

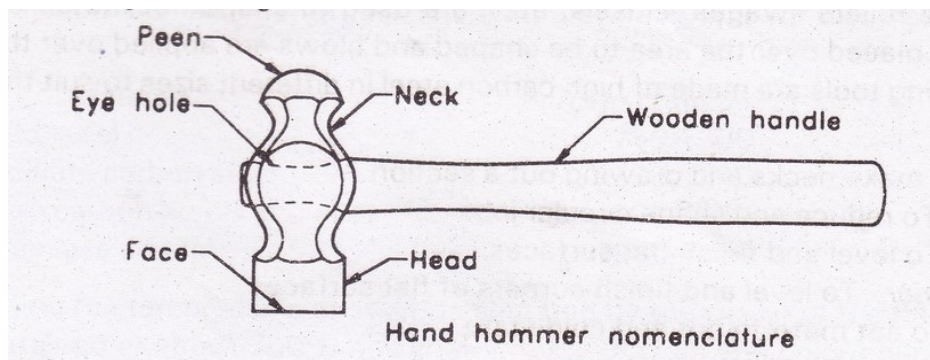
## USE OF HAND AND PORTABLE TOOLS

Hand tools are essential for some operations such as sawing, filing, polishing, chipping, tapping and threading in a workshop or workplace.

Hand tools must be used with due care. This will keep tools safe and good working condition.

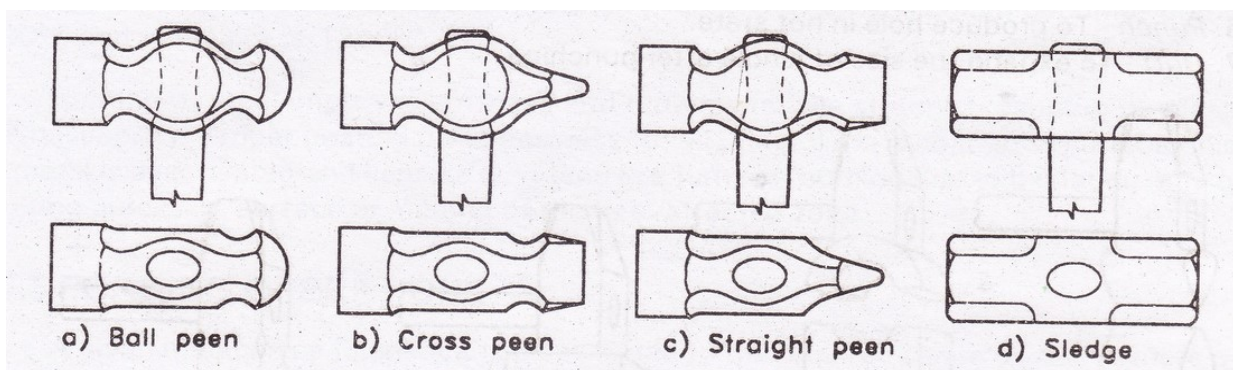
There is some kind of hand tools classified as follows:

1. **HAMMERS:** The hammer is an important tool, which is often used by the worker. It is used for striking purpose
  - While chipping, riveting, punching, forging, straightening, bending etc. The major parts of a hammer are a head and a handle. The parts of a hammer are-Head, face, cheek, eye hole. The size of a hammer is specified by its weight and shape of the peen.

