FITTING WORKSHOP

(by Sankalp Gaur)

1.1 Introduction

- Working on components with hand tools and instruments, mostly on work benches is generally referred to as '**Fitting work**'.

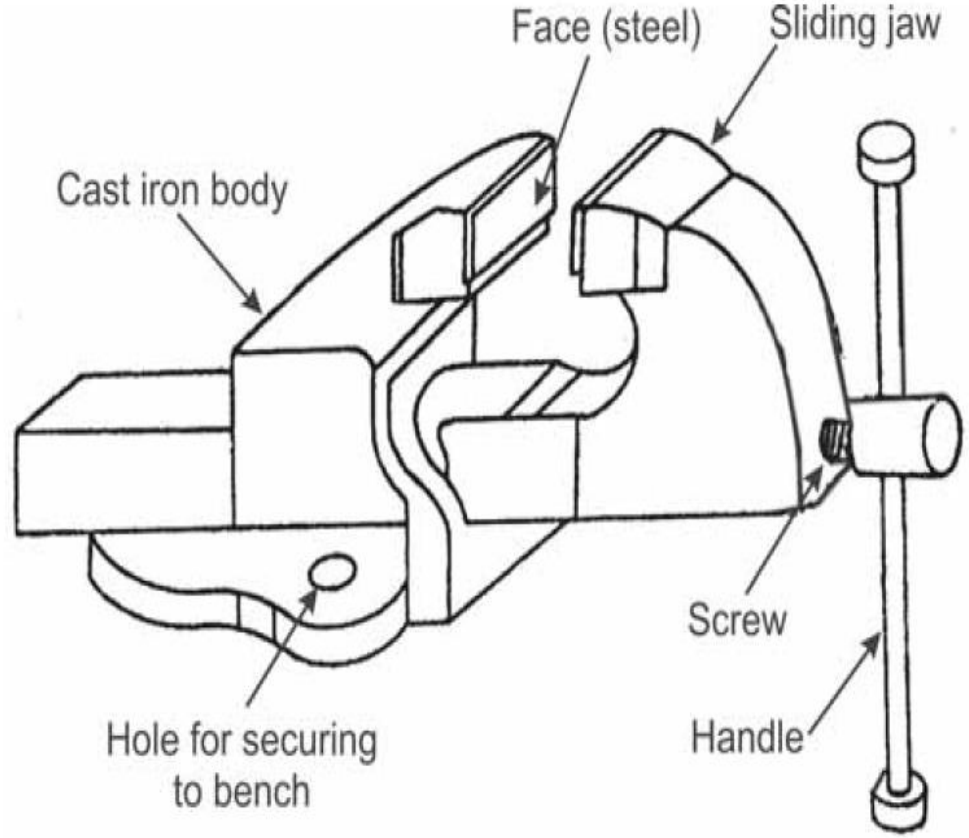
- The hand operations in fitting shop include marking, filing, sawing, scraping, drilling, tapping, grinding, etc.,using hand tools or power operated portable tools.

- Measuring and inspection of components and maintenance of equipment is also considered as important work of fitting shop technicians.

1.2 Work Holding Tools

1.2.1 Bench Vice

- **The bench vice is a device commonly used for holding the work pieces.**
- **The body of the vice is made of cast iron.**
- **When the vice handle is turned in a clockwise direction the moving jaw forces the work against the fixed jaw.**
- **The greater the pressure applied to the handle the tighter is the work held.**



Bench Vice

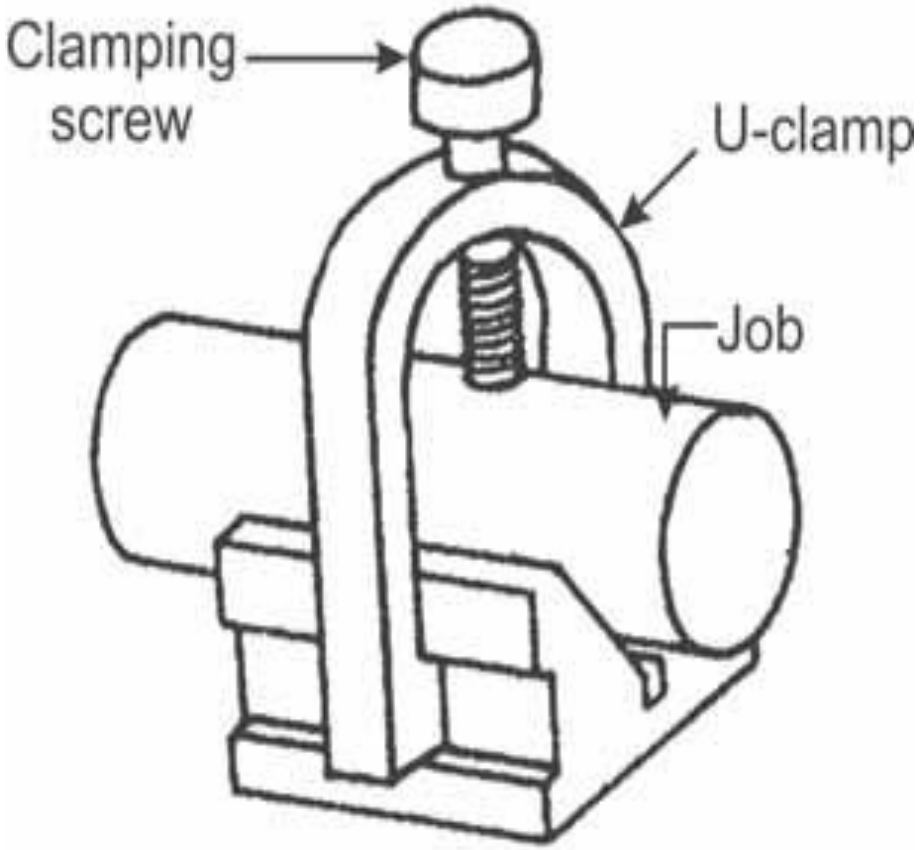
1.2.2 V-block with clamp

- **The V-block is a rectangular or square block with a V-groove on one or both sides, opposite to each other.**

- **The angle of the V is usually 90..**

- **V-block with a clamp is used to hold cylindrical work securely, during marking of measurements or for measuring operations.**

