straight edge, divider, scriber, Try square, Punch, scale etc.

Some other hand tools used in sheet metal working are described here :-

1. **ANVIL :-** Anvil is main supporting tool, widely used in metal working shop. It is made of cast iron. Anvil consists of beak, face, hardie hole, Pritchel hole, tail, body, clamp, base. Each part have its own importance due to exclusive functions.

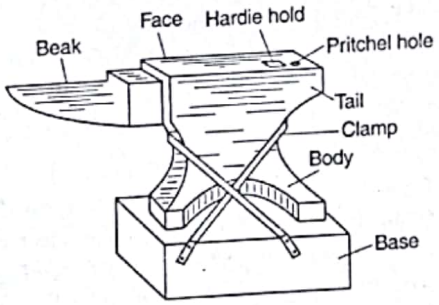


Fig. 8.1 Anvil

Base :- It is made of Cast Iron, wood or Concrete used to provide a strong and rigid support & foundation to it.

Body :- Body is the middle portion of anvil which decides the height of it and transmission the blows to its foundation.

Beak :- Beak is tapered, convex, extended part at the front used to give a shape to work piece. It is used in bending operation.

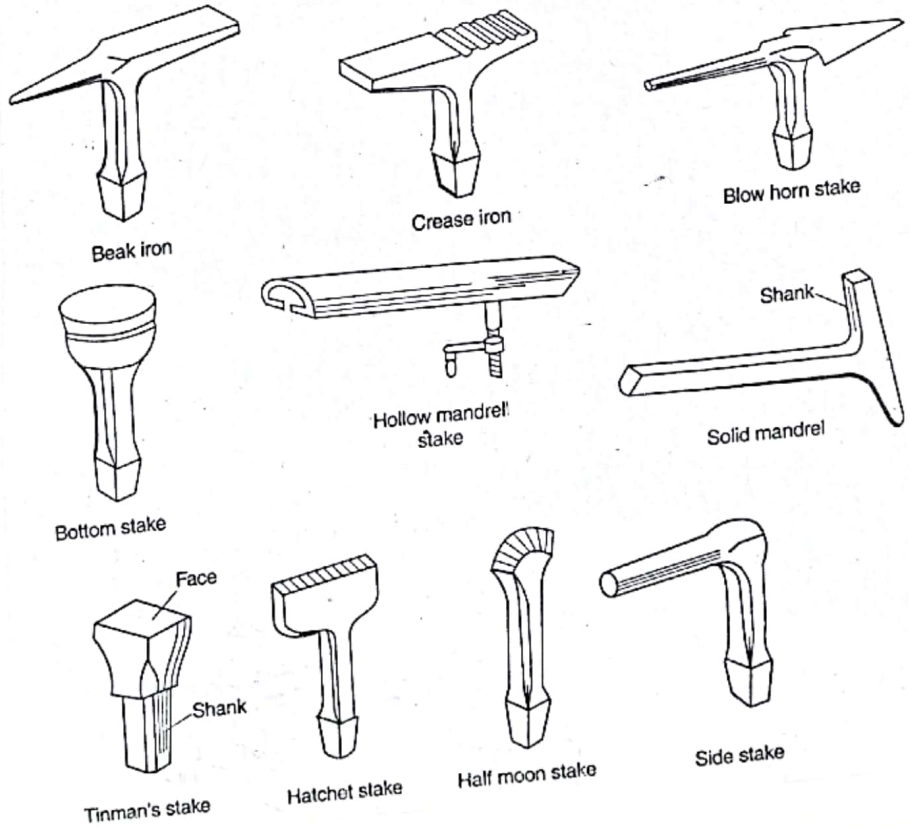
Face:- Face is top and flat surface of anvil which provides support to work piece when it is processed. Face is made of high conductivity hard material to facilitate hot working of metal.

Hardie Hole:- It is a square hole at the tail of anvil to hold grip the rectangular objects.

Pritchel Hole:- It is a circular hole used to grip the round objects to process them.

STAKES:- Stake is a supporting tool used in sheet metal working. It provides support to sheet metal to do work upon it. It is made of cast steel or forged steel. It is used for bending, riveting and making seam joint in sheet metal.

Stakes are classified into different types depending upon the shape of their upper face.



HAMMER :—

Some heavy duty hammers are said sledge hammer. They are further classified on the basis of shape of their peen like straightpeen, cross peen, ball peen, double face hammer.