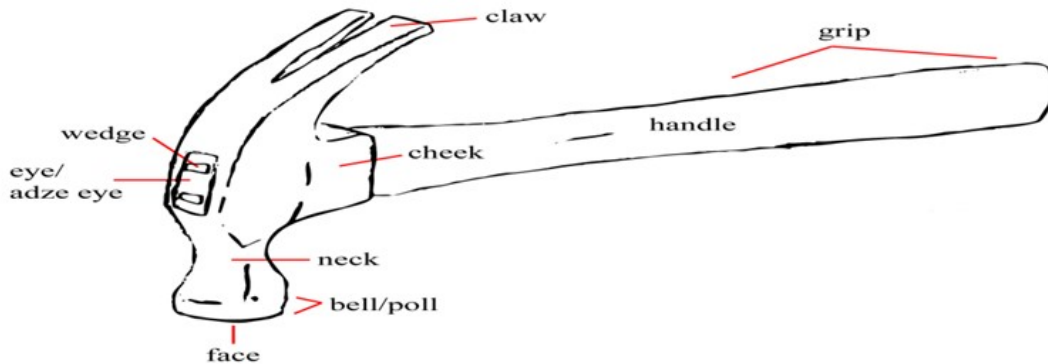


### The commonly used types of hammers are described below :

1. **Ball peen Hammer:** It is a general-purpose hammer. It consists of a face, a peen, an eye and a handle. These are made in variety of sizes, with head masses ranging from approximately 55 g to 1400 g. They are hardened and tempered. The smaller sizes are used for layout work, while the larger ones are used for general bench work.
2. **Cross-peen Hammer :** it is generally used for hammering into shoulders, for hammering inside curves for bending, for stretching etc.
3. **Straight-peen Hammer:** It is generally used for stretching of metal.
4. **Sledge Hammer:** This type of hammer is mostly used blacksmith for straightening round rods, iron bars, angle iron, channel, flat iron etc. Its shape is similar to that of double-ended hammer. As it is used for heavy jobs, its weight is more – 4 kg to 10 kg.



5. Claw Hammer: This is a special type of hammer. On one end of this hammer a round face is made and on the other and its peen is inclined towards the handle. In its centre a slot is cut, with whose help nails etc. can be extracted (taken out).

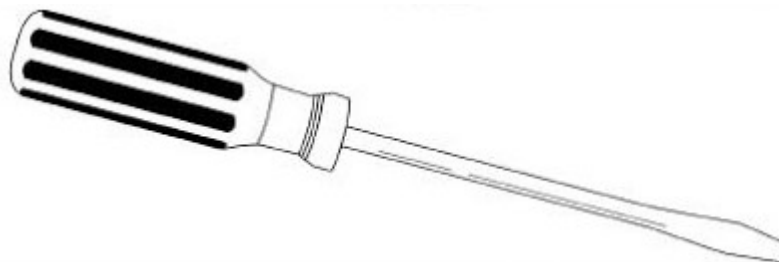


The following care should be taken of the hammers:-

1. The weight of the hammer should be suited to the job at hand.
2. The hammer should be held towards the end of the handle end of edge of the hammer should never come into contact with the work.
3. Hammers with loose heads or split handles should never be used.
4. The hammer face should be kept flat on the work that is being struck.

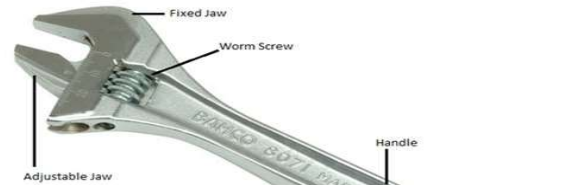
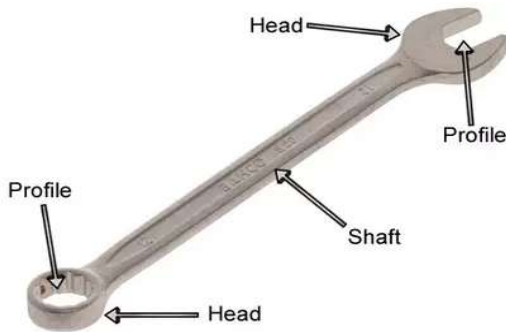
Soft Hammers: These are the hammers with heads made of solid lead, copper or Babbitt. They are used to seat work in a machine vice, to drive a mandrel, or to perform any other similar operation where the hard surface of a steel hammer might injure the edge or surface of machined piece of work.

2. SCREW DRIVER: Screw drivers are made in a variety of shapes, types and sizes. The standard or common screw driver is used on slotted-head screws. It consists of three parts: the blade, the shank, and the handle, When using a screw driver, grasp the handle with the right hand and guide the tip into the slot of the screw with the left hand. Although most shanks are round, those on heavy-duty screw drivers are generally square. This permits the use of a wrench to turn the screwdriver when extra torque is required. The offset screw driver is designed for use in confined areas where it is impossible to use a standard screw driver. The blades on the ends are at right angles to each other. The screw is turned one-quarter of a turn with one end and then one-quarter of a turn with the other end.



