INTRODUCTION TO FITTING SHOP

FITTING SHOP

Fitting is the process of assembling various parts manufactured in the machine shop

Tools used in Fitting shop

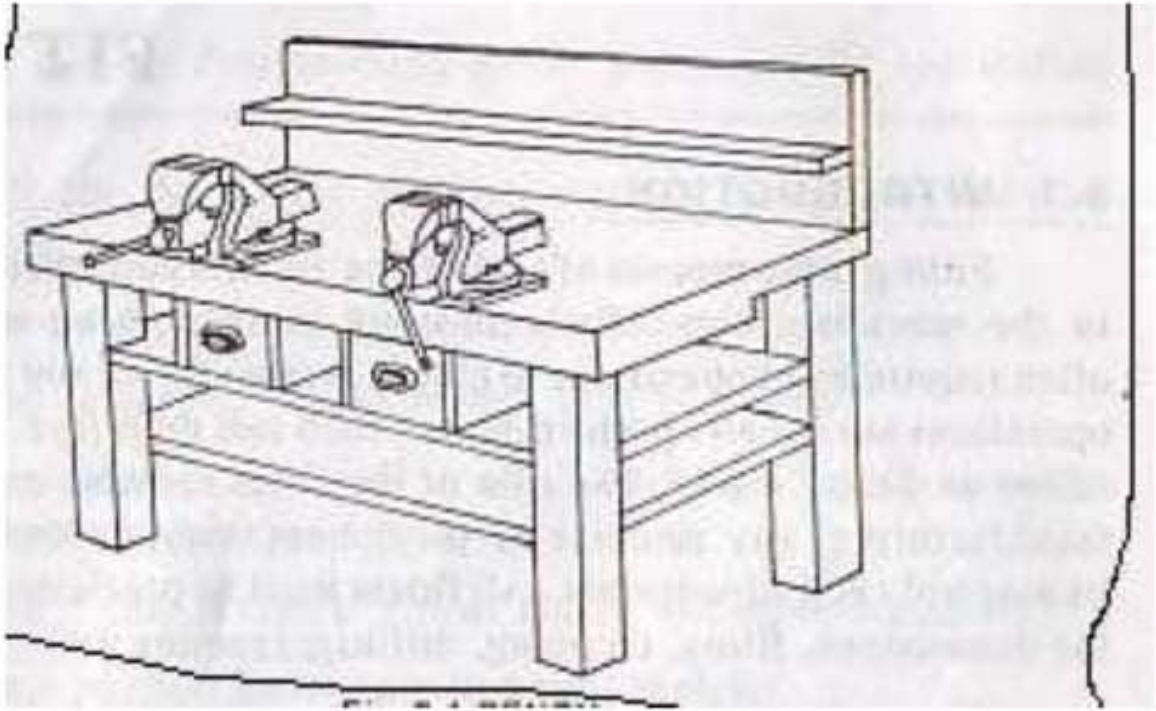
1.Holding tools

2. Cutting tools

3. Striking tools

4. Marking and measuring tools

Work bench



BENCH VICE

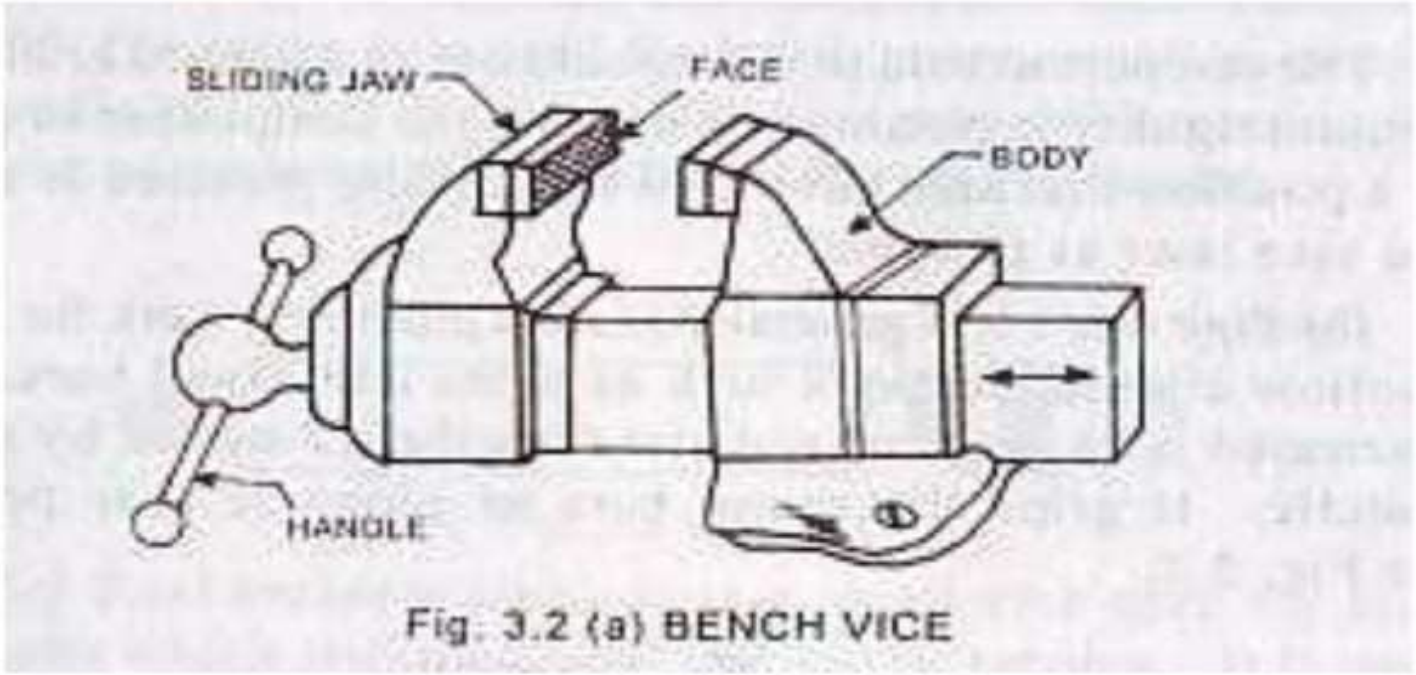
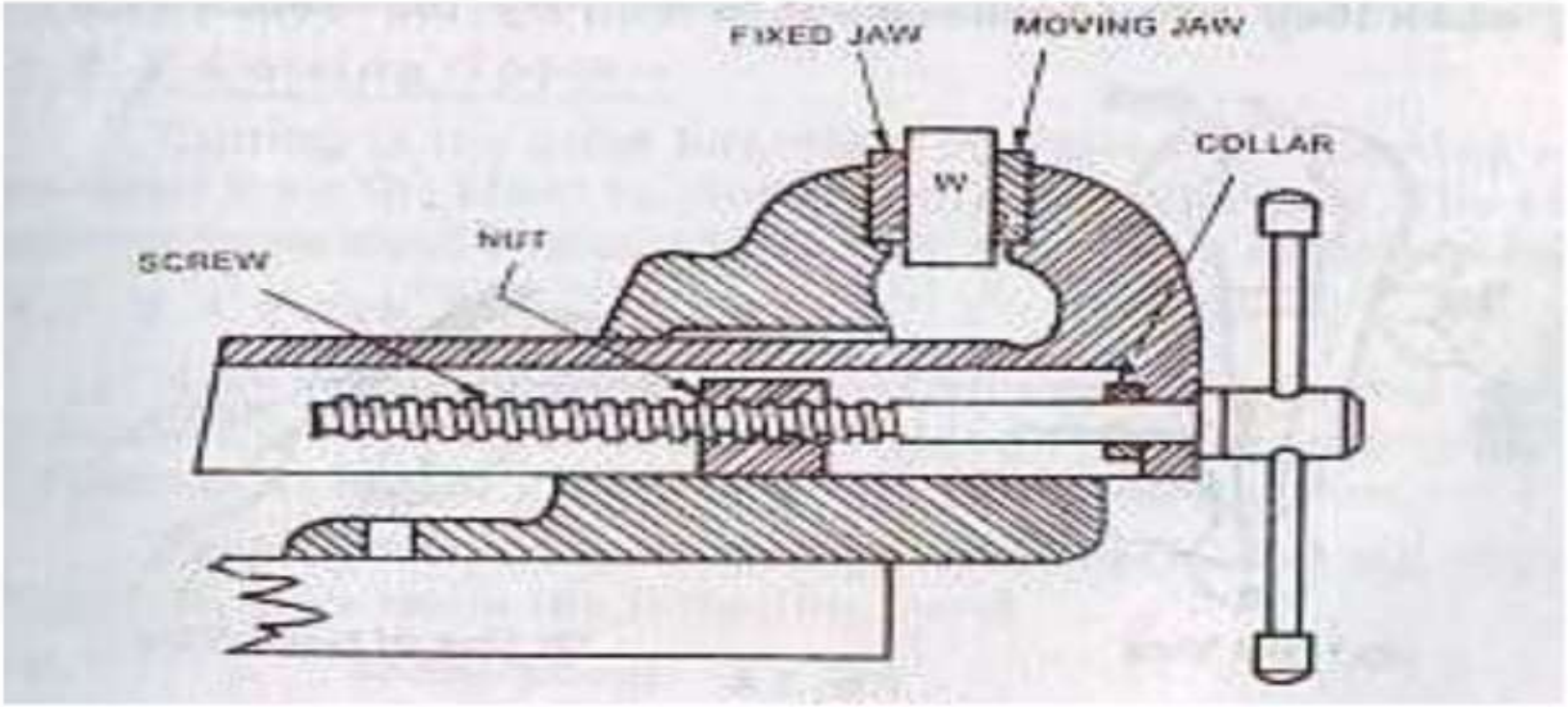


