FITTING

Manufacturing processes are broadly classified into four categories; (i) Casting processes, (ii) Forming processes, (iii) Fabrication processes, and (iv) Material removal processes.

In all these processes, components are produced with the help of either machines or manual effort. The attention of a fitter is required at various stages of manufacture starting from marking to assembling and testing the finished goods.

Working on components with hand tools and instruments, mostly on work benches is generally referred to as 'Fitting work'. The hand operations in fitting shop include marking, filing, sawing, scraping, drilling, tapping, grinding etc., using hand tools or power operated portable tools. Measuring and inspection of components and maintenance of equipment is also considered as important work of fitting shop technicians.

The term "bench work" generally denotes the production of a part by hand on the bench. "Fitting" is the assembling of the parts together by removing materials from the parts to secure the necessary fit, and may or may not be carried out at the bench. There is no clear meaning between these two terms hence it is used rather loosely. Both these two types of work require the use of large number of tools and equipments and involve number of operations to finish the work piece to desired dimensions, shape.

The operations that are carried out on bench and fitting work may be classified as:

1. Marking out
2. Sawing
3. Chipping
4. Filing
5. Scraping
6. Grinding
7. Drilling
8. Reaming
9. Tapping
10. Dieing

Fitting Tools

The tools used in fitting work may be classified into the following groups.

1. Job Holding Device
2. Striking tools
3. Cutting tools
4. Measuring, marking and testing tools

Job Holding Device

VICES

The vice is the most common tool for holding work. Various types of vices are used for various purposes. They include bench vice, leg vice, pipe vice, hand vice, pin vice and toolmaker's vice.

Bench vice : The most commonly used is the engineer's parallel-jaw bench vice, Sometimes called fitter's vice. It must be firmly fixed to the bench with nuts and bolts. The vice essentially consists of cast iron body, a fixed jaw, a movable jaw-both made of cast steel, a handle, a square-threaded screw, and a nut-all made of mild of mild steel. Separate cast steel plates known as jaw plates are fixed to the jaws by means of set screws and they can be replaced when worn. The holding faces of the jaw plates have teeth for holding the work firmly but this has some disadvantage for soft metal which may be damaged when firmly held between the faces. Protective grips of 'clamps' which can be made of lead, fibre, tin-plate, etc. are, therefore, usually fitted over the jaws to prevent the serrations damaging the surface of the finished work. The movement of the vice is caused by the movement of the screw through the nut fixed under the movable jaw and the screw is provided with a collar inside to prevent it from coming out of the jaw when revolved.

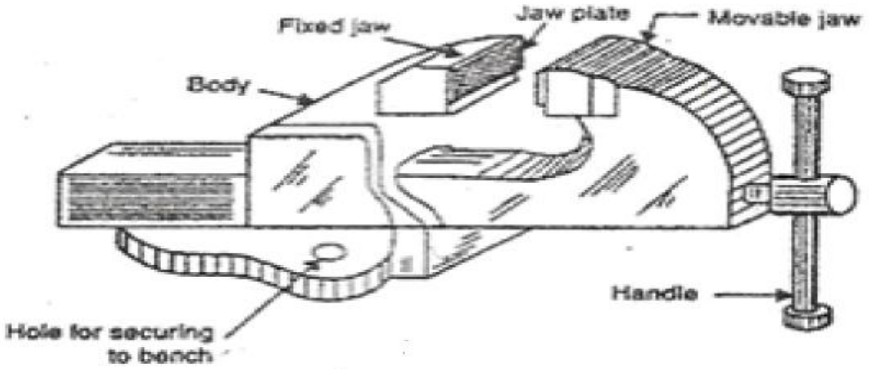


FIGURE 1: VICE

The Following points should be kept in mind while using a vice.

1. The vice should be kept clean and free from dust and metal chips using a brush.
2. The threads and the nut should be occasionally oiled.
3. The vice should never be used as an anvil.
4. For holding tubes, temporary wooden blocks should be used. The serrated jaws should be covered with soft metal clamps when finished work is held.