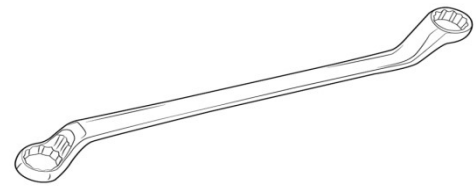
3. **SPANNERS:** Many types of spanners are used, each being suited for a specific purpose. The name of a spanner is derived from either its shape, its use, or its construction. A single-end spanner is one that fits only one size of bolt, head, or nut. A double-end spanner has a different size opening at each end. It is used in the same manner as a single-end spanner.

The adjustable spanner is adjustable to various size nuts and is particularly useful for odd size nuts. Unfortunately, this type of spanner, when not properly adjusted to the flats of a nut, will damage the corners of the nut.

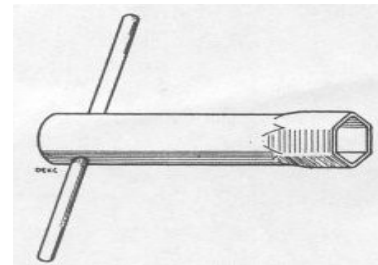


**Some other Spanners:-**

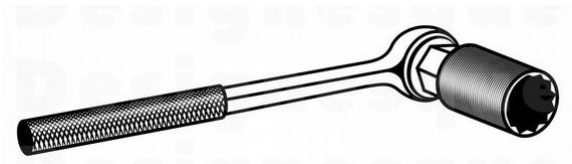
1. **Ring Spanners:** These spanners have hole on one or both ends. Generally 12 notches are made in the hole to grip the head of bolt or nut from all the sides. These spanners are used where application of open ended spanners is not possible.



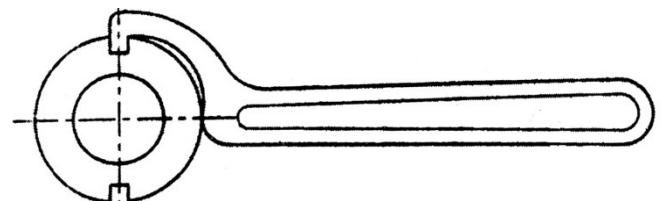
2. **Tubular Box Spanners:** These spanners are generally used where hexagonal bolt or nut is to be fitted in some more depth.



3. **Socket Spanners:** These spanners are generally used where hexagonal bolt or nut is to be fitted in some less depth.



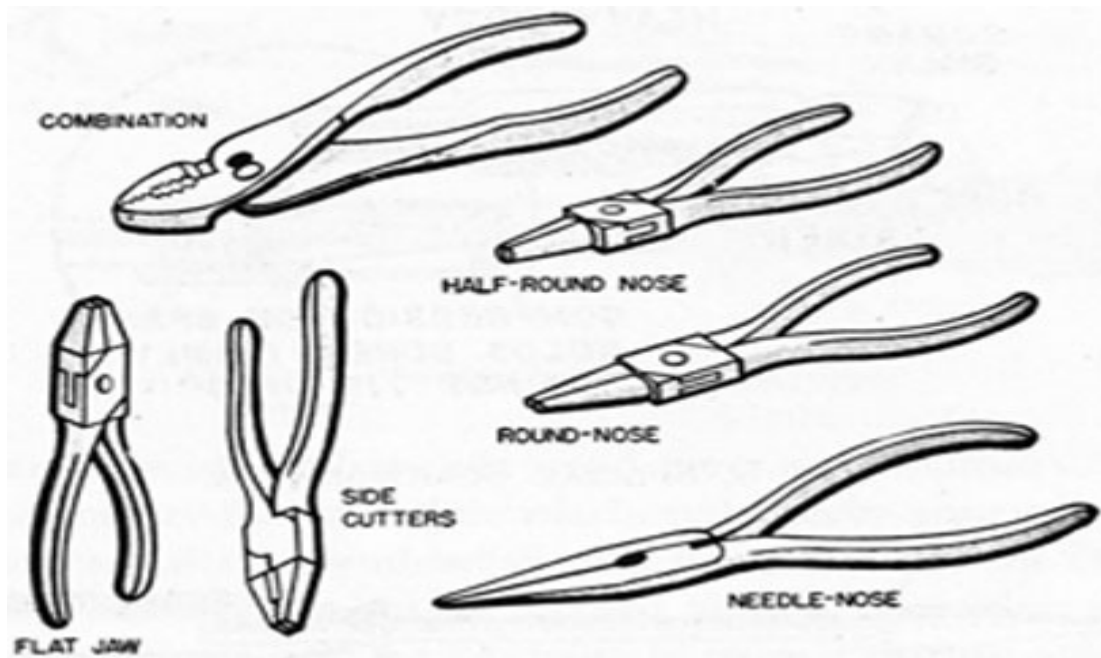
4. **Pin Hook Spanners:** It is also called as 'C' spanner which is generally used on circular nut having a slot.