Fig. 3.2 (a) BENCH VICE

CROSS SECTION OF BENCH VICE



PIPE VICE

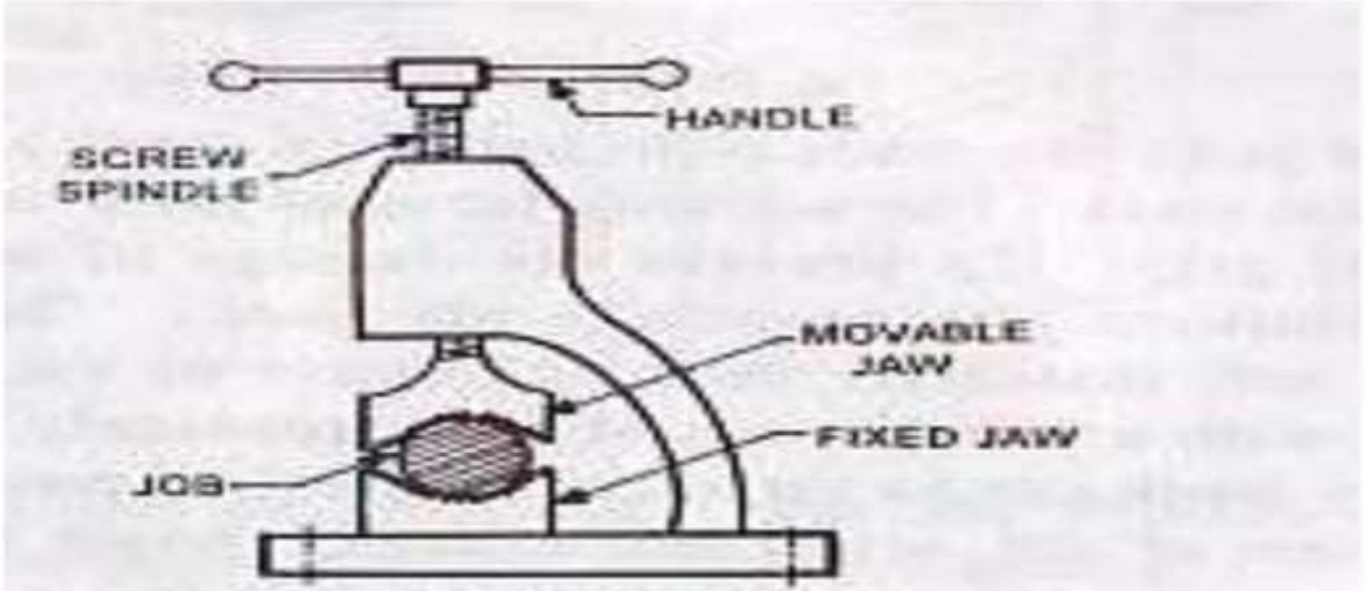


Fig. 3.3. PIPE VICE

HAND VICE

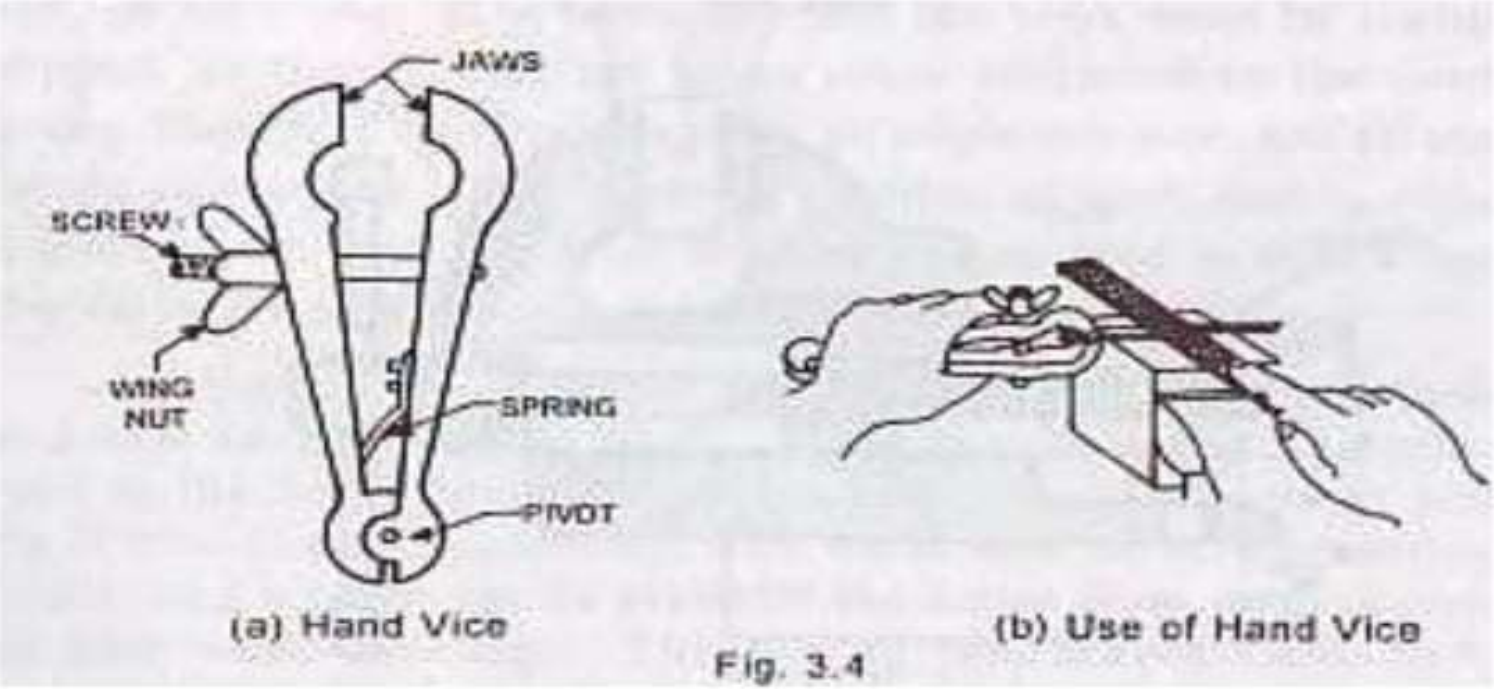


Fig. 3.4

PIN VICE

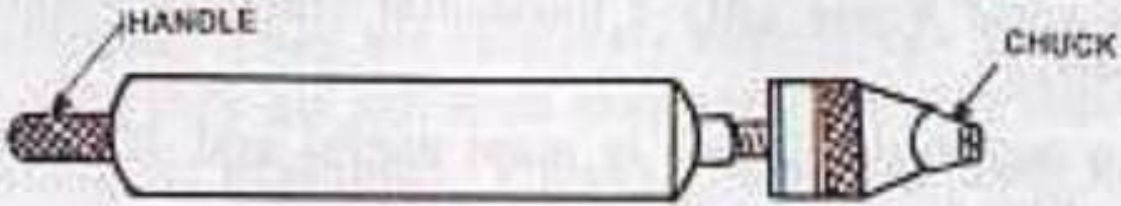


Fig. 3.5 PIN VICE

TOOL MAKERS VICE

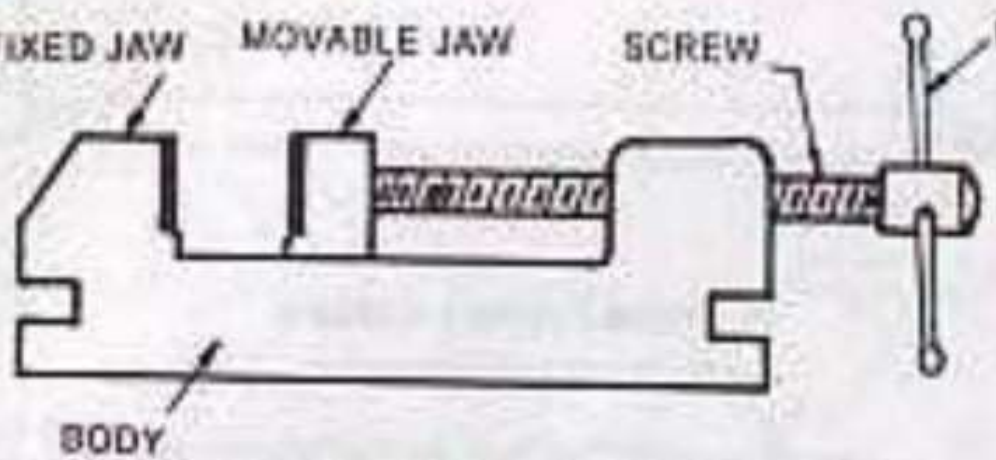


Fig. 3.6 TOOL MAKER'S VICE

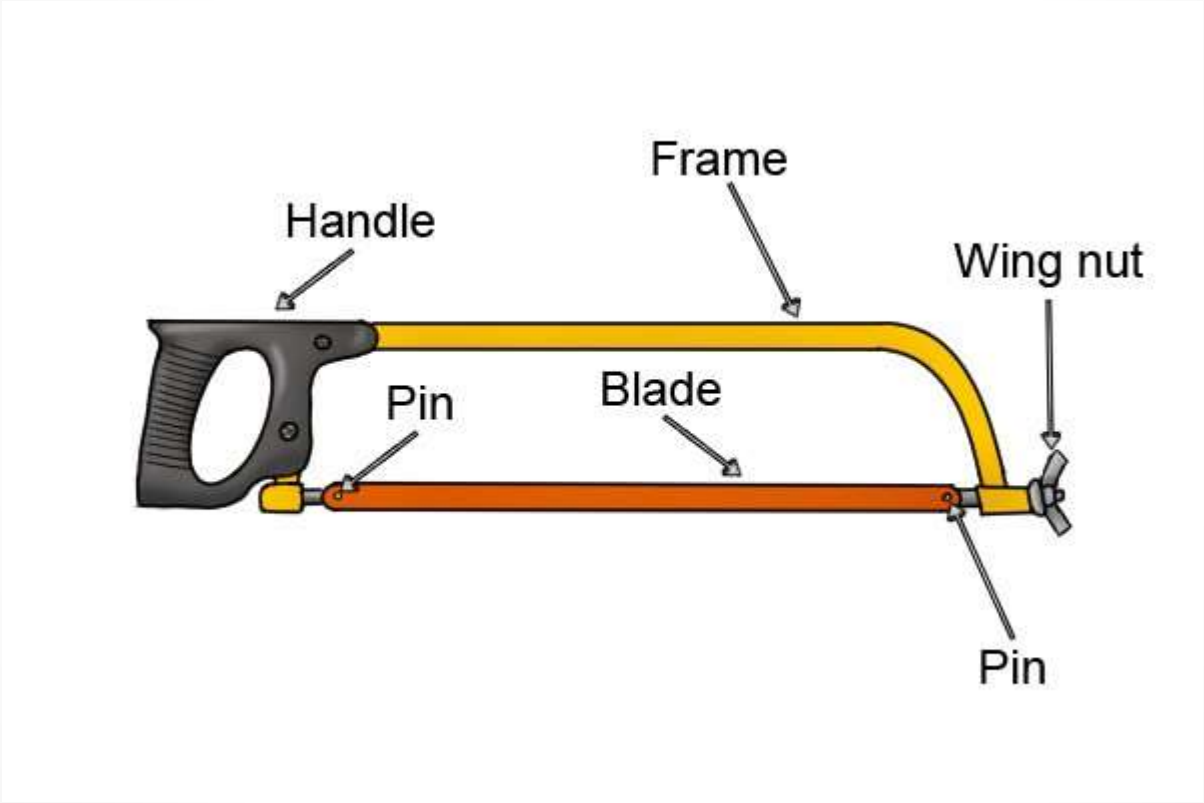
CUTTING TOOLS

Hack Saw

The Hack Saw is used for cutting metal by hand. It consists of a frame, which holds a thin blade, firmly in position. Hacksaw blade is specified by the number of teeth for centimeter. Hacksaw blades have a number of teeth ranging from 5 to 15 per centimeter (cm). Blades having lesser number of teeth per cm are used for cutting soft materials like aluminium, brass and bronze. Blades having larger number of teeth per centimeter are used for cutting hard materials like steel and cast Iron. Hacksaw blades are classified as (i) All hard and (ii) flexible type.

The all hard blades are made of H.S.S, hardened and tempered throughout to retain their cutting edges longer. These are used to cut hard metals. These blades are hard and brittle and can break easily by twisting and forcing them into the work while sawing. Flexible blades are made of H.S.S or low alloy steel but only the teeth are hardened and the rest of the blade is soft and flexible. These are suitable for use by un-skilled or semi-skilled persons.

The teeth of the hacksaw blade are staggered, as shown in figure and known as a ‘set of teeth’. These make slots wider than the blade thickness, preventing the blade from jamming


Frame
Handle
Wing nut
Pin
Blade
Pin

Types of Hacksaw Blades

Following are the main **types of hacksaw blades**:

- Course Grade Hacksaw Blade
- Medium Grade Hacksaw Blade
- Fine Grade Hacksaw Blade
- Superfine Grade Hacksaw Blade
- Ail Hard Blade

Course Grade Hacksaw Blade

Hacksaw blade of this grade is used for cutting thickness of mild steel, copper, aluminium and brass etc. It contains 14 to 18 teeth per inch.

Medium Grade Hacksaw Blade

Hacksaw blade of this type is used for cutting all kinds of metals such as cast iron, tool steel, aluminium, brass, high carbon steel etc. From 20 to 24 teeth per inch are cut in this hacksaw blade.

Fine Grade Hacksaw Blade

This type of hacksaw blade is mainly used to cut thin pipes ,sheets, tubes etc. It has 24 to 30 dents per inch.