- ***Material:*** **C.I or hardened steel.**

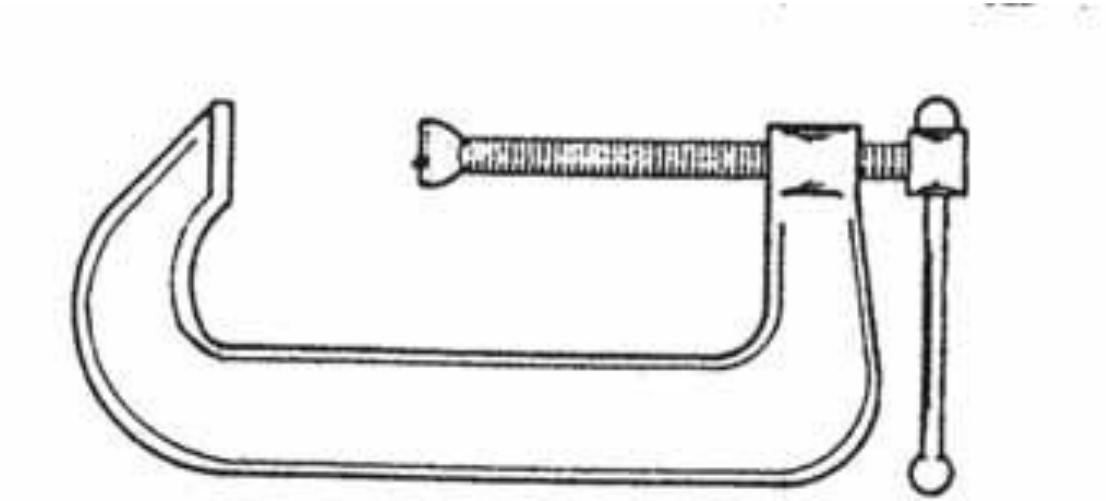


V-Block

1.2.3 C-Clamp

- This is used to hold work against an angle plate or V-block or any other surface, when gripping is required.

- It is also known as G-clamp.

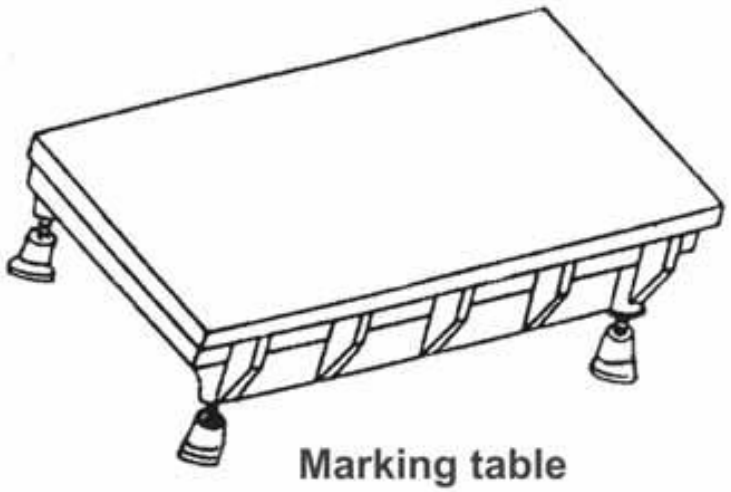


C.clamp

1.3 Marking Tools

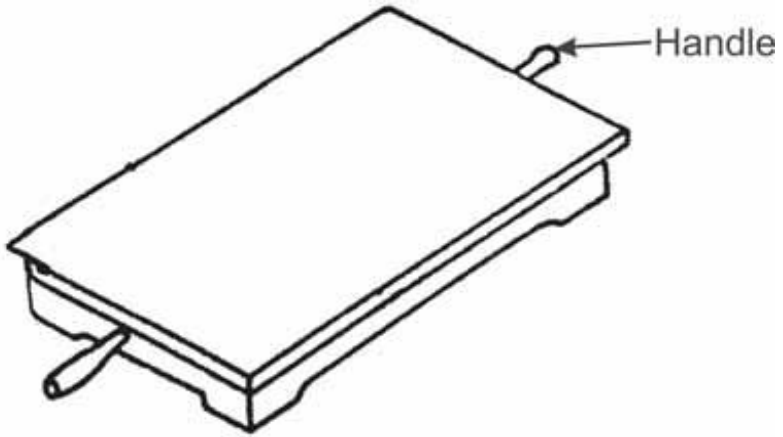
1.3.1 Marking table

- A marking table is a heavily build cast iron table used for layout work on all sizes of jobs.
- This table provides a flat surface to mark lines with the help of height gauge, angle plate, V-block or surface gauge as per job requirements.


Marking table

❑Surface plate

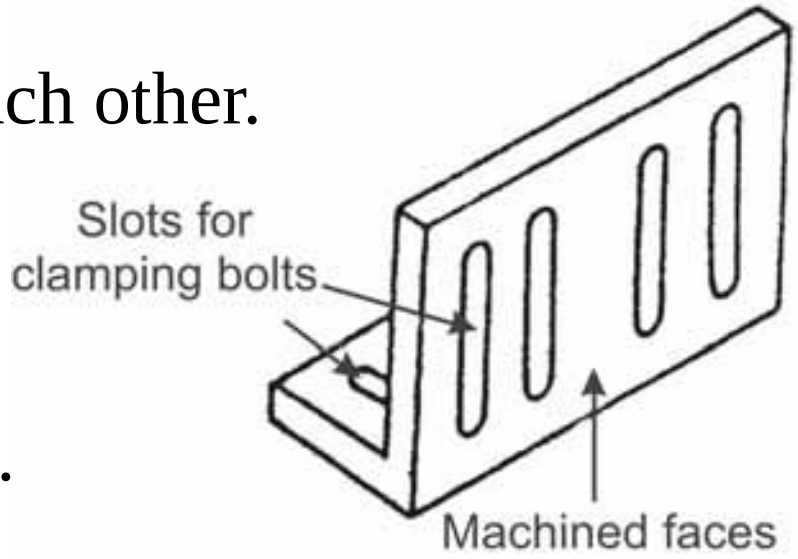
- The surface plate is used for testing the flatness of the work piece and other inspection purposes.
- It is also used for marking on small works.
- It is more precise in flatness than the marking table



Surface plate

1.3.3 Angle Plate

- The angle plate is made of cast iron.
- It has two surfaces machined at right angles to each other.
- Plates and components which are to be marked out may be held against the upright face of angle plate to facilitate the marking or inspection.