## 4. PLIERS

A Plier is a hand tool having two legs joined by pivot. Its each leg consists of a long handle and a short jaw. It is classified by the shape of mouth and overall length. The overall length varies from 150 mm to 230 mm. It is generally made of cast steel.

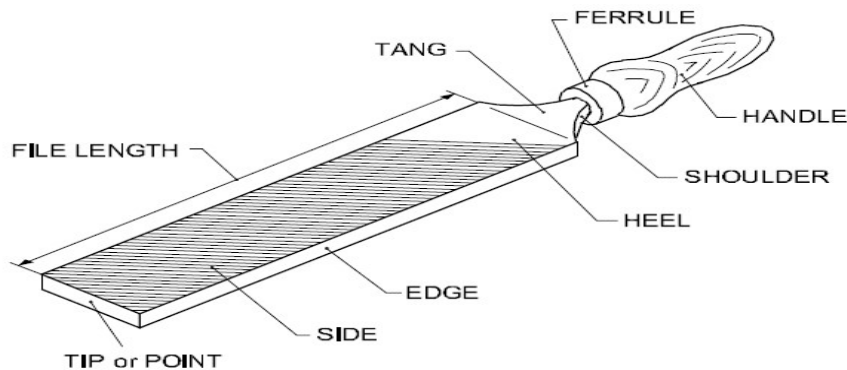
1. **Side Cutting Pliers:** It has two jaws with cutting edges to cut soft wires. It is generally used in workshop.
2. **Flat Nose Pliers:** It consists of tapered wedge jaws with flat gripping surfaces (either smooth or serrated). It is used for bending and folding narrow strips of thin sheet metal.
3. **Round Nose Pliers:** It consists of tapered round shaped jaws which is generally used to shape loops in wires and to form curves in light metal strips. This type of plier is generally used by electricians and radio mechanics.
4. **Slip-Joint Pliers:** These pliers are available in various ranges of jaw openings. It is generally used for gripping purpose.
5. **Slip-Joint, Multi-grip Pliers:** These pliers are similar to the slip-joint pliers but have more opening in legs. These pliers give a range of jaw openings and allow parallel gripping by jaws in a number of positions.
6. **Needle Nose Pliers:** These pliers are used for fitting and remove the circlips in assembly works for this purpose external and internal needle nose pliers are used.