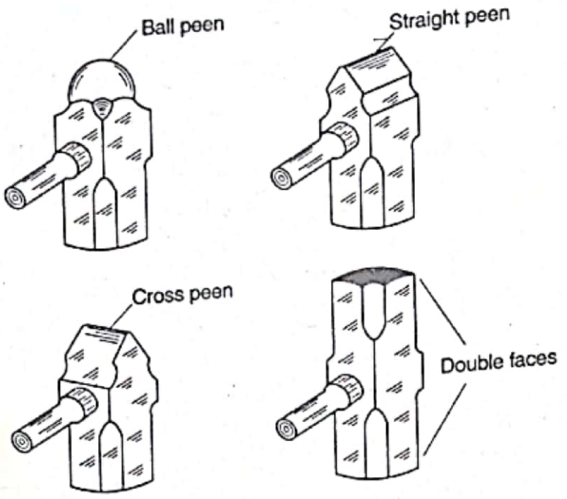


Fig. 8.3 Sledge Hammer

Set HAMMER :—

Set hammer consists of a flat surface used to strike on the surface of sheet metal to flatten it. It is recommended to work in narrow space and to fold the edges of sheet metal at 90°.

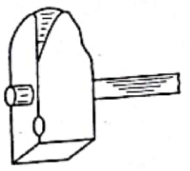


Fig. 8.4 Set Hammer

FULLER :—

Fullers are used in pairs. The lower one is called bottom Fuller. which is used to support work piece. The upper one is called top fuller used to strike on the work piece. Fullers are made of hardened carbon steel. It is used for making slots, finishing the edges and increasing the length or width of work piece.

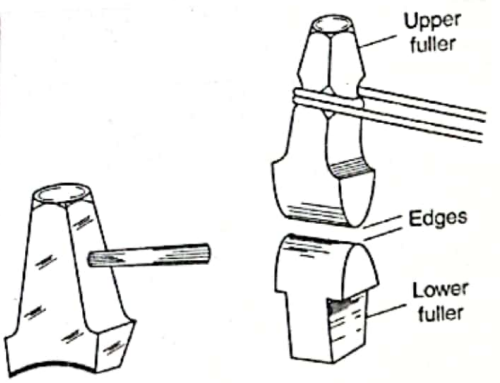


Fig. 8.5 Fullers

SWAGES:-

Swages are also made in pairs like fuller called top swage and bottom swage. These are made of hardened carbon or high carbon steel. Each of the pair of swages consist of circular groove of compatible size. the work piece to be processed is kept in the groove of bottom swage and strokes with top swage. It is used to increase the length of rod and to finish the cylindrical objects.

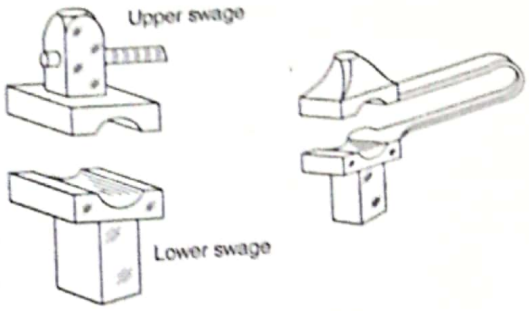


Fig. 8.6 Swages

FLATTER:-

It is made of hardened, high carbon steel and used for flattening the surface. It consists of one end flat with rectangular cross-section and other end smaller. the working face of flatter is flat end.

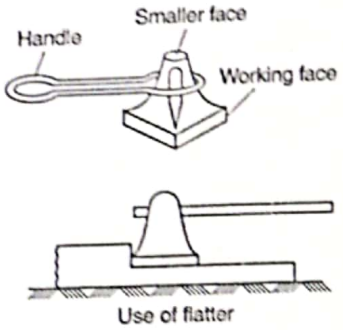


Fig. 8.7 Flatter and its use

SNIPS:-

It is also called shears. It is a shearing tool used to cut the sheet metal by shearing action. It consists of two movable jaws. with sharp edge on each of them. which can be brought closer to cut the metal.

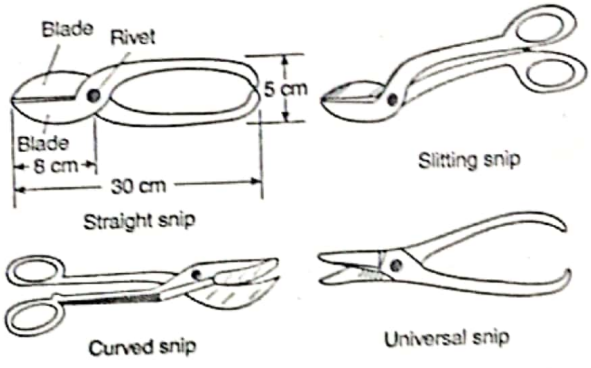


Fig. 8.10 Type of Snips

Snips or shears can be classified into different types depending upon the shape of cutting edge:-

Straight snip:- It consists of straight cutting edge and mostly used for straight cutting of sheet metal.