Superfine Grade Hacksaw Blade

For cutting extraordinary solid metals and thin metal sheets, thin type of hacksaw blade is used. There are 30 to 32 dents per inch in this type of hacksaw blade.

Ail Hard Blade

Blades of this nature are hardened and tempered only except the ends having holes. These are used for cutting articles cast iron or mould iron etc.

Methods of Using Hacksaw

- Selection of hacksaw blade should be done according to the metal for which it is to be used.
- While fixing the blade on the frame it should be ensured that its teeth should cut the metal when they are driven forward.
- The job should be held in the vice in such a way that its cutting lines are clearly visible.
- Before starting a cut with a hacksaw blade, the blade should be kept on the marking line, the left-hand thumb should be placed with its support as shown in fig. It would ensure that the blade would move only on the line there would be no risk of its slip.
- After marking with the support of thumb we should hold the handle with right-hand palm and fingers and with the left-hand palm and fingers, we should hold the other end of the hacksaw frame as shown in fig.
- You should stand on the left hand of the vice and keep your right foot backwards and the left foot a little ahead of the right.
- Contact between the blade and the job should be in such a way that at least two teeth should remain in contact with the surface of the job.
- The speed of operating hacksaw should be 40 to 50 strokes per minute.
- Pressure should be exerted on the forward stroke and it should be withdrawn on backward stroke.
- Before finishing cutting with a hacksaw the cutting speed should be slowed down.

Precautions of Using Hacksaw

Following are the precautions of using hacksaw:

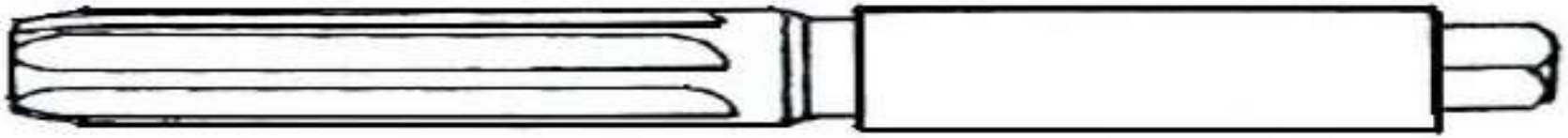
- Hacksaw blade should be fitted on the frame very carefully. It should not be very tight nor very loose.
- The job which is to be cut should not be held in a vice much high otherwise there would be vibrations in it.
- While cutting thin metal sheet, packing of wood, plastic or any other appropriate material should be used in its front and back.
- Hacksaw blade should not be allowed to become slanting while using a hacksaw. If it becomes slating, there are chances that it may break.
- If the blade starts cutting in a slanting manner we should start a fresh cut. Operating a hacksaw in an old cut may break it.
- If a blade gets broken while working, then we should replace it with a blade which has been used almost for the same period rather than using a brand new blade. The new blade can break if it is operated in that old slot.

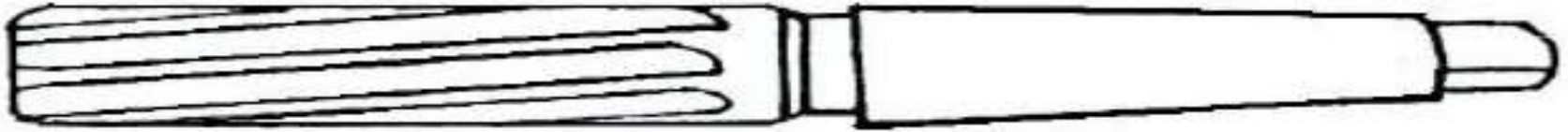
FINISHING TOOLS

Reamers

Reaming is an operation of sizing and finishing a drilled hole, with the help of a cutting tool called reamer having a number of cutting edges. For this, a hole is first drilled, the size of which is slightly smaller than the finished size and then a hand reamer or machine reamer is used for finishing the hole to the correct size.

Hand Reamer is made of High Carbon Steel and has left-hand spiral flutes so that, it is prevented from screwing into the whole during operation. The Shank end of the reamer is made straight so that it can be held in a tap wrench. It is operated by hand, with a tap wrench fitted on the square end of the reamer and with the work piece held in the vice. The body of the reamer is given a slight tapper at its working end, for its easy entry into the whole during operation, it is rotated only in clock wise direction and also while removing it from the whole.





Reamers

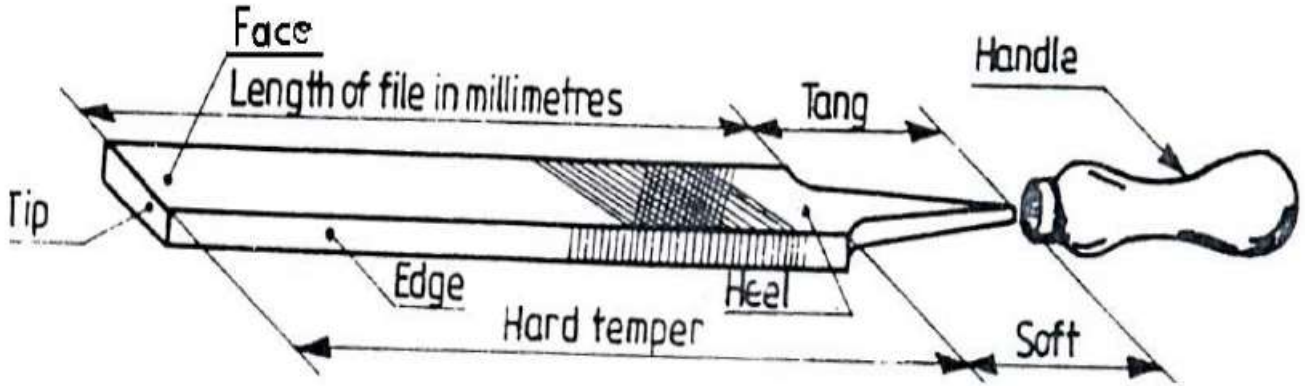
Files

Filing is one of the methods of removing small amounts of material from the surface of a metal part. A file is hardened steel too, having small 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. The figure shows various parts of a hand file. The hand file is parallel in width and tapering slightly in thickness, towards the tip. It is provided with double cut teeth. On the faces, single cut on one edge and no teeth on the other edge, which is known as a safe edge.

Length of file

- Length is measured from heel to point
- Files are available from 100mm to 450mm
- Common sizes are 100mm, 150mm, 200mm, 250mm, and 300mm.