## Classification of Cutting Tools

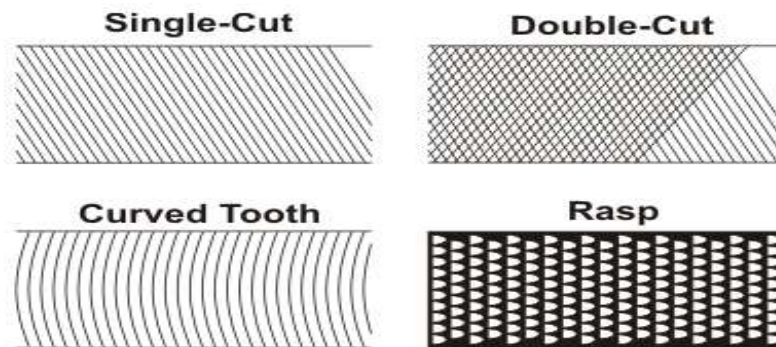
A cutting tool is any tool that is used to remove material from the workpiece by means of shear deformation. Cutting may be accomplished by single-point or multipoint tools. Single-point tools are used in turning, shaping, planing and similar operations, and remove material by means of one cutting edge. Milling and drilling tools are often multipoint tools

1. **File:** A file is a hardened steel tool having parallel rows of cutting edges on its surface. The main parts of a file are tang, heel, face, edge and point.



Files are classified and named according to three main factors : size, type or cut of teeth, and sectional form. The size of a file is indicated by its length, which is the distance from the point of the heel, without the tang. The files for fine work vary from 100 to 200 mm and those for heavier work vary from 200 to 450 mm in length.

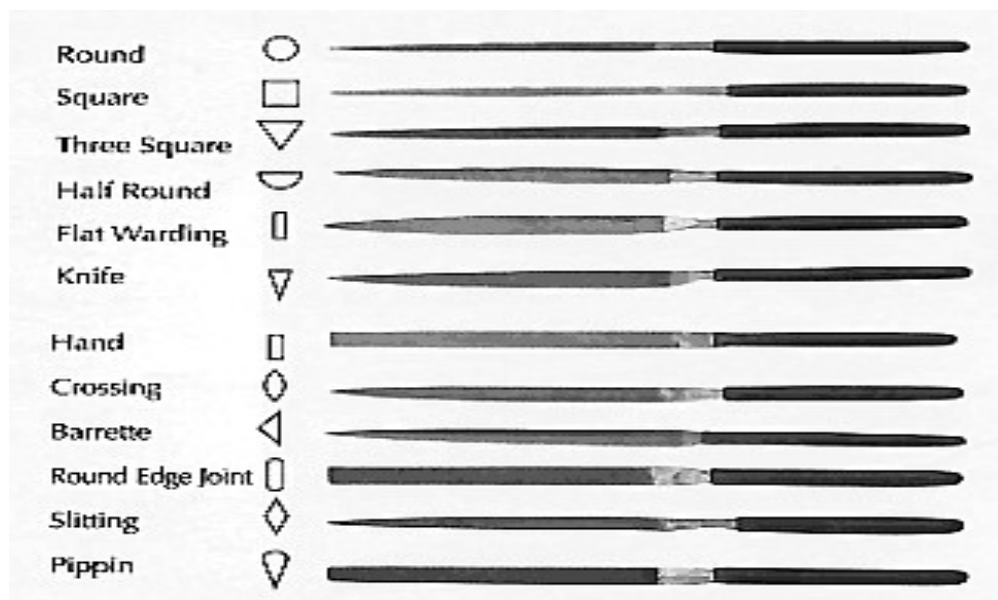
**Types of Cuts:** There are four types of cuts: Single cut, Double cut, Rasp cut and Curved out file. The selection of a file with a particular type of cut is based on the material to be filled. Single cut files are used for filling soft materials.



**File Shapes:** The shape of a file is specified by its cross-section.

1. **Flat file:-** It has rectangular cross-section. The edges along the width are parallel up to two-thirds of the length, and then they taper towards the point. The faces are double cut, and the edges single cut. It is used for general-purpose work.
2. **Square file:-** It has square cross-section and is also parallel for about two-thirds of its length after which it tappers off. It has double-cut teeth on all its faces. It is used for filling corners and slots.