Striking tools

HAMMERS

Hammers are used to strike a job or a tool. They are made of forged steel of various sizes (weights) and shapes to suit various purposes. A suitable range would be from 0.11 to 0.33 kg for light work such as clinching small rivets and dot punching; 0.45 kg for chiseling, 0.91 kg for heavier work such as chipping, the popular sizes for bench work being 0.33 and 0.45 kg.

A hammer consists of four parts namely peen, head, eye and face as shown in Fig. 2 The eye is normally made oval or elliptical in shape and it accommodates the handle or shaft. The face is hardened and polished well, and is slightly convex, instead of flat to avoid spoilage of the surface of the metal to be hammered by the sharp edge of the flat surface.

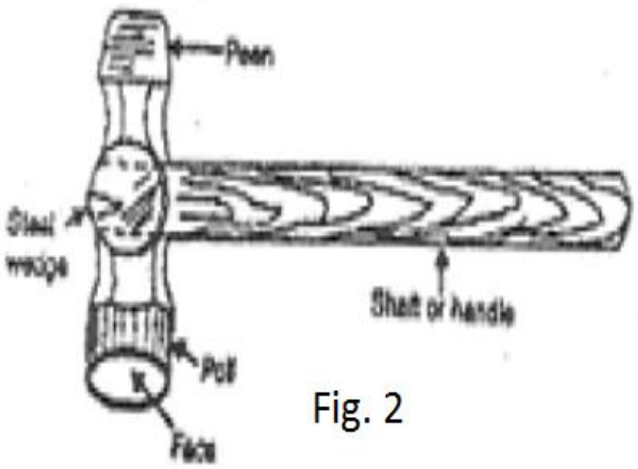


Fig. 2

Cutting tools : The chief cutting tools used in fitting are

1) Cold chisels

2) Files

3) Hacksaws

1) Chisels : There are two kind of chisels based on their use.

The chisels which are used to cut the metals in cold state is called cold chisels. The chisels which are used to cut the metals is hot state is called hot chisels.

a) Cold chisels

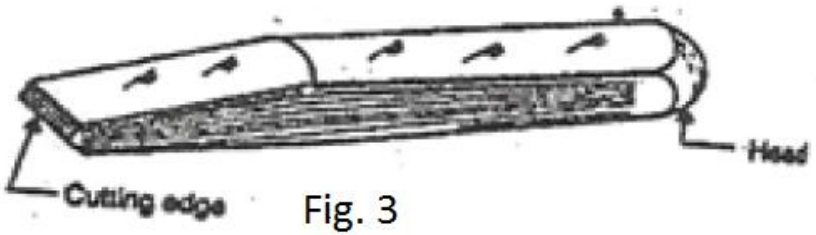


Fig. 3

The cold chisels is an important cutting tool used by the fitter as shown in fig. 3

b) Cross Cut chisel

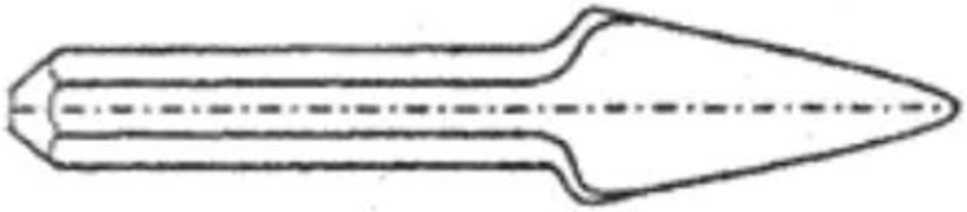


Fig. b

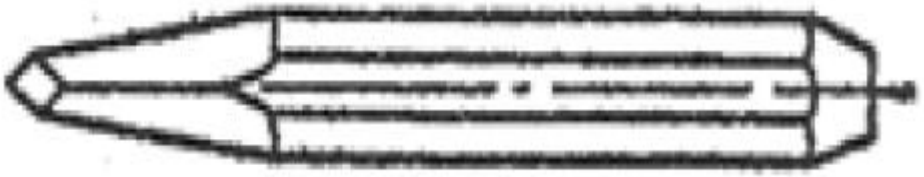


Fig. c

c) Diamond pointed Chisel

Files

A file is a hardened piece of high grade steel with slanting rows of teeth. It is used to cut smooth or fit metal parts. It cuts all metals except hardened steel and it cuts only on the forward stroke. It consists of body with a tang for fixing into the wooden handle. The teeth are cut on the body which are hardened and tempered. The tang is tempered to make is soft and tough the various parts of the file are shown in fig. (1), the metal ring on the file handle is called ferrule, in order to prevent splitting of the handle.