Parts of a hand file

Grade

- Depending on fineness and or pitch of teeth, they are graded as

(a)Rough---8 teeth per cm, rough work

(b)Bastard –12 teeth per cm,cuts smaller amounts than Rough file

© Second cut– 16 teeth per cm, better finish than Bastard

(d) smooth– 20 to 24 teeth per cm

(e) Dead smooth– 25 to 40 teeth per cm

Teeth pattern of File

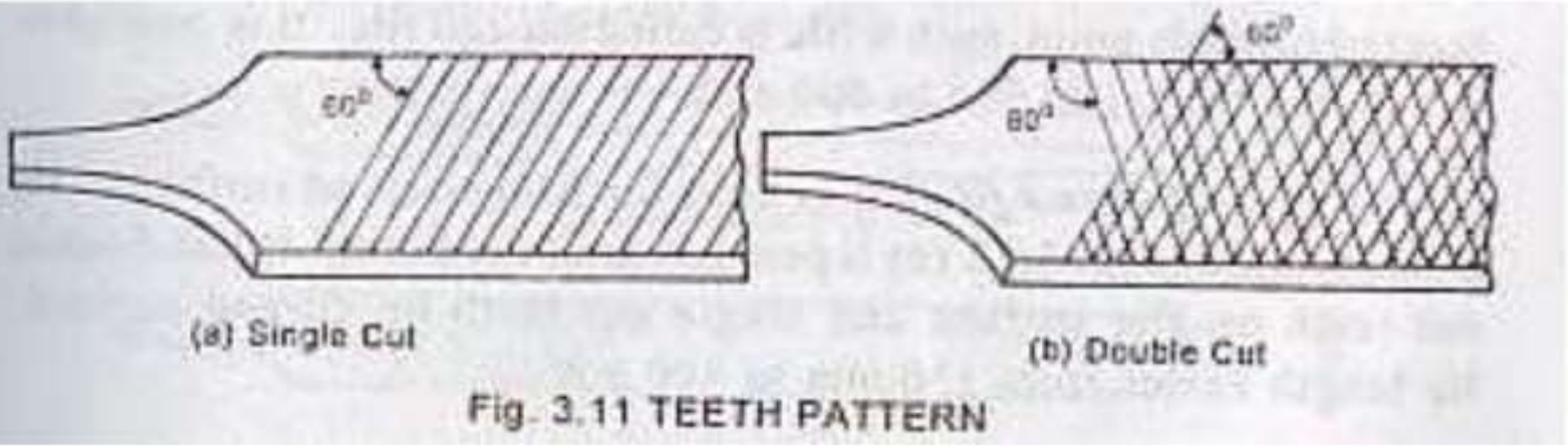
Files are classified as

(a) Single cut files, and

Angle from 45^0 to 60^0 from edge

(a) double cut files

70^0 to 80^0 from opposite side

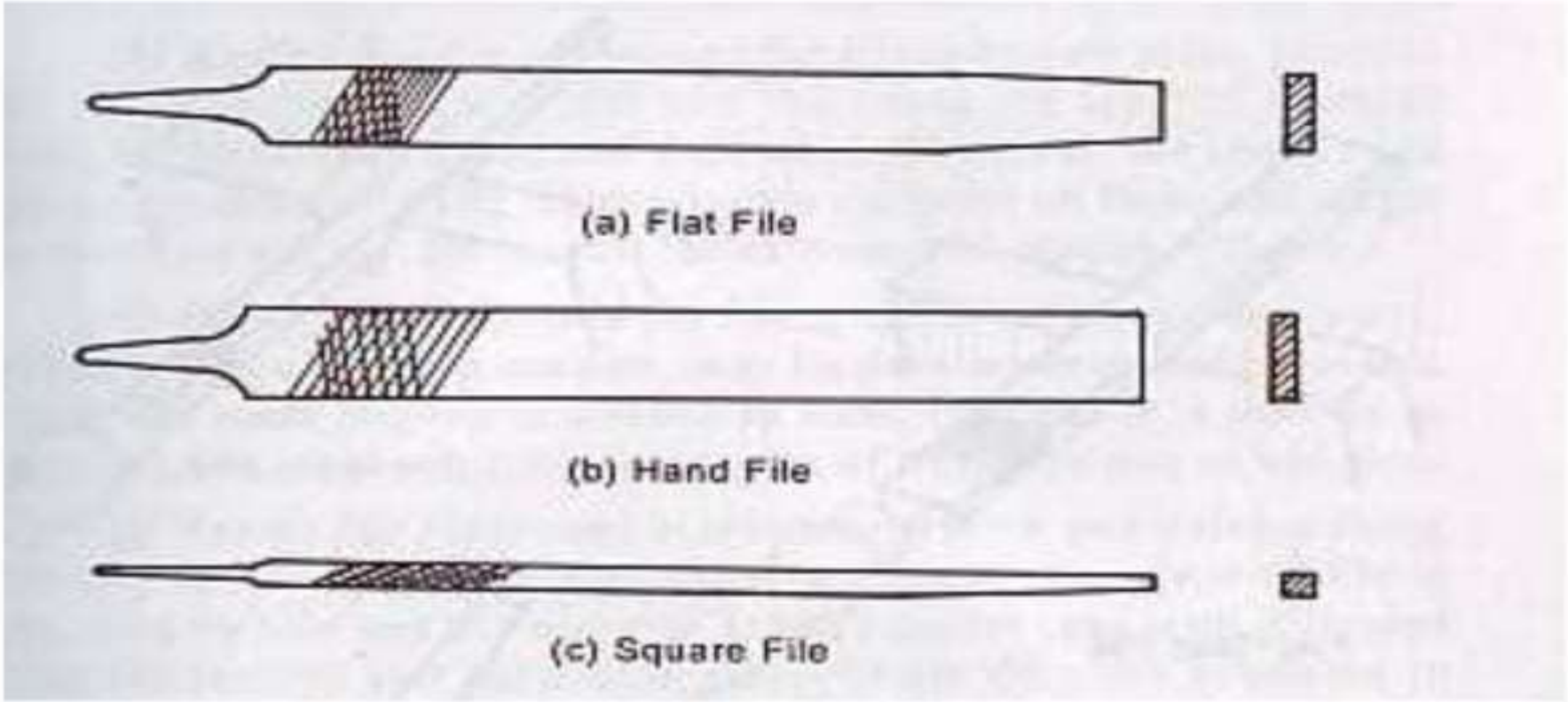


(a) Single Cut

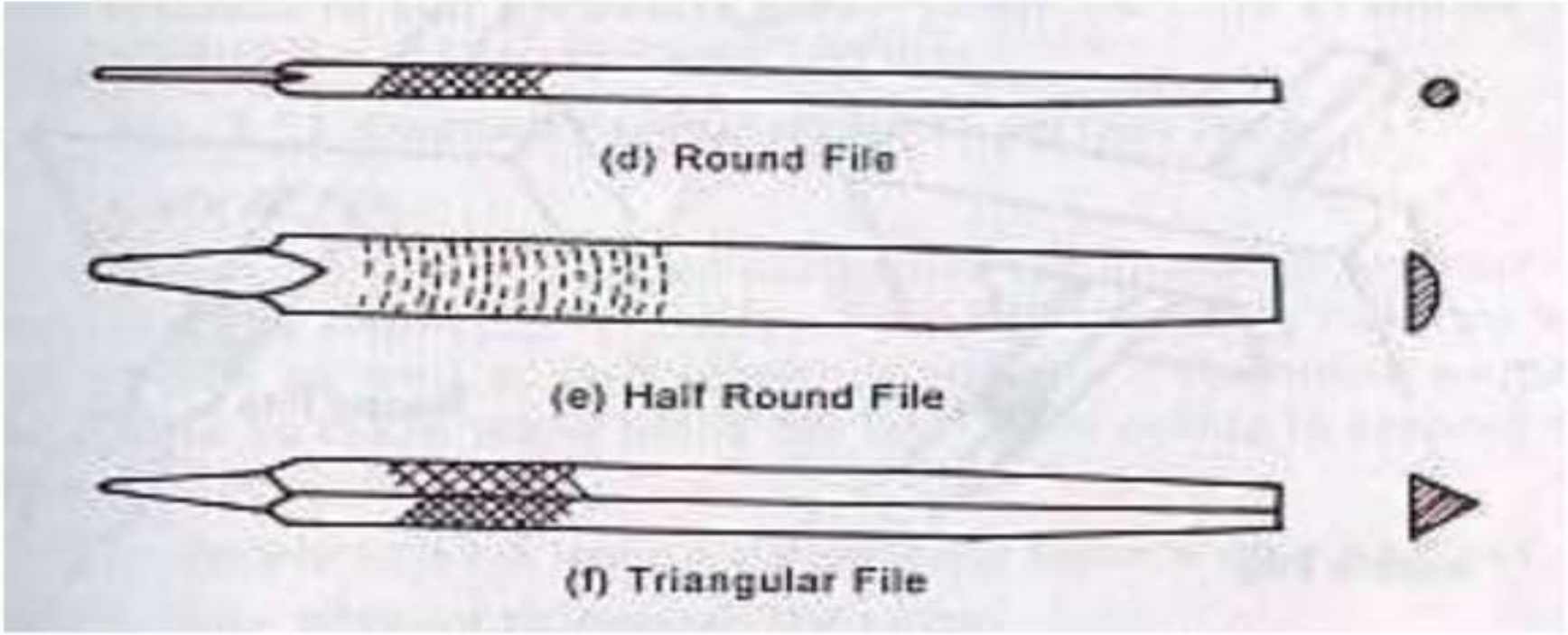
(b) Double Cut

Fig. 3.11 TEETH PATTERN

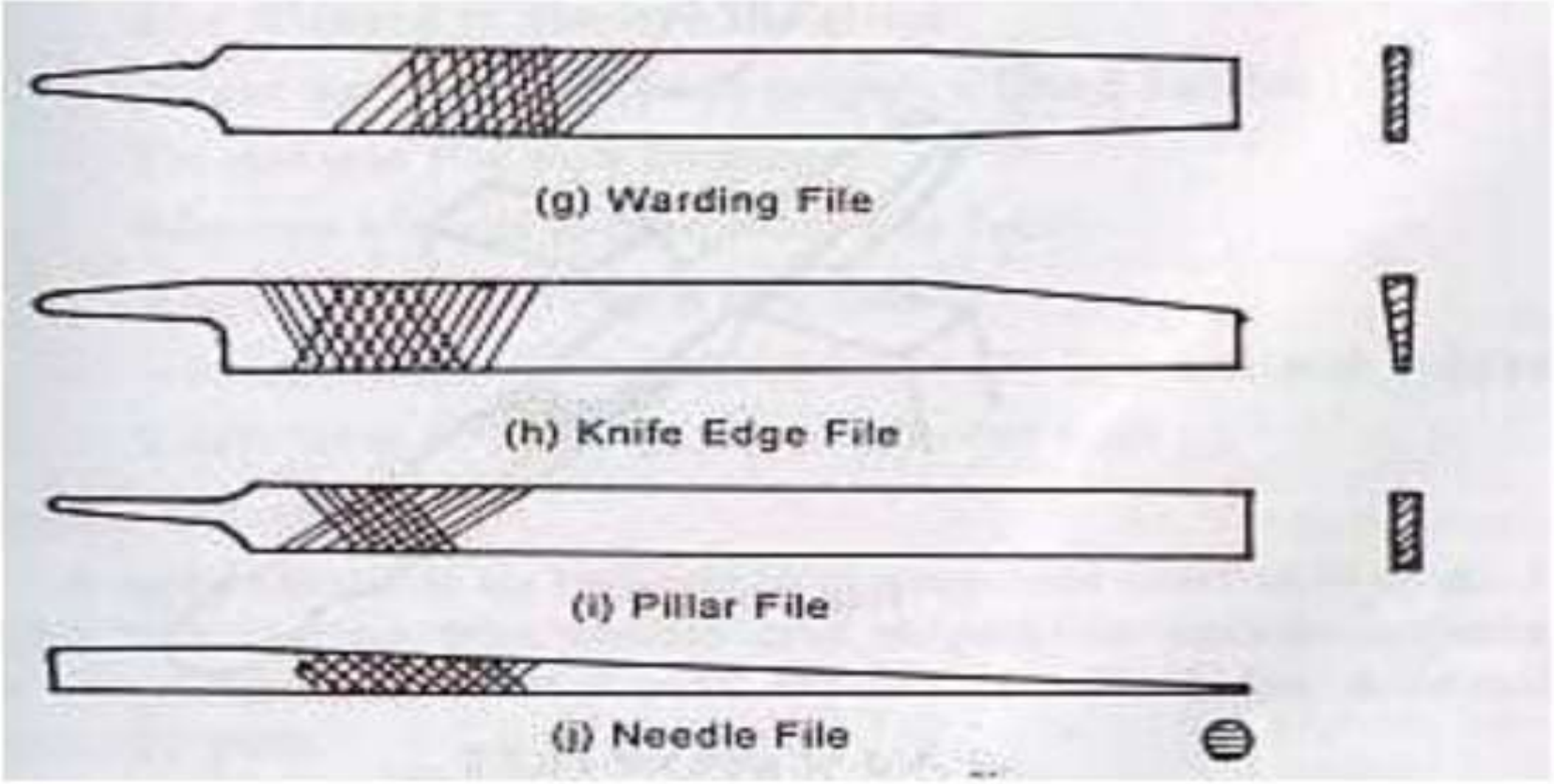
Types of files

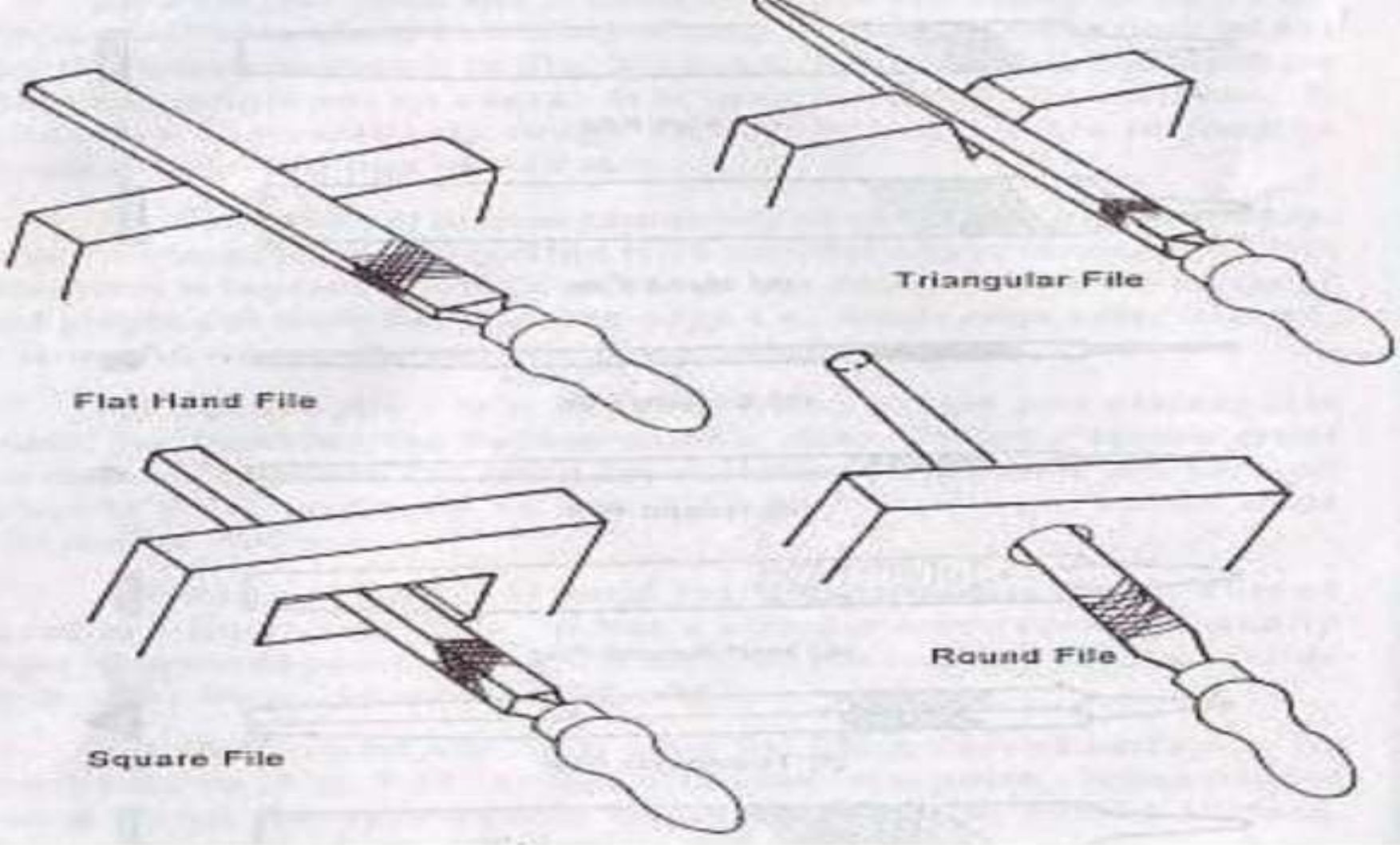


TYPES OF FILES

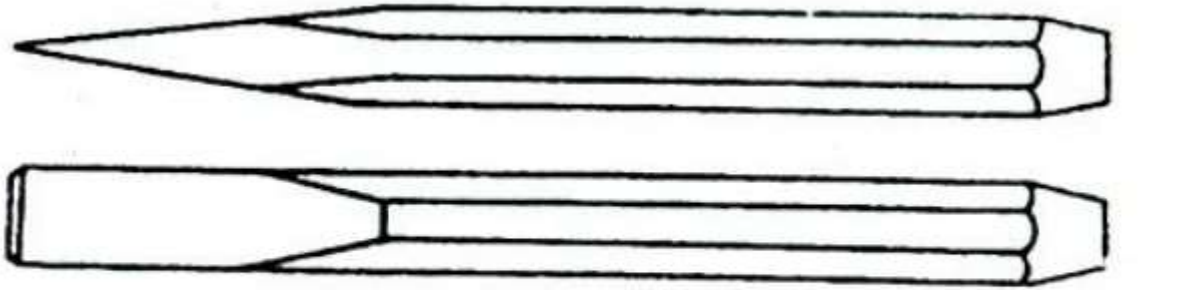


TYPES OF FILES




Triangular File
Flat Hand File
Round File
Square File

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 hard cutting edge. Annealing relieves the internal stresses in a metal. The cutting angle of the chisel for general purpose is about 60°.