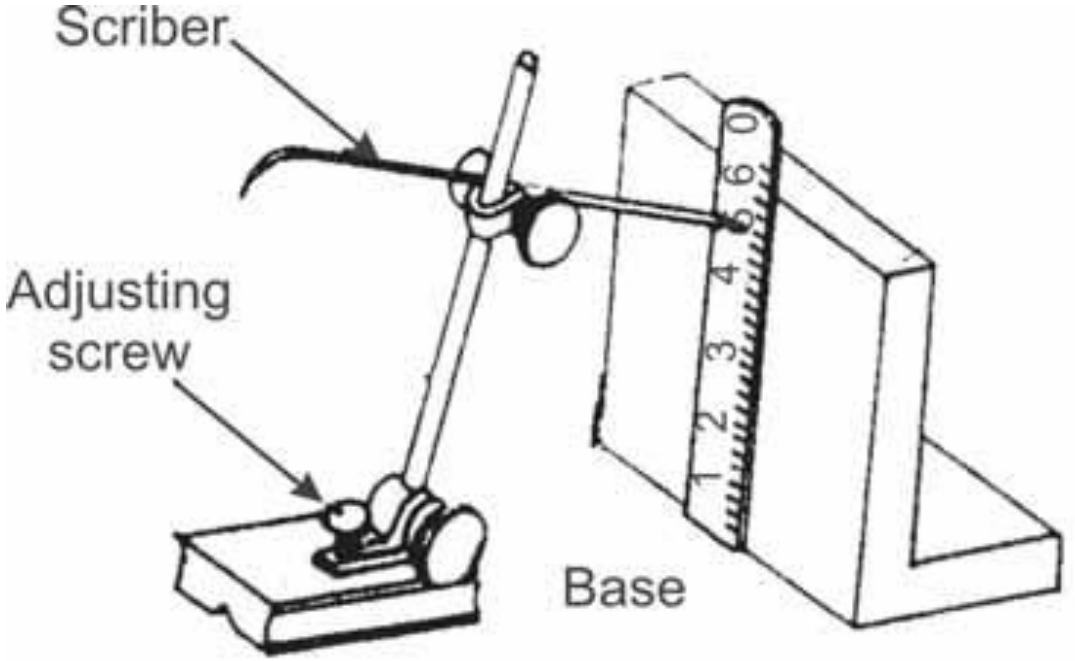
Angle plate

1.3.4 Scriber

A Scriber is a slender steel rod, used to scribe or mark lines on metal work pieces.

1.3.5 Universal Scribing Block

This is used for scribing lines for layout work and checking parallel surfaces.



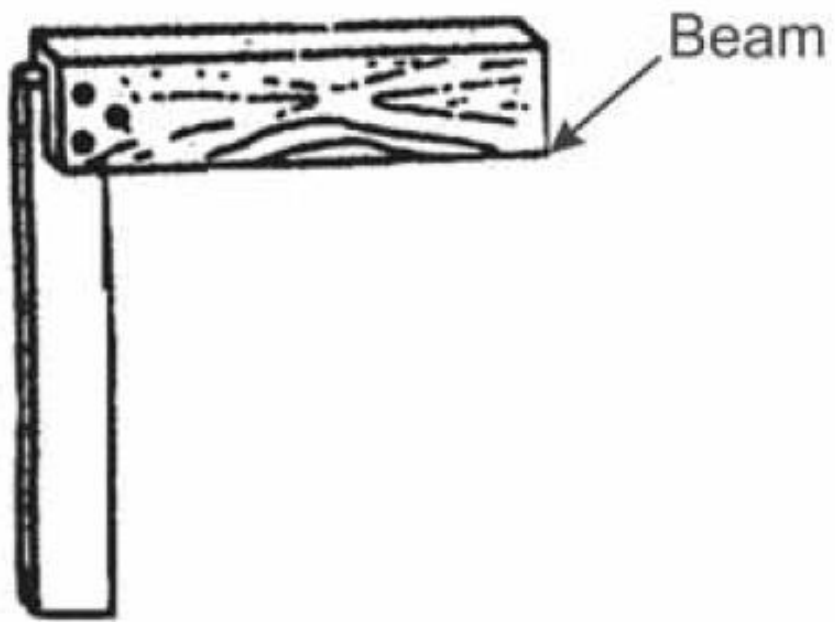
Universal scribing block

1.3.6 Try-square

- Try-square is used for checking the squareness of small works, when extreme accuracy as not required.

- The size of the try-square is specified by the length of the blade.

  Ex: l0 cm, 30 cm etc.

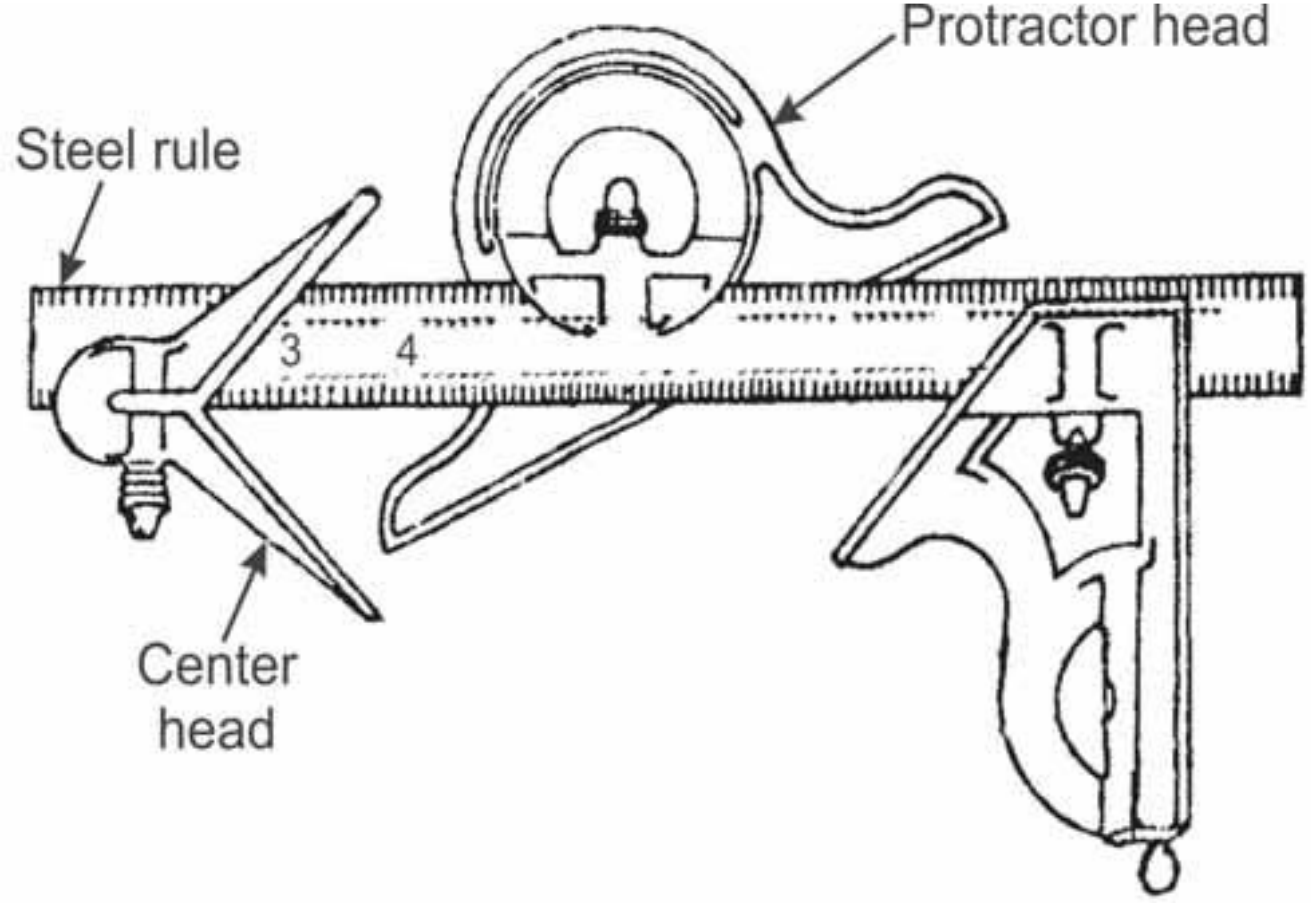


1.3.7 Combination Set

- A combination set consists of a rule, square head, centre head and a protractor.