3. **Hand file**:- It is similar to flat file except that it has constant width throughout its length and tapers off only in thickness. Both the faces are double cut, one edge single cut and the other edge uncut. The uncut edge is called safe edge. Because of the safe edge, it is useful for filling surfaces, which are at right angles to surfaces already finished.
4. **Pillar file**:-It is similar to flat file except that it is narrower. It is used for filling keyways, fillets and narrow slots.
5. **Round file**:-It has a circular cross-section and is parallel for about two-thirds of its length. it is used for producing rounded corners, round slots, and for opening out holes.
6. **Half round**:- This file has one half round and other half flat. It is used for jobs involving the formation of a radius.
7. **Triangular (or three square) file**:- It has its edges at an angle of  $60^\circ$  each and is used for corners with angles less than  $90^\circ$ . It is double cut on all faces.
8. **Knife file**:-This is knife shaped and the included angle of its sharp edge is generally  $10^\circ$ . It is used for finishing sharp corners of slots and grooves.
9. **Warding file**:- This is of rectangular section, and is similar to flat file except that it is thinner and parallel along its thickness. It is useful for cutting narrow slots.
10. **Mill saw file**:- This is similar to flat file except that it is parallel along both its width and thickness.
11. **Swiss pattern files** :- These are similar to ordinary files except that they are made to much more exact measurements.
12. **Needle files**:- These belong to swiss pattern file family. They are used by tool makers, die makers and watch makers.

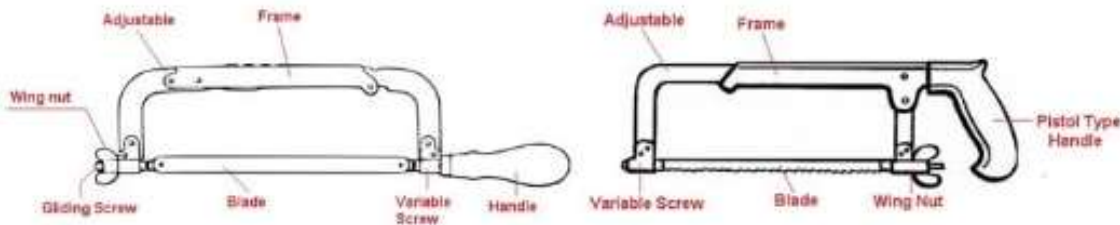


2. **Hacksaw:-** The hacksaw is a hand tool used to cut metal. Its four main parts are: frame, blade, handle and adjusting wing nut. The frames on most hacksaws may be flat or tubular. Some hacksaws have adjustable frames to accommodate various hacksaw blade lengths.

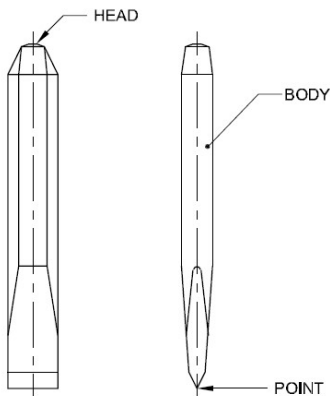
There are two different types of hacksaw handles: straight handle and pistol grip handle. The pistol grip handle has the advantages:

\*The operator can give the required sawing effort in a direct line with the blade.

\*There is less risk of twisting the blade when sawing.