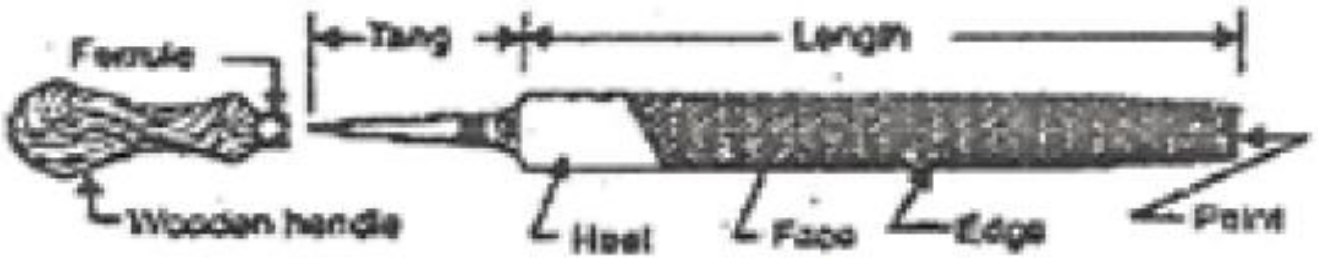


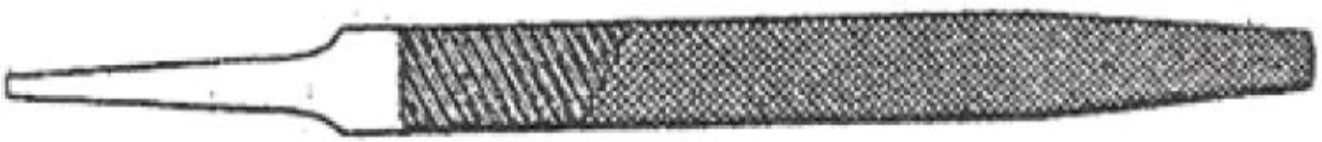
Fig (1)

Types of Files

The files according to their shape are classified as :

1. Flat file
2. Square file
3. Hand file
4. Triangular file
5. Round file
6. Half round file

Flat file



Hand file

Square file

Triangular file

Round file

Half round file

Care of files :-

The following points should be kept in mind while using files.

1) The file should not be used without handle or with loose fitting handle.

2) A file should never be used on hardened steel, hard surface scale or allowed to strike against.

3) The new file should be used first on copper, brass and then on wrought iron and mild steel.

4) The file should not be allowed to rust and to prevent it, the file is coated with machine oil. Before using the file, the oil should be removed with carbon tetrachloride or caustic soda.

5) The worn-out files may be reused by dipping it in hydrochloric acid.

Hacksaw

The Hacksaw is the chief tool used by the fitter for cutting rods, bars and pipes into desired lengths. It is used for sawing all metal except hardened steel. It consists of a metal frame, which may be solid as shown in fig. (2), or adjustable as shown in fig. (3). The solid frame in which the length cannot be changed and the adjustable frame which has a back that can be lengthened or shortened to hold blades of different length. The blade fits over two pegs which project from the pins sliding in the ends of the frame. The wing nut at the front end to the frame is for tensioning the blade. The blades are made of carbon or high-speed steel and may be finished with the cutting edge only hardened or they may be hard all over. The blades are specified by its length and the

Hacksaw

point or pitch. The length of the blade is the distance between the outside edges of the holes which fit over the pins. The most usual blade for hand work is 250mm long and 12.5mm wide. The point or pitch is measured by the number of teeth per 25mm length.