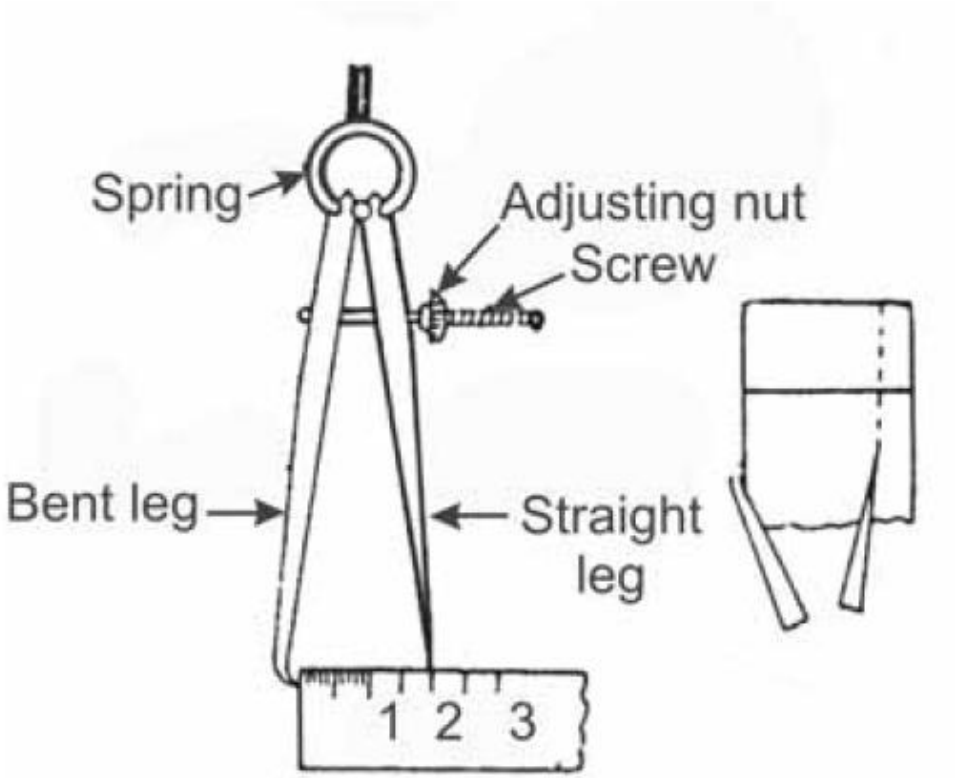
- This may be used as a rule, a square, a depth gauge, for marking mitres (45 degrees), for measuring and marking angles.

- The rule is made of tempered steel with grooves.



1.3.8 Odd-leg caliper

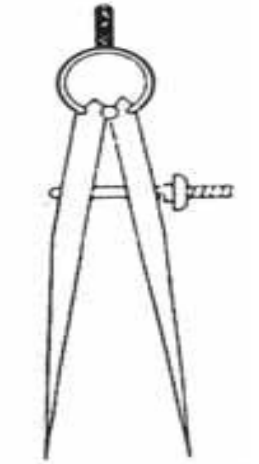
- This is also called ‘jenny caliper’ or ‘hermaphrodite’.
- This is used for marking parallel lines from a finished edge and also for locating the center of round bars.



Odd-leg caliper

1.3.9 Divider

- This is used for marking circles, arcs, laying out perpendicular lines, bisecting lines, etc. Size ranges from 100 mm to 300 mm.

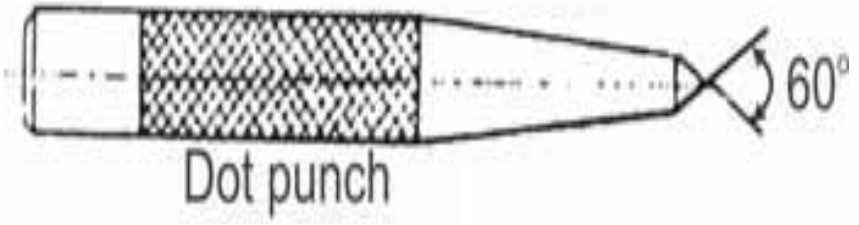


Divider

1.3.10 Dot Punches

- This is used to locate centre of holes and to provide a small centre mark for divider point etc.

- For this purpose, the punch is ground to a conical point having 60° included angle.



Dot punch

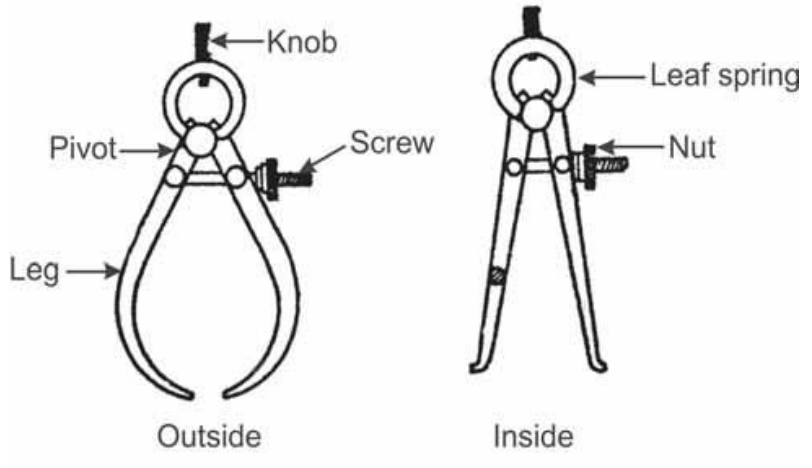
1.4 MEASURING TOOLS

1.4.1 Calipers

These are used with the help of steel rule to check outside and inside measurements.