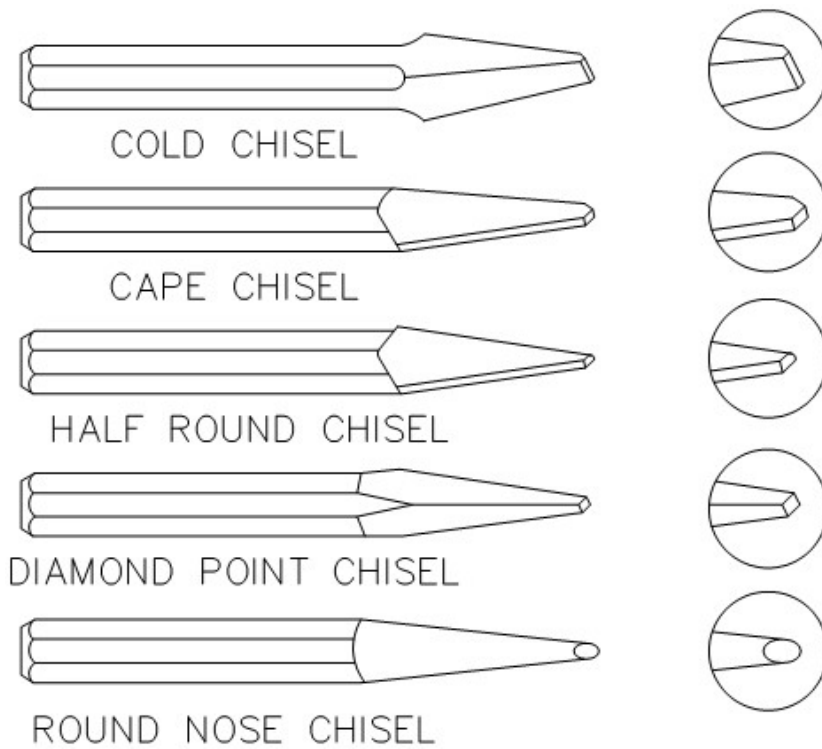


3. **Chisel:-** A chisel is a hand tool made of hexagonal or octagonal bars of tool steel. One end is shaped for the purpose of cutting and the other end to receive the impact of hammer blows. One-third of the chisel length from the cutting edge side is heat-treated. This ensures hardness of the cutting edge, while the remaining portion remains relatively soft. The length of a chisel ranges from 150 to 200 mm.



### Types of chisels:-

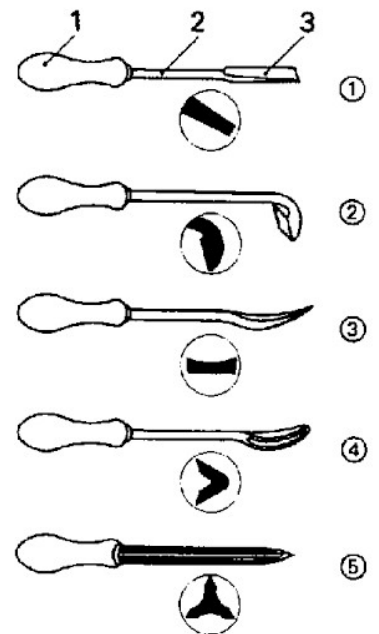
- (i) **Flat chisel:-** This is a general-purpose chisel. The cutting edge angle is ground depending upon the material to be chiseled. It is 120-150 mm long.
- (ii) **Crosscut chisel:-** This is mainly used for cutting keyways, grooves, and slots. It is also known as cape chisel. The width of the cutting edge is 5-9 mm. It can be used in places where the wider flat chisel cannot be used.
- (iii) **Half round chisel:-** This is used for making grooves in bearings, making fillet radii or for roughing out small concave radii.
- (iv) **Diamond chisel:-** This is used for chipping sharp corners for making V-shaped grooves.
- (v) **Round nose chisel :-** It has its cutting edge given a slight curvature to make the cutting more effective.
- (vi) **Web chisel:** It is also called as punching chisel which is used for separating metals after chain drilling.



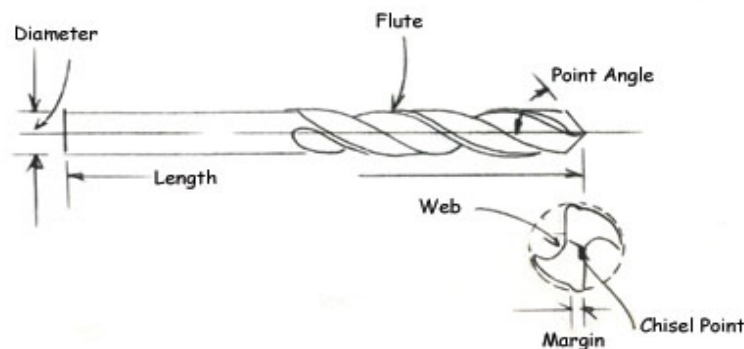
4. **Scraper:-** Scraping is a method of removing the high spots from a surface to allow parts to fit together accurately so as to reduce wear, or to provide a flat surface for measuring purposes, such as for a surface plate. It may also be used to decorate the metal.