Flat chisel

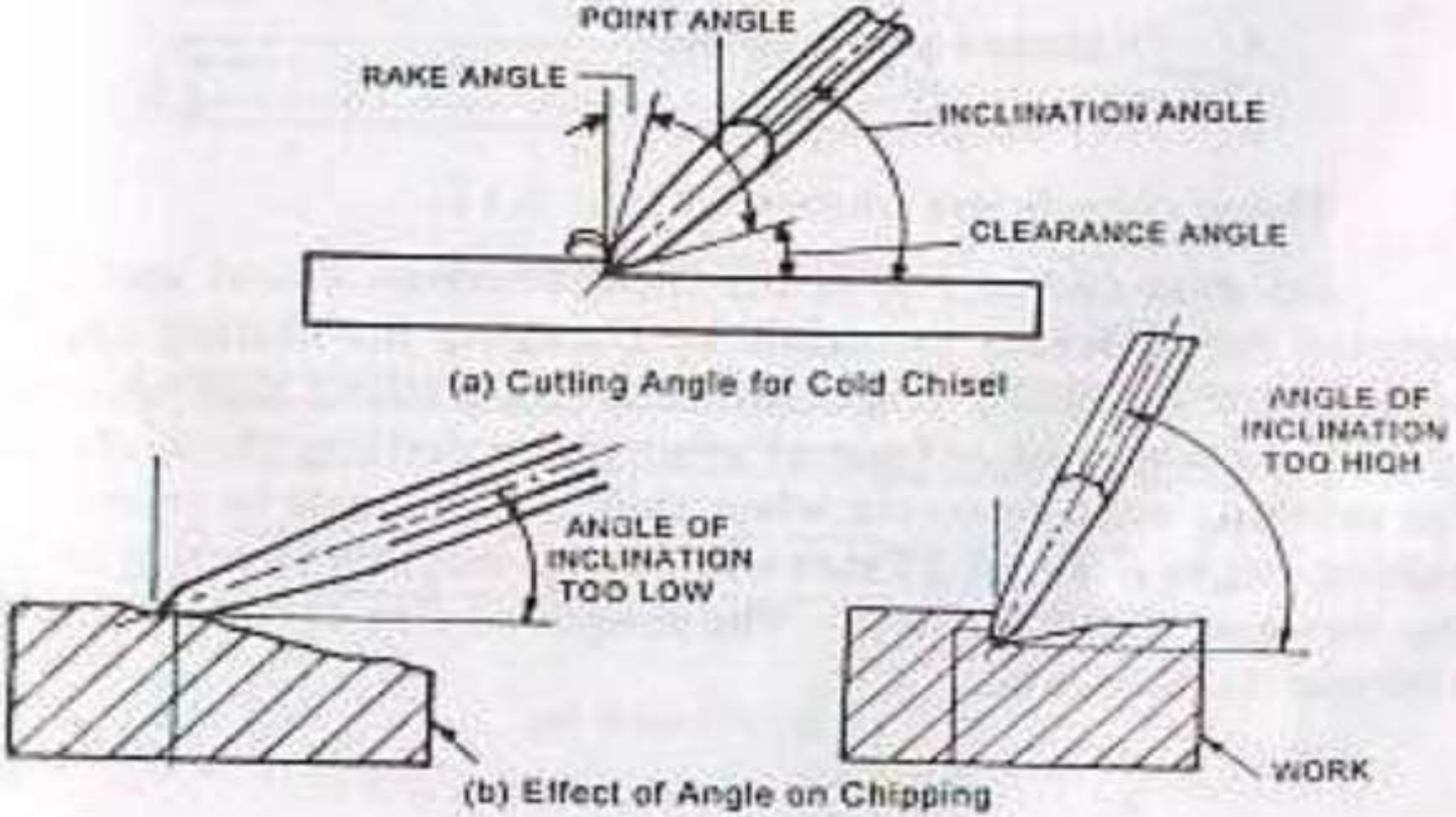

POINT ANGLE
RAKE ANGLE
INCLINATION ANGLE
CLEARANCE ANGLE
(a) Cutting Angle for Cold Chisel
ANGLE OF INCLINATION TOO LOW
ANGLE OF INCLINATION TOO HIGH
WORK
(b) Effect of Angle on Chipping

Fig. 3.16

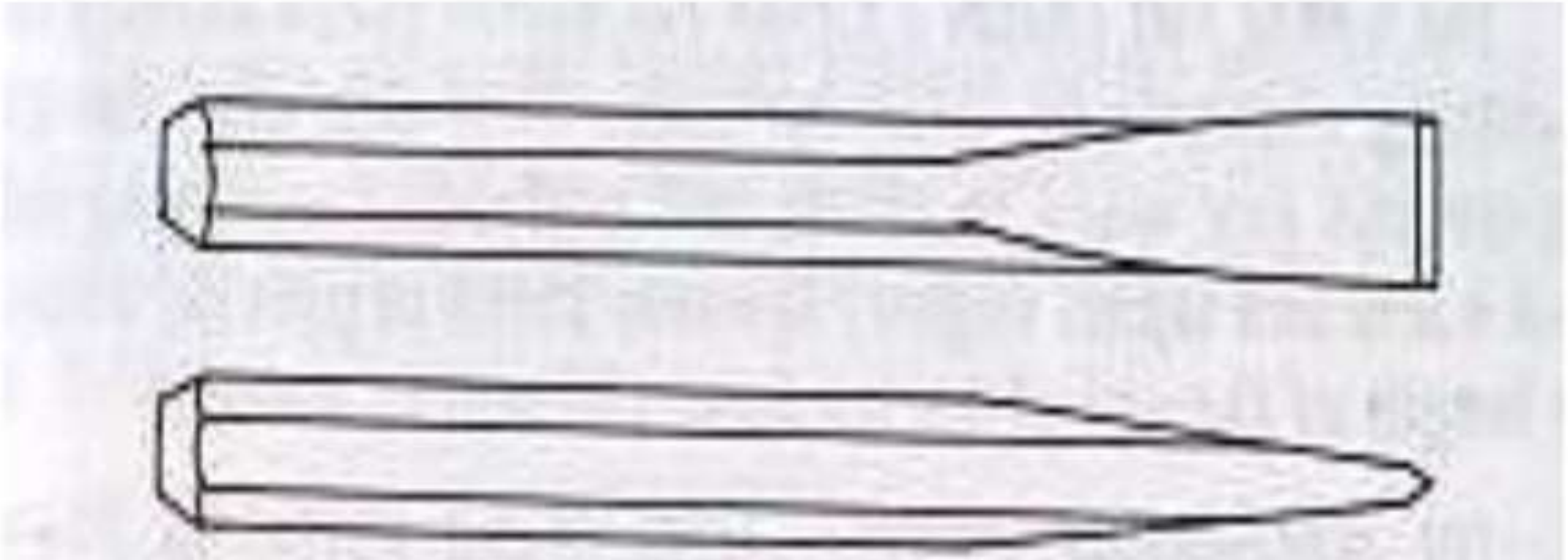
Table 3.3 Chisel Point Angles

Metal being cut	*Point angle*	*Angle of inclination*
Aluminium	30°	22°
Copper	45°	29.5°
Brass	50°	32°
Mild steel	55°	34.5°
Cast iron	60°	37°
High carbon steel	65°	39.5°
Cast steel	70°	42°