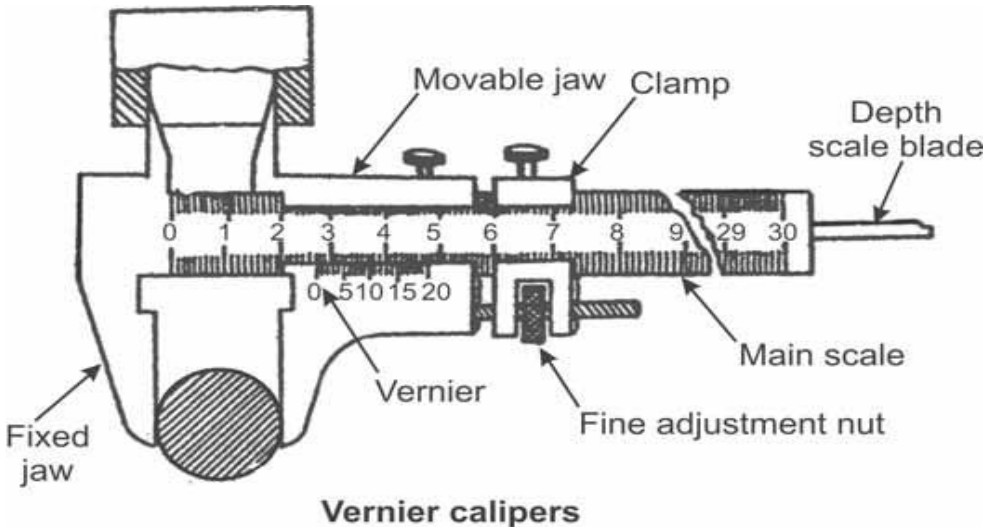
They are specified by the maximum length measured.

Sizes vary from 100 mm to 300 mm.



1.4.2 Vernier Calipers

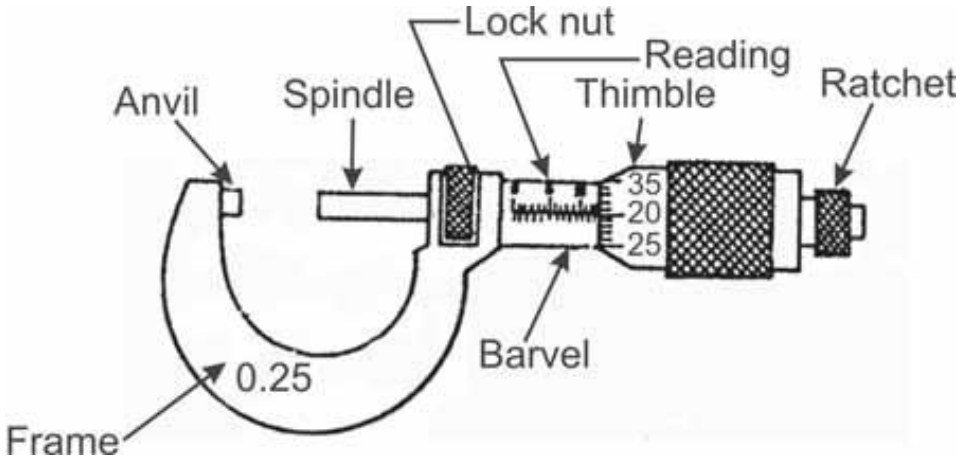
These are used for measuring outside as well as inside dimensions accurately. It may also be used as a depth gauge.

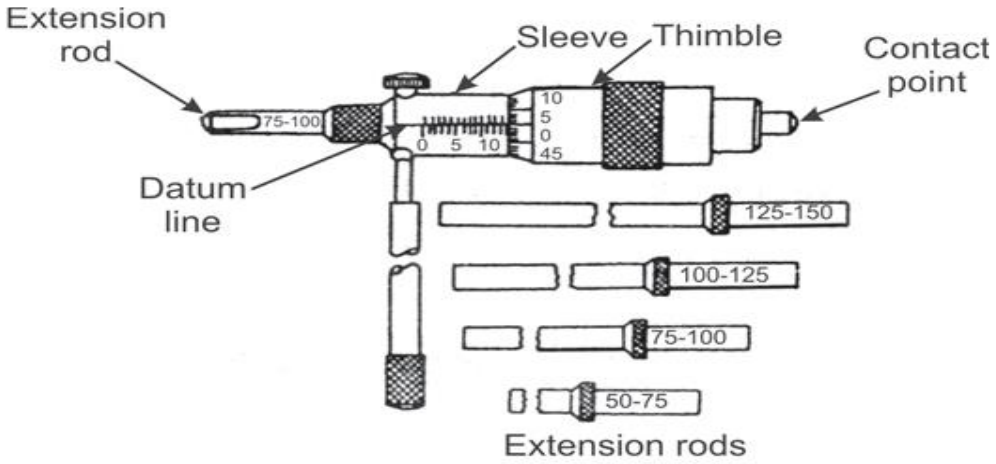


Vernier calipers

1.4.3 Micrometers

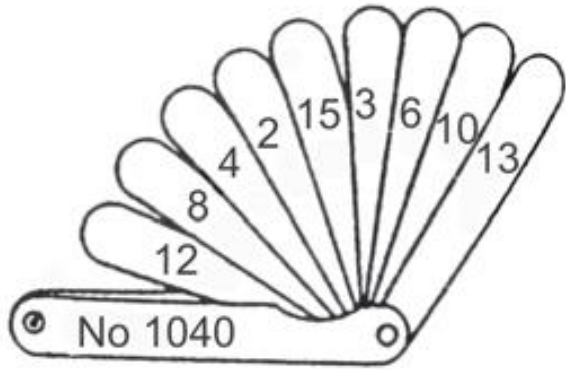
This is used for measuring external / internal dimensions accurately.





1.4.4 Feeler Gauges

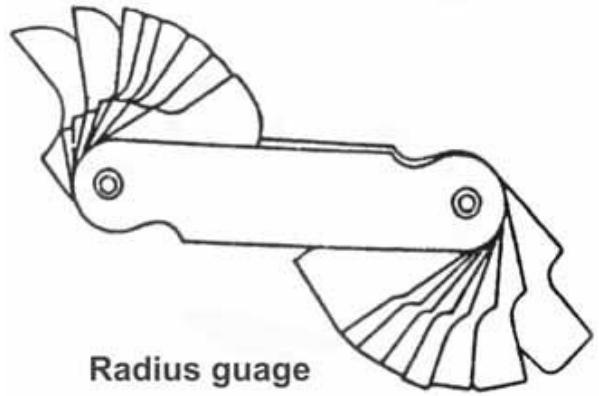
The thickness gauges or feeler gauges are a set of gauges consisting of thin strips of metal of varying thickness.
They are widely used for measuring and checking bearing-clearance, adjusting tappets, spark plug gaps, and so on



Feeler guage

1.4.5 Radius Gauges

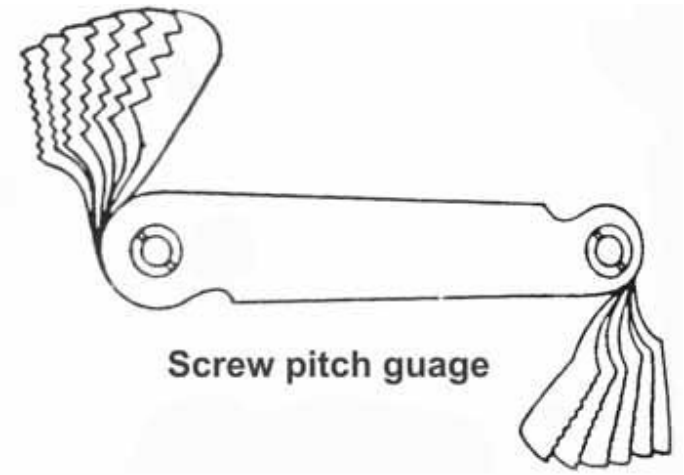
Also known as fillet gauges, these are of thin flat steel tool used for inspecting and checking, or laying out work having a given radius. Such a gauge is made in sets of individual gauges for measuring concave (internal) or convex (external) radius.