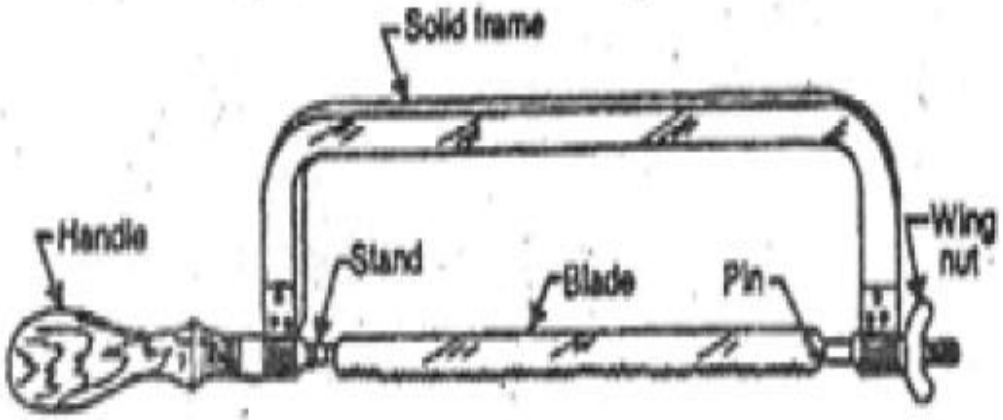


Fig. 2

Hacksaw

The choice of the blade for any particular class of work depends upon the pitch of the teeth atleast two or three teeth should be in contact with the surface being sawn. The best allround blade for hand use is one with 16 to 18 teeth per 25mm.

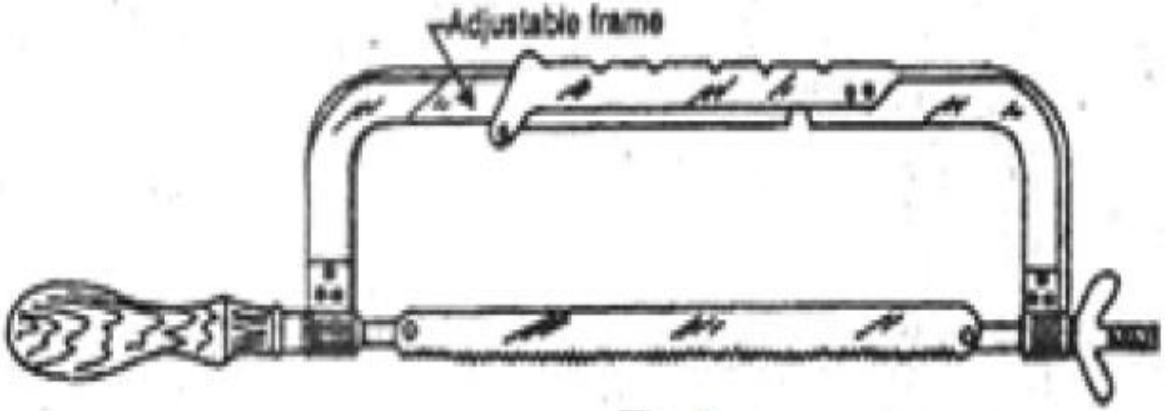


Fig 3

6. Punches

A punch is used in a bench work for marking out work, locating centers, etc. in a more permanent manner. Two types of punches are used : (1) prick punch, and (2) centre punch. The prick punch fig. 33(b) is a sharply pointed tool. The tapered point of

In this body portion the punch is a steel rod 90 to 150mm long and 8 to 13mm in diameter.

Prick punch

Centre punch

Safe and correct practices in fitting shop

The following are some of the safe and correct work practices in bench work and ting shop are

1) Position of the work piece area such that the cut to be made is close to the vice this practice prevents springing, saw breakage and personal injury.
2) Apply force only on forward stroke, relieve the force on the return stroke while sawing operation.
3) Cut a small groove with a file in sharp corners, where saw cut is to be started. The groove permits accurate positioning of the saw and also prevents stripping of the teeth.
4) Use a file with properly fitted tight, handle.
5) Examine the hammer each time before it is used. The handle must be securely wedged.
6) Remove sharp projecting edges and burns which produce inaccuracies in layout, measurement errors and improper fits.