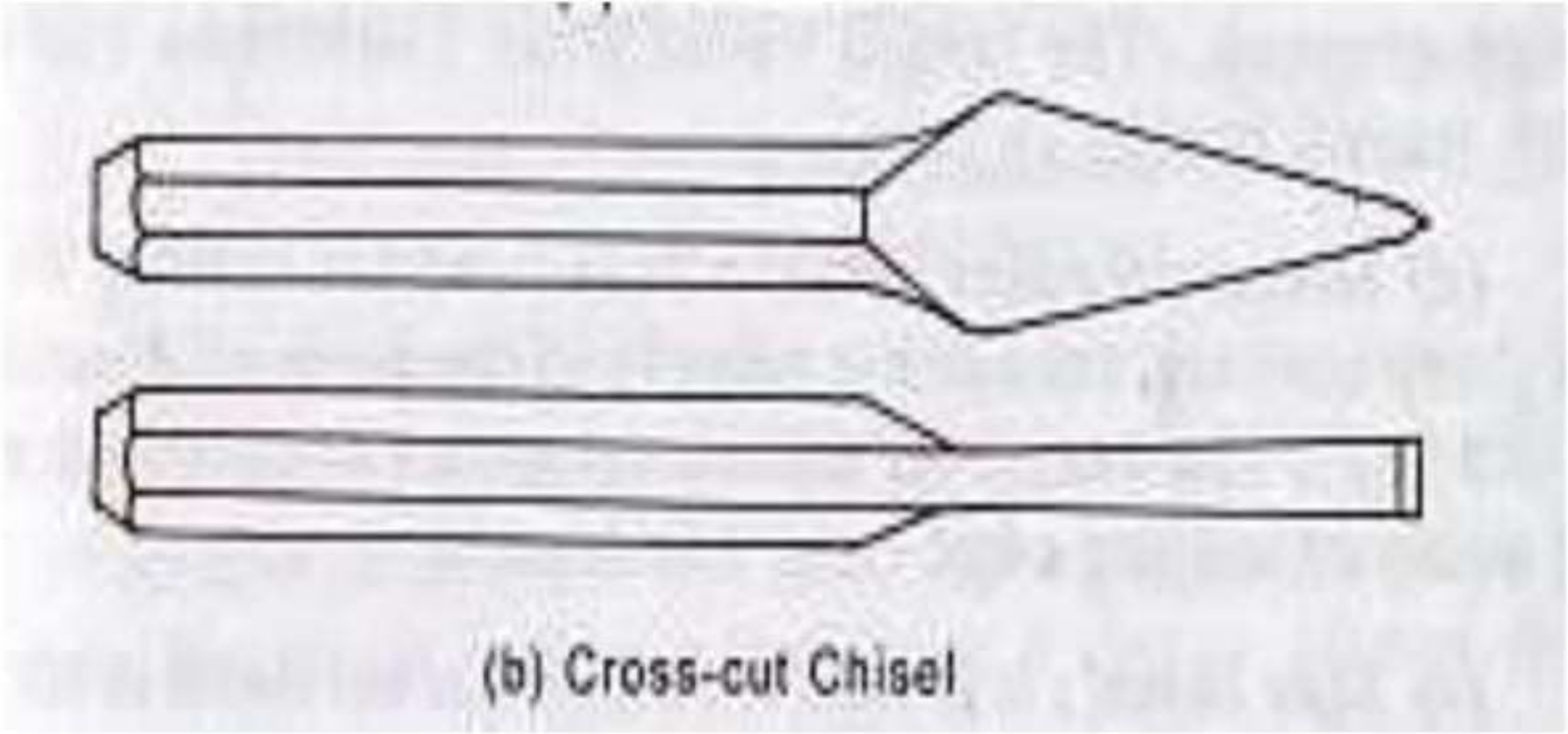
Types of chisels

The most commonly used chisels are

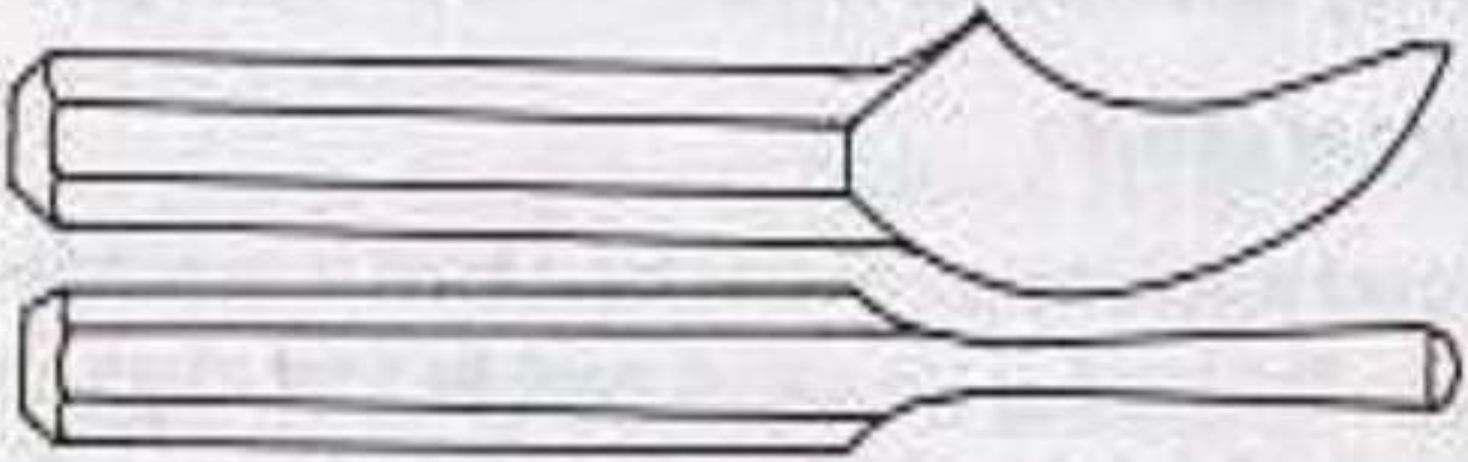
1. Flat chisel
2. Cross cut chisel
3. Half-round chisel
4. Diamond point chisel
5. Side chisel