Radius guage

1.4.6 Screw Pitch Gauges

A screw pitch gauge is used for quickly determining the pitch of a threaded part or tapped hole.
The gauge consists of a set of templates of teeth, each confirming to a standard pitch.



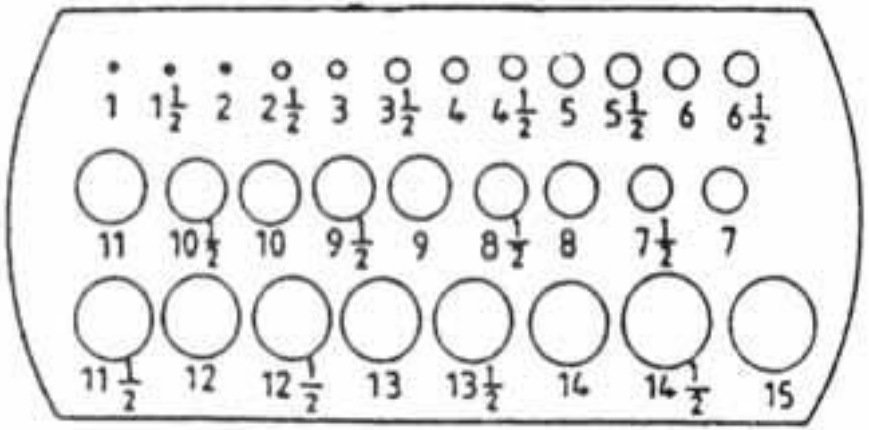
Screw pitch guage

1.4.7 Drill Gauges

Thin sheets with holes drilled accurately to the size marked are used as drill gauges for easy selection and checking of drill size.

This is very much useful when the drill size marked on the drill wears out over repeated usage.

These guages are also available as stands for letter drills and number drills which are very small in size.

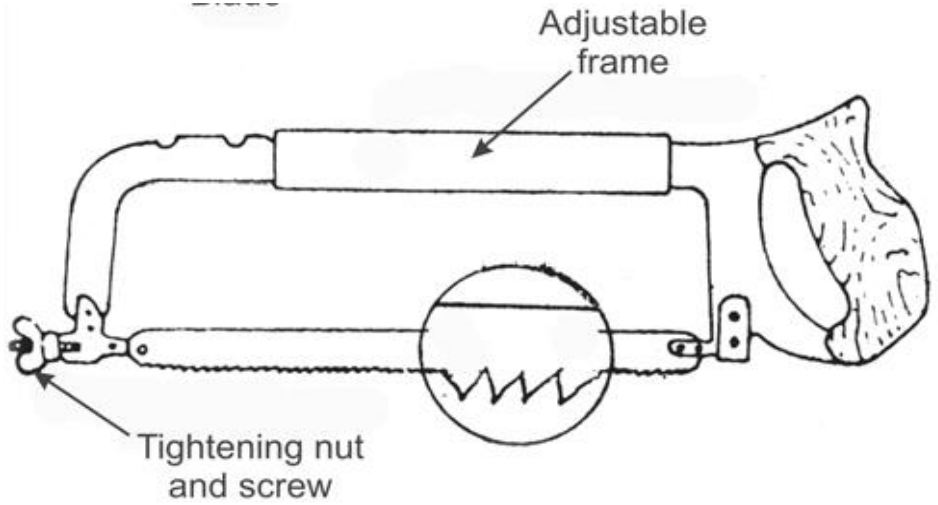


Drill guage

1.5 Cutting Tools

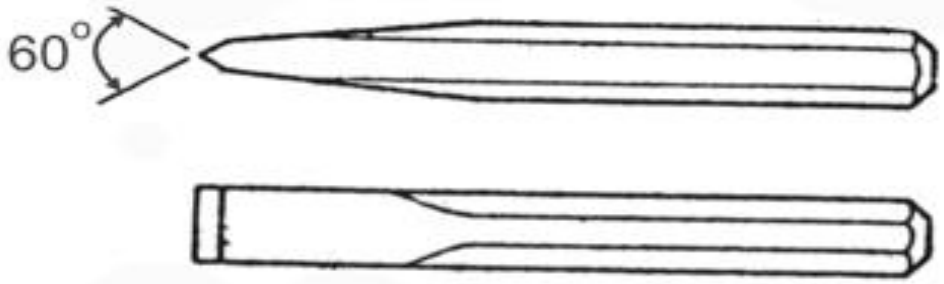
1.5.1 Hacksaw

The hacksaw is used for cutting metal by hand.
It consists of a frame which holds a thin blade, firmly in position.
The blade has a number of cutting teeth.



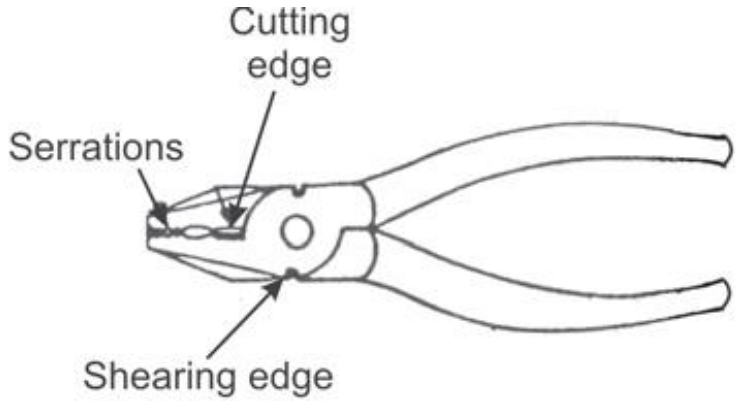
1.5.2 Chisels

Chisels are used for removing surplus metal or for cutting thin sheets. These tools are made from 0.9% to 1.0% carbon steel of octagonal or hexagonal section. Chisels are annealed, hardened and tempered to produce a tough shank and a hard cutting edge. Annealing relieves the internal stresses in the metal.