Curved or circular snip:- This snip consists of curved cutting edges and recommended to cut the sheet metal along a curve.

Slitting snip:- In slitting snip jaws are kept below the handle to improve visibility of line along which cutting is to be done. It also consists of straight cutting edges.

Universal snip:- cutting edges of this snip are inclined to each other. It can be used for any type of cutting comfortably.

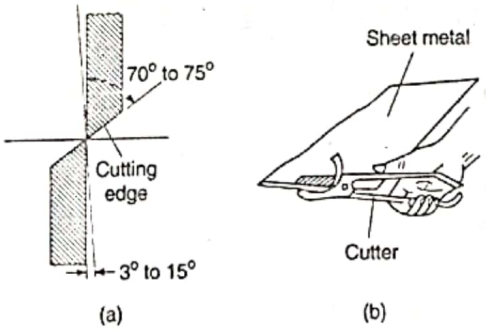
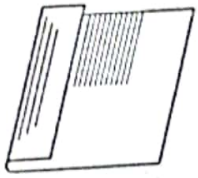


Fig. 8.9 Cutting Action of Snip

SHEET METAL JOINTS: HEMS AND SEAMS

Sheet metal working incorporates a wide variety of hems and seams.

A *hem* is an edge or border made by folding. It stiffens the sheet of metal and does away with the sharp edge. A *seam* is a joint made by fastening two edges together.



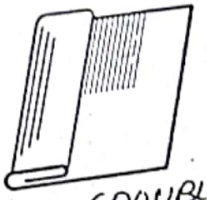
HEM (SINGLE)

Hem. Three common types of hems are : (1) single hem, (2) double hem, and (3) wired edge.

The *single hem* is made by folding the edges of the sheet metal over to make it smooth and stiff.

The *double hem* is made by folding the edges over twice to make it stiff and smooth.

The *wired edge* is smooth and very strong. Step by step process of making it is shown in Fig. 18.11.

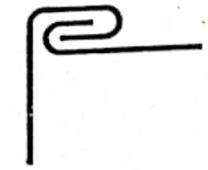


HEM (DOUBLE)

Seams. Most common types of seams are : (a) lap seam, (b) grooved seam, (c) single seam, (d) double seam, (e) dovetail seam, and (f) burred bottom seam. The type of seam, of course, is determined by the thickness of metal, and the purpose for which the object is to be used.

The *lap seam* is the simplest type of seam and can be prepared as lap joint by means of soldering.

The *grooved seam* is made by hooking two single hems together and then locking them by a groover.

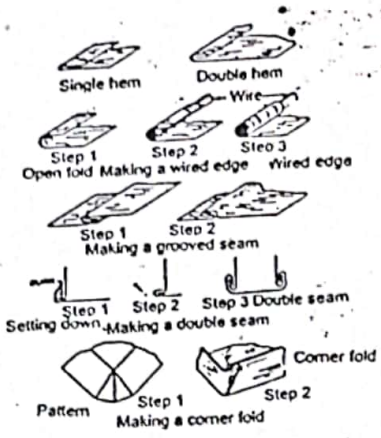


SEAM.

The *single seam* is used to join a bottom to vertical bodies of various shapes.

The *double* seam is similar to single seam with the difference that its formed edge is bent upward against the body.

The *dovetail* seam is similar to dovetail joint in carpentry and is used to join flat plate to a cylindrical piece.



Hems and seams

The *burred bottom* or *flanged seam* is used to join the bottom of a container to its body. The flange on cylindrical jobs is often referred to as a *burr* and the process of making a narrow flange is known as burring.

BASIC TOOLS USED IN SHEET METAL WORK

1. Measuring tools :
   - (a) Steel rule
   - (b) Folding rule
   - (c) Circumference rule
   - (d) Vernier caliper
   - (e) Micrometer
   - (f) Thickness gauge
   - (g) Sheet metal gauge
2. Straight edge
3. Steel square
4. Scriber
5. Divider
6. Trammel points
7. Punches
8. Chisel
9. Hammers
10. Snips or shears
11. Pliers
12. Stakes
13. Groovers
14. Rivet set
15. Soldering iron