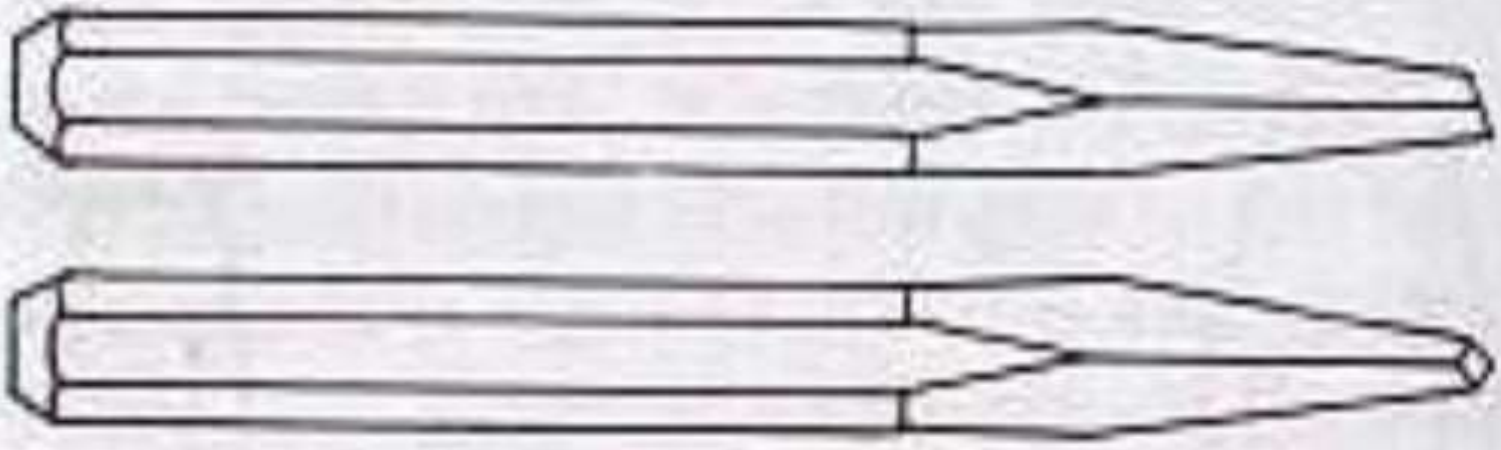
(a) Flat Chisel



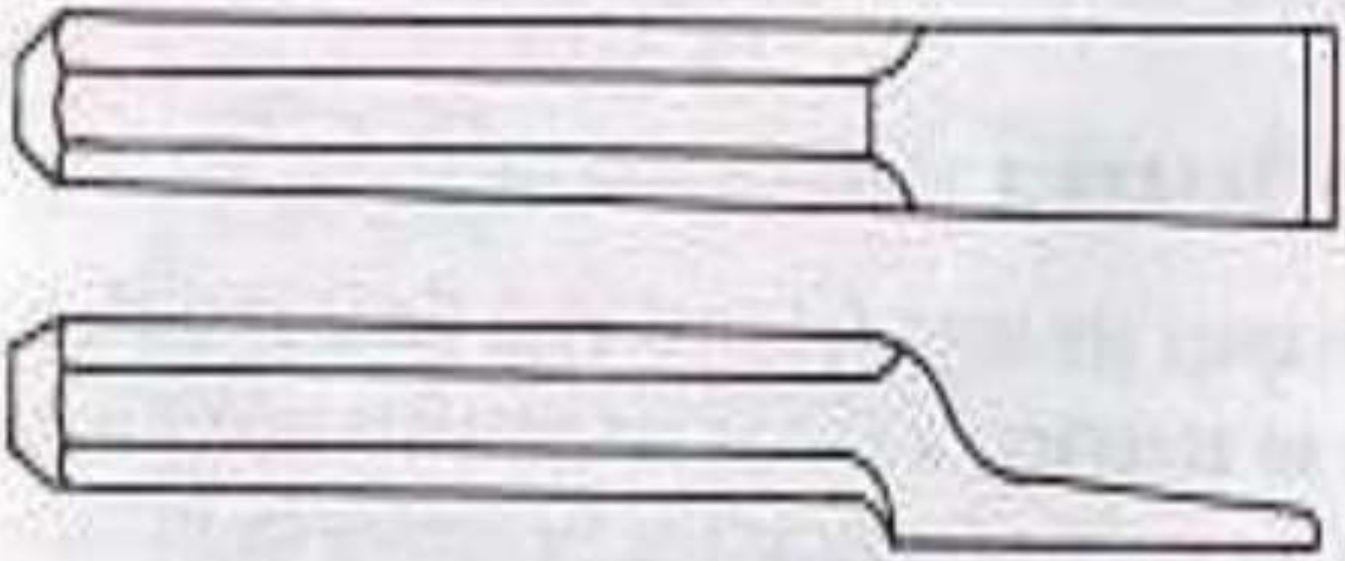
(b) Cross-cut Chisel



(c) Half-round Chisel



(d) Diamond-point chisel



(e) Side Chisel

DRILLS

Drills are used to make circular holes

These are made up of high-speed steel, chromium steel and carbon tool steel

It has the following parts

1. Body
2. Neck
3. Shank
4. Tang

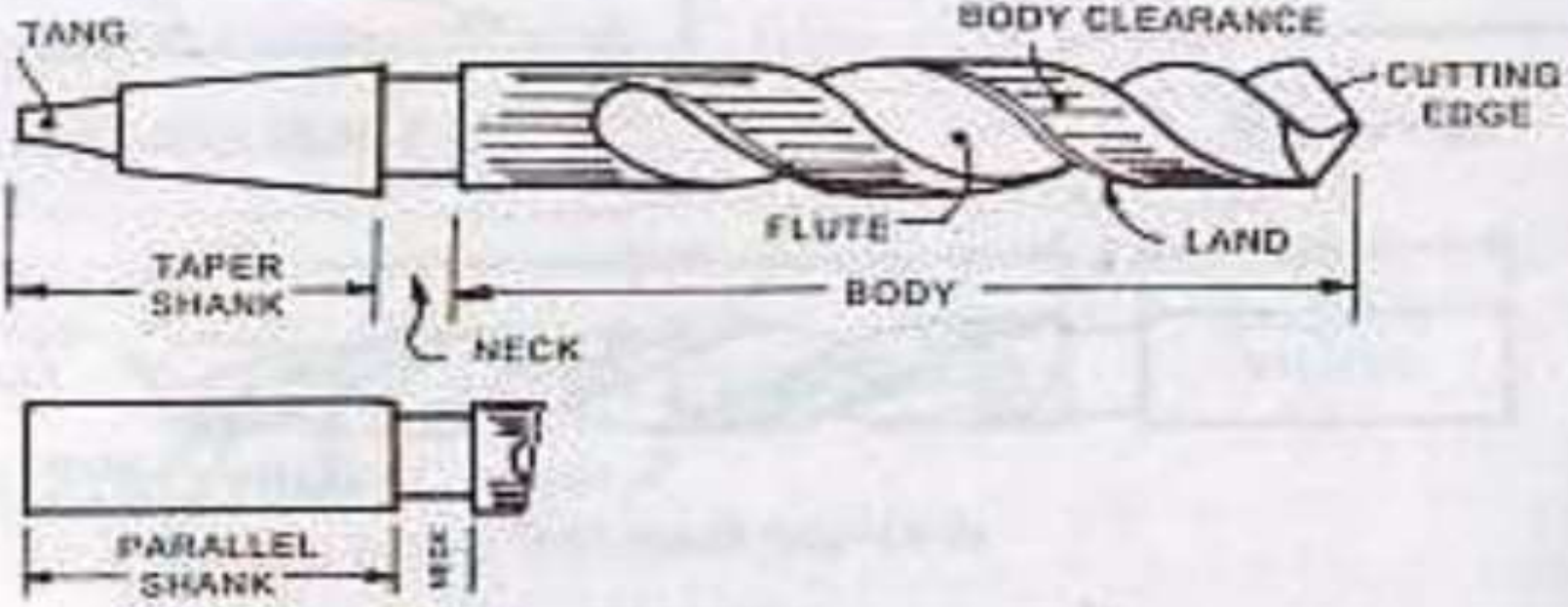
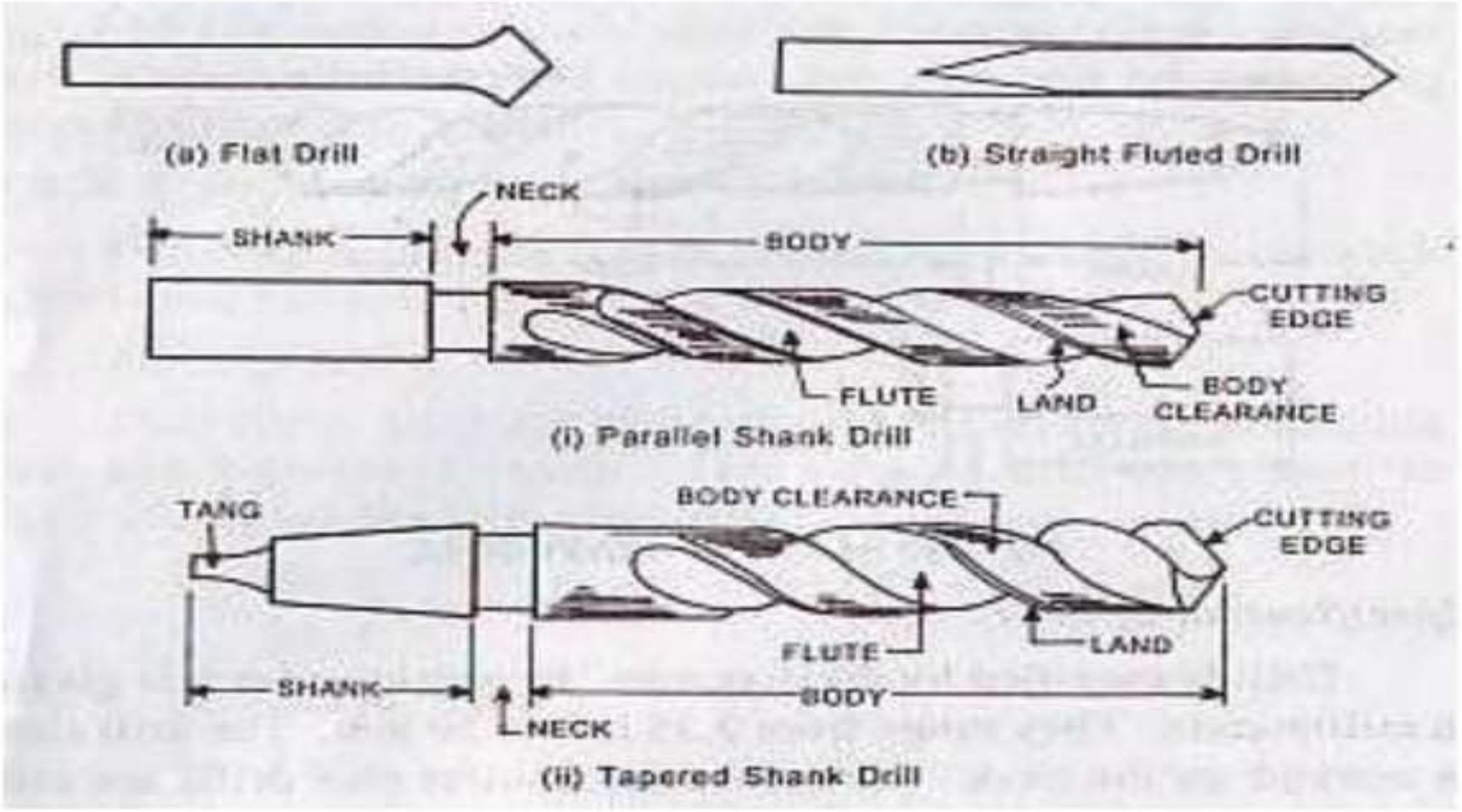


Fig. 3.20 PARTS OF TWIST DRILL

Types of Drills

The following types of drills are more commonly used

1. Flat drill
2. Straight fluted drill
3. Twist drill


(a) Flat Drill
(b) Straight Fluted Drill
NECK
SHANK
BODY
CUTTING EDGE
FLUTE
LAND
BODY CLEARANCE
(i) Parallel Shank Drill
TANG
BODY CLEARANCE
CUTTING EDGE
FLUTE
LAND
SHANK
BODY
NECK
(ii) Tapered Shank Drill

Reamer

After drilling a hole, Reamer is used to finishe the drilled hole.

It consists of Body and Shank

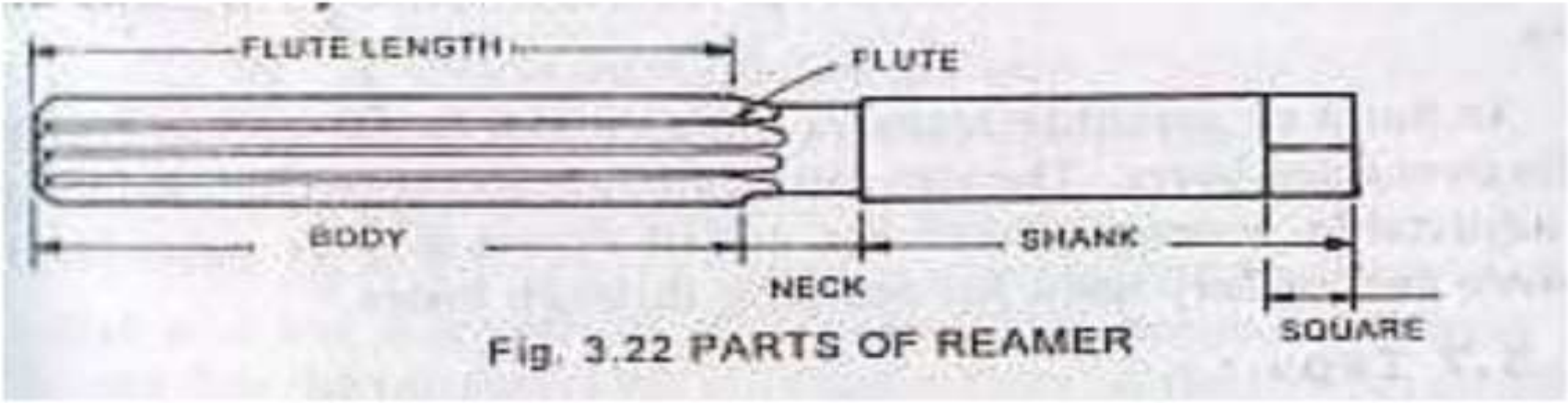
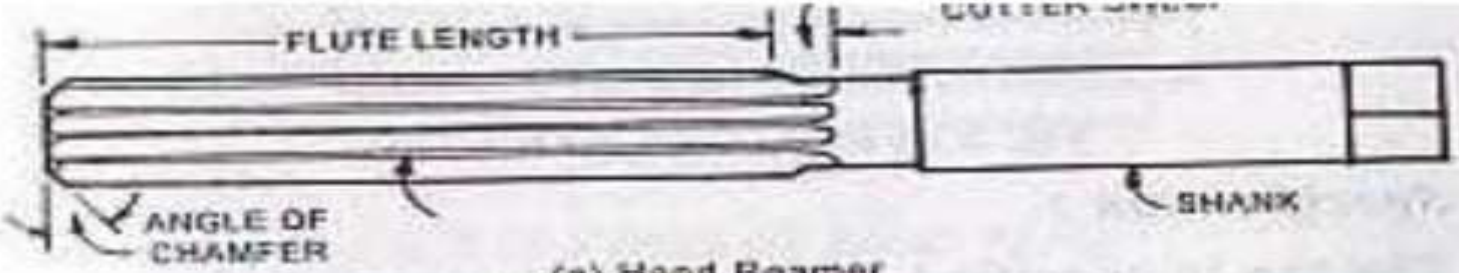
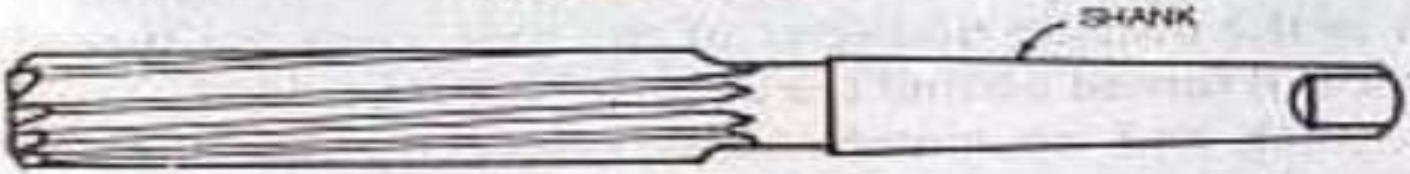


Fig. 3.22 PARTS OF REAMER



(a) Hand Reamer



(b) Machine Reamer

(c) Expanding Reamer

Fig. 3.23 TYPES OF REAMERS

Taps

Taps are used to make internal threads in drilled holes

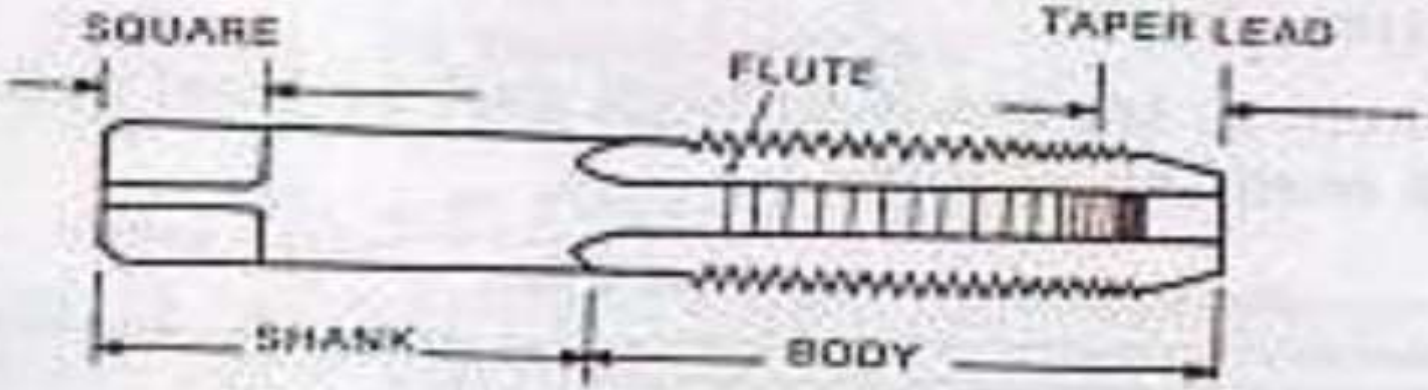


Fig. 3.24 PARTS OF HAND TAP

Types of Taps

Taps are available in following three types

1.Taper or first tap (rough)