1.5.3 Combination Cutting Plier

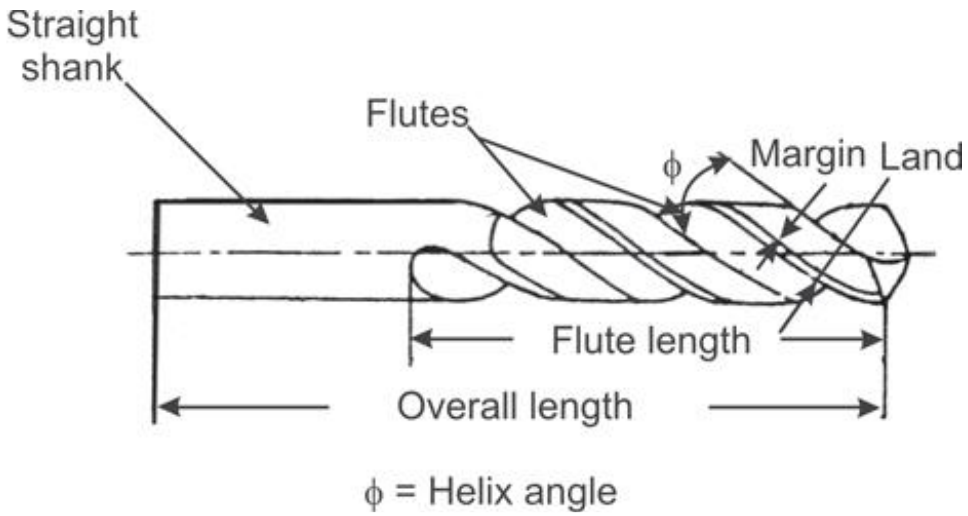
This is made of tool steel and is used for cutting as well as for gripping the work. The handles of the pliers used by electricians are insulated with PVC covering to protect from electric shocks.



Combination cutting edge

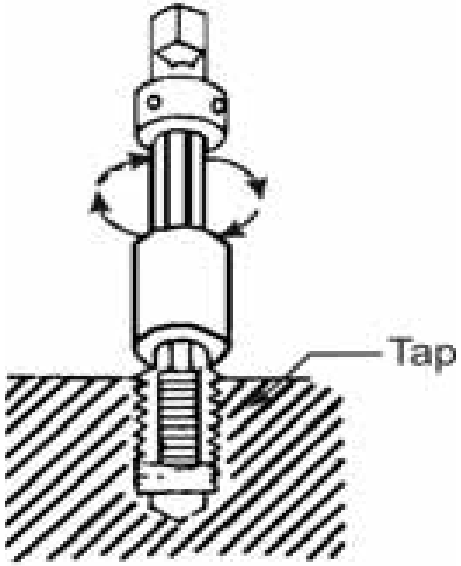
1.5.4 Twist drill

Twist drills are used for making holes. These are made of high speed steel. Both straight and taper shank twist drills are used with machines



1.5.5 Extractors

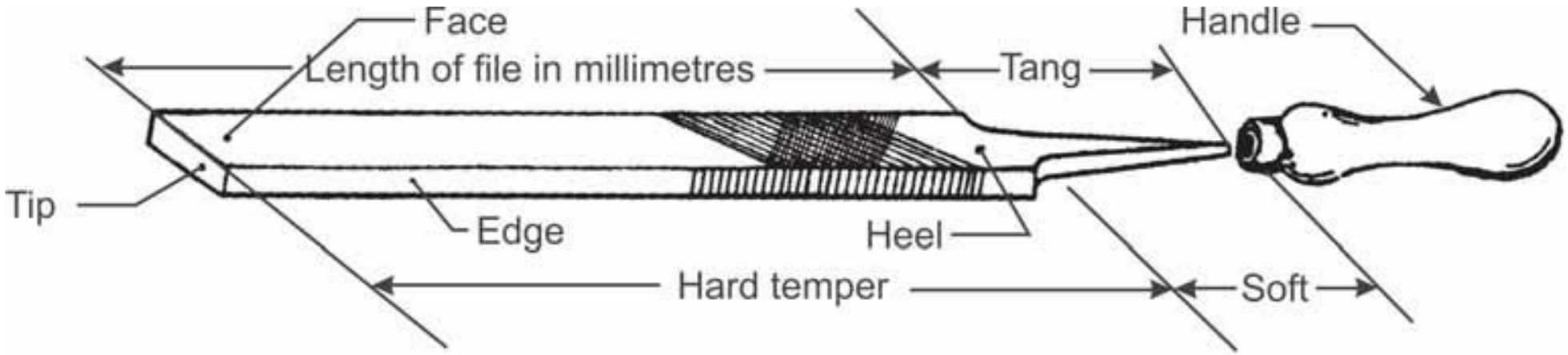
This tool is used to extract parts of taps that are broken, in a hole.
An extractor has prongs that fit into the flutes of a tap.
The extractor is turned counter clockwise with a tap wrench to remove a broken righthand tap.



1.6 Finishing Tools

1.6.1 Files

Filing is one of the methods of removing small amounts of material from the surface of a metal part. A file is a hardened steel tool, having slant parallel rows of cutting edges or teeth on its surfaces. On the faces the teeth are usually diagonal to the edge. One end of the file is shaped to fit into a wooden handle.