Various types of scrapers are:-

- (i) **Flat scraper**, used for scraping of flat surfaces.
- (ii) **Half round scraper**, used for scraping of curved surfaces such as bearings.
- (iii) **Three square scraper**, used for similar purposes as the half round scraper but usually on smaller curves.
- (iv) **Bullnose scraper**, used for scraping of large curved surfaces such as large bearings.



5. **Drilling:-**Drilling is a cutting operation and produces round holes in metallic or non-metallic materials. The holes are cut through by means of a cutting tool called a drill on a drilling machine. The parts of a drill are: point, shank, tang, body, flutes, land/margin, body clearance, web.

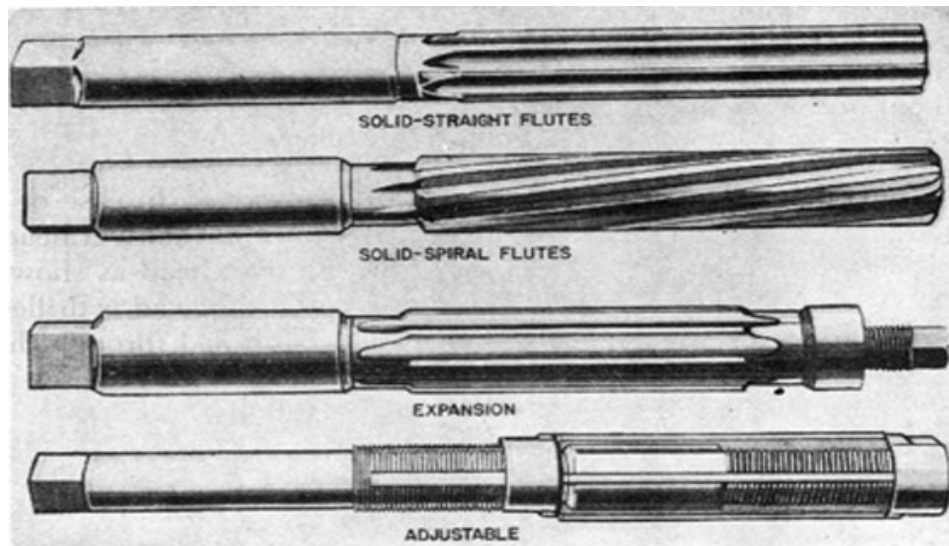




The different types of drills used are:-

- (i) **Flat drill** is the simplest form of drill, which carries a flat section at the cutting edge. It is commonly used in brass work and for drilling stepped holes.
- (ii) **Twist drill** is the one most commonly used. It consists of a cylindrical body carrying spiral flutes cut on it. It is made of high-speed steel or high carbon steel. It has taper shank or parallel shank. Small drills upto 12.5 mm dia. are provided with parallel shank and larger sizes with tapered shank. Morse taper sleeve or socket is used for holding tapered shank drills.
- (iii) **Centre drill** is a straight shank, two fluted twist drill used when centre holes are to be drilled on ends of a shaft.
- (iv) **Oil tube drill** is used for deep-hole drilling. It has an oil tube running lengthwise spirally through the body to carry oil directly to the cutting edge.
- (v) **Taper shank core drill** has 3 or 4 flutes. It is used for enlarging cored, punched or drilled holes.

6. **Reamer:-** A reamer is a multi-point cutting tool used for enlarging by finishing previously drilled holes to accurate sizes. Speed, feed, and reaming allowance are three factors that can affect the accuracy of a reamed hole. Approximately 0.4 mm is left for reaming holes upto 12.5 mm in diameter; 0.8 mm is recommended for holes over 12.5 mm diameter. The speed for reaming is generally about one-half of the drilling speed.



The reamers are made of carbon tool steel or high-speed steel. There are also carbon tipped reamers, with carbide tips brazed at the cutting edges. There are two types of reamers: hand reamers and machine reamers. Hand reamers have a square on one end and are used to remove no more than 0.13 mm from a hole. Machine reamers have a straight or tapered end and are used under power.