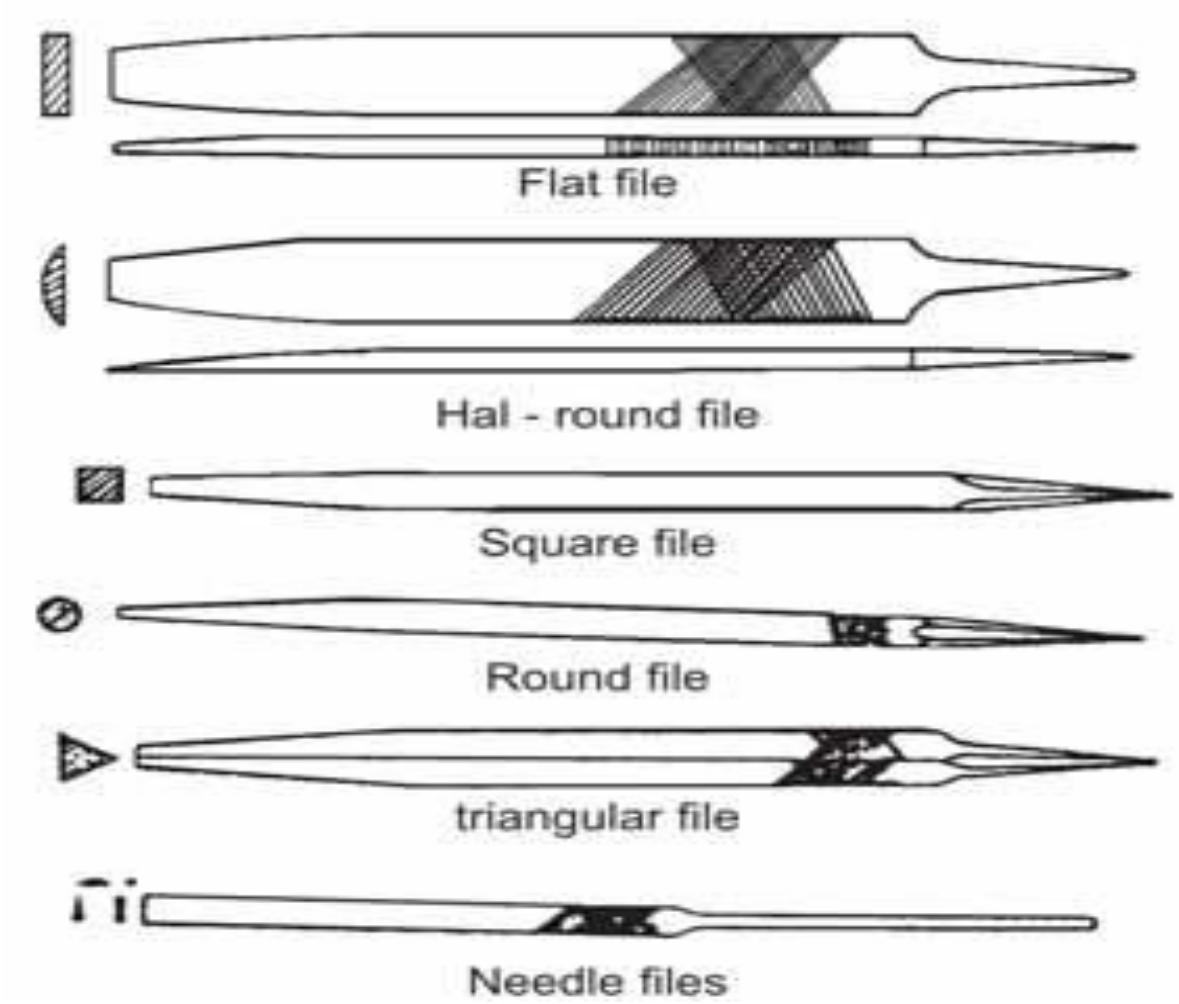


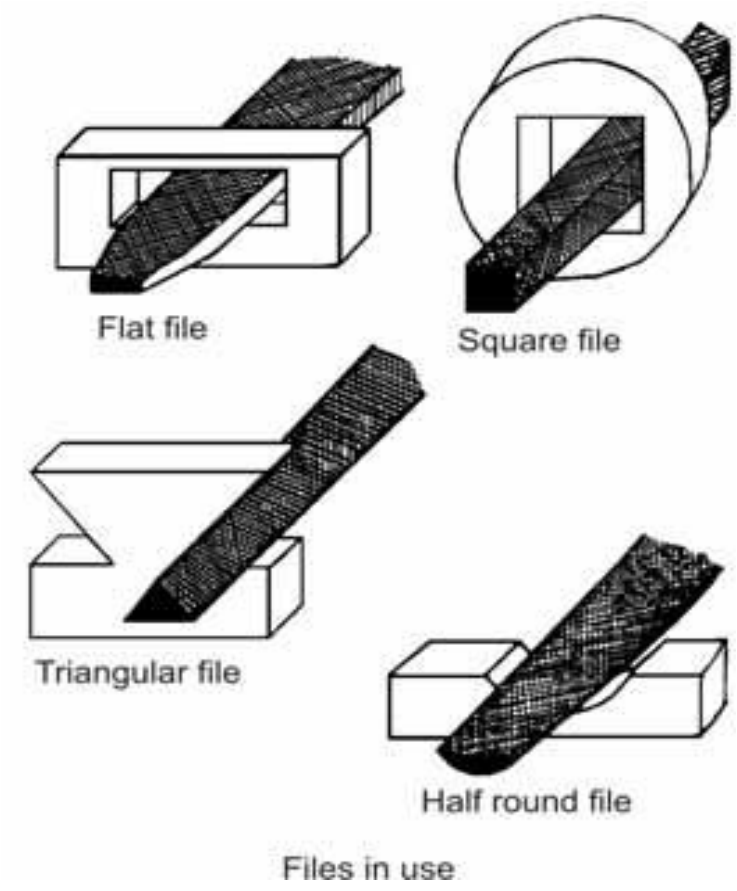
1.6.2 Types of files

Files are classified according to their shape, cutting teeth and pitch or grade of the teeth,

Type of file Description and Use

1. Hand file : Rectangular in section and tapered in thickness but parallel in width. The faces carry double cut teeth and one of the edges single cut. The other edge, known as safe edge, does not have any teeth and hence this file is also known as safe edge file. It is useful in filing a surface which is at right angles to an already finished surface.





2. Flat file: It is rectangular in section and tapered for 1/3 length in width and thickness towards the tip. The faces carry double cut teeth and the edges carry single cut teeth. It is a general purpose file.

3. Square file : It is square in section and carry double cut teeth on all the four faces. It is tapered for 1/3 of its length towards the point. Square files are used for filing corners and slots. It is also used to cut keyways.

4. Three square file : It is of equilateral triangular in section and tapers towards the tip. The faces are double cut and the edges sharp. These files are used to file angular hole, and recesses. Used for sharpening wood saws.

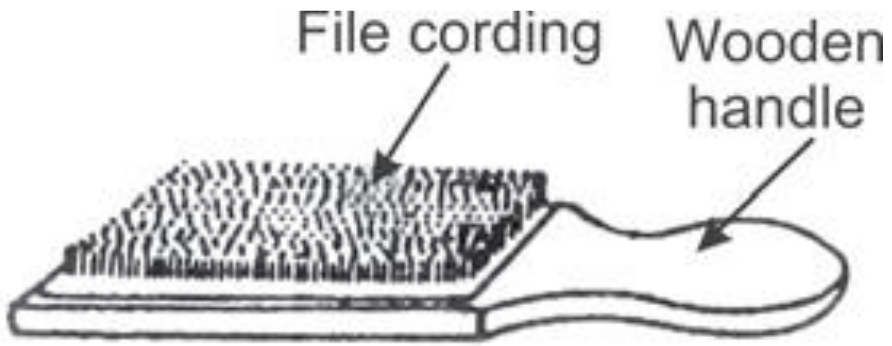
5. Round file : It is tapered for 1/3 length with double cut on large coarse grades. Used for filing out round, elliptical and curved openings.

6. Half round file : The half round file has one flat and one curved side. The flat side is double cut and the curved side is single cut. It is not a semicircle but only about 1/3 of circle.

7. Swiss or Needle files: 150 mm long with double cut teeth. Used for filing corners, grooves, narrow slots, etc.

1.6.3 File Card

It is a metal brush used for cleaning the files, to free them from filings, clogged in between the teeth



THE END!