2. Plug or second tap(semi-finish tap)

3. Bottoming tap (finish tap)

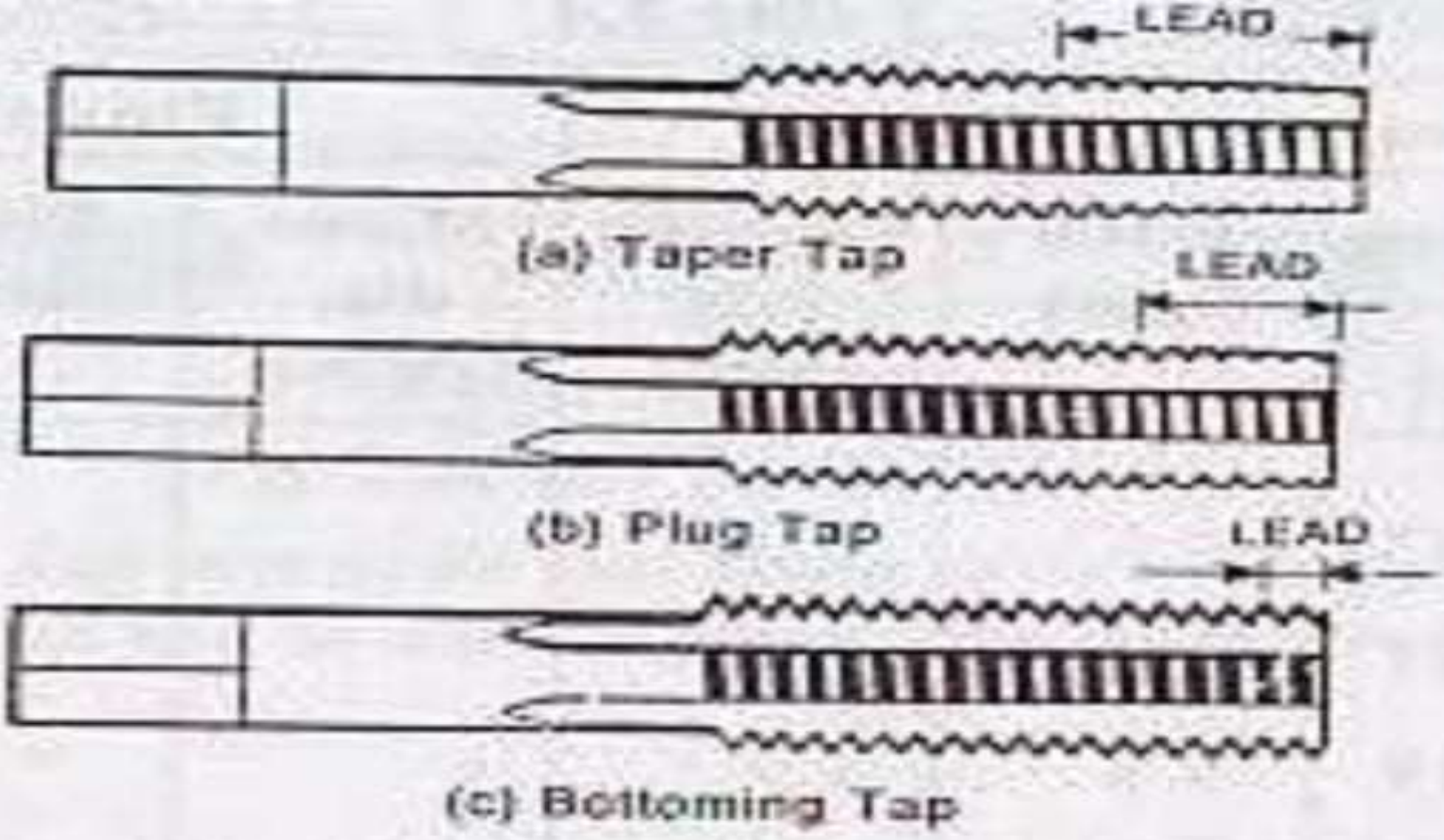


Fig. 3.25 TYPES OF HAND TAPS

DIES

- The die is a cutting tool used to cut external threads on cylindrical parts
- It is a circular disc of hardened tool steel having a threaded hole and flutes which forms cutting edges

Types of Dies

1. Solid die
2. Adjustable split die
3. Adjustable two-plate die

(a) Split - Die

(b) Two-Plate Die

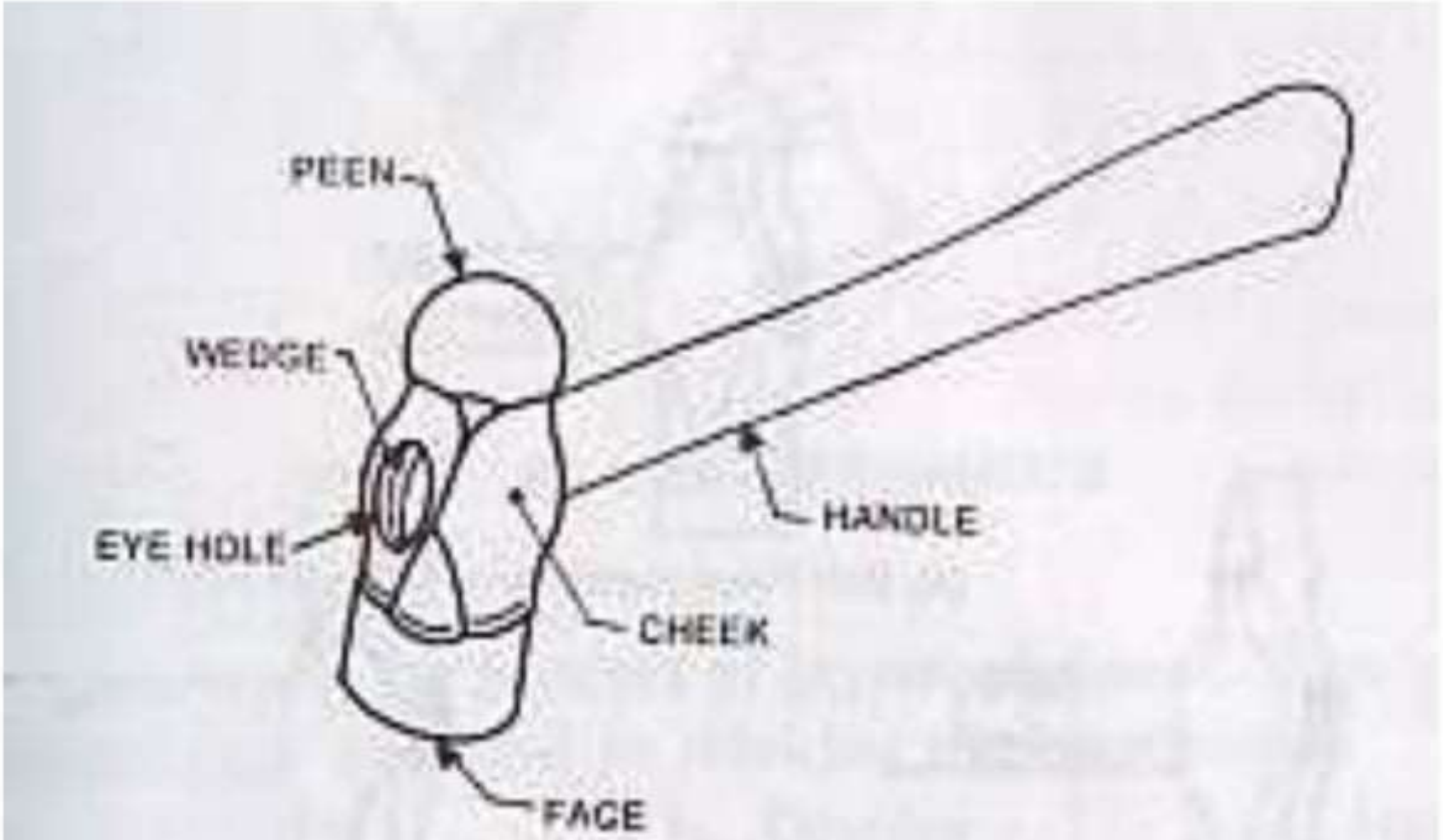
Striking Tools

These are used for striking purposes like punching, chipping, marking, bending, straightening and riveting

Hammer is basic striking tool

Parts of hammer

1. Peen
2. Face
3. Eye hole
4. Handle
5. head


PEEN
WEDGE
EYE HOLE
HANDLE
CHEEK
FACE

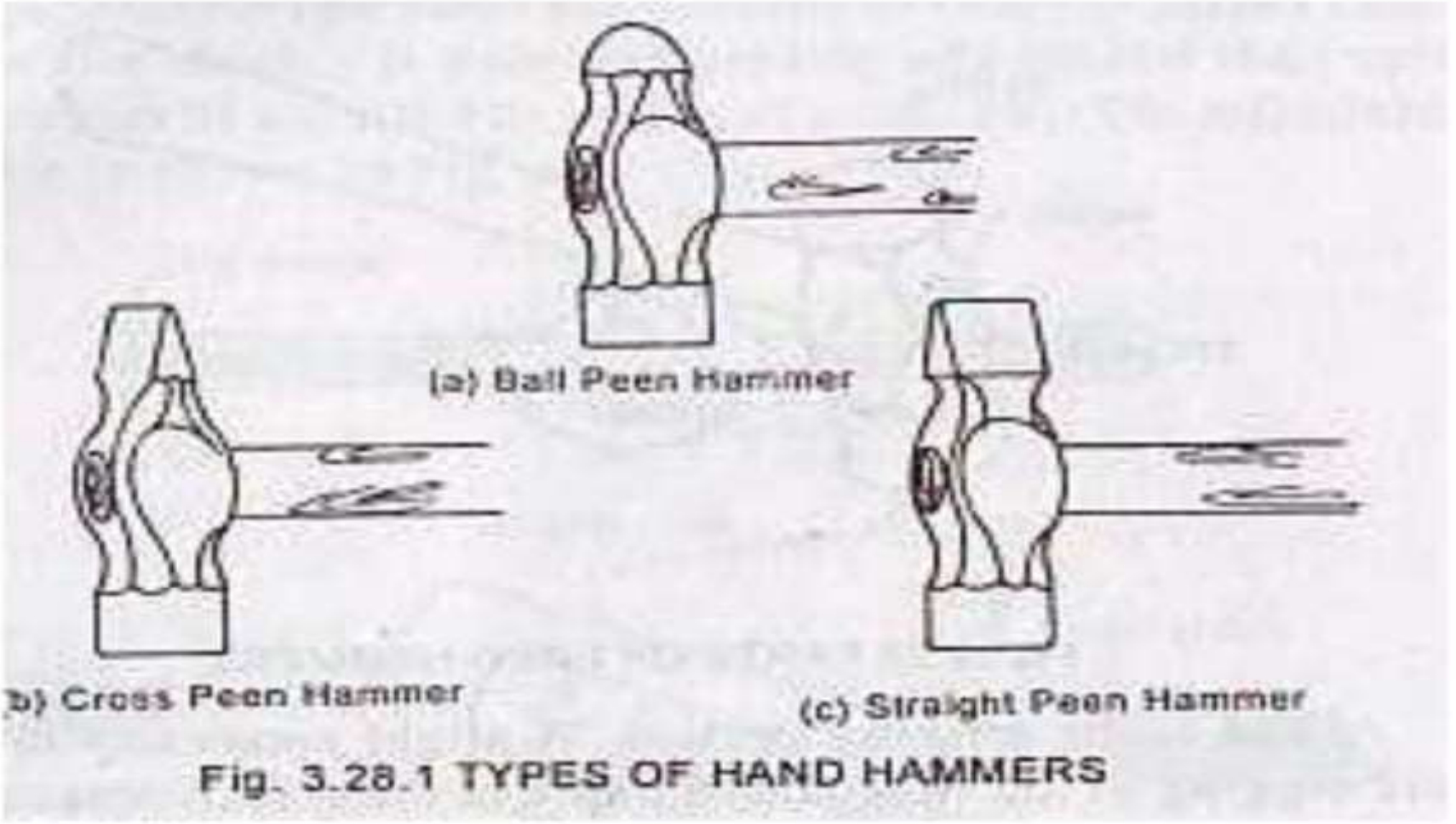


Fig. 3.28.1 TYPES OF HAND HAMMERS

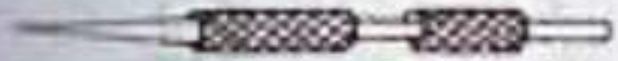
Fig. 3.29 SOFT HAMMER

Marking Tools

Marking is the process of layout of sizes on work piece. The following tools are used in marking out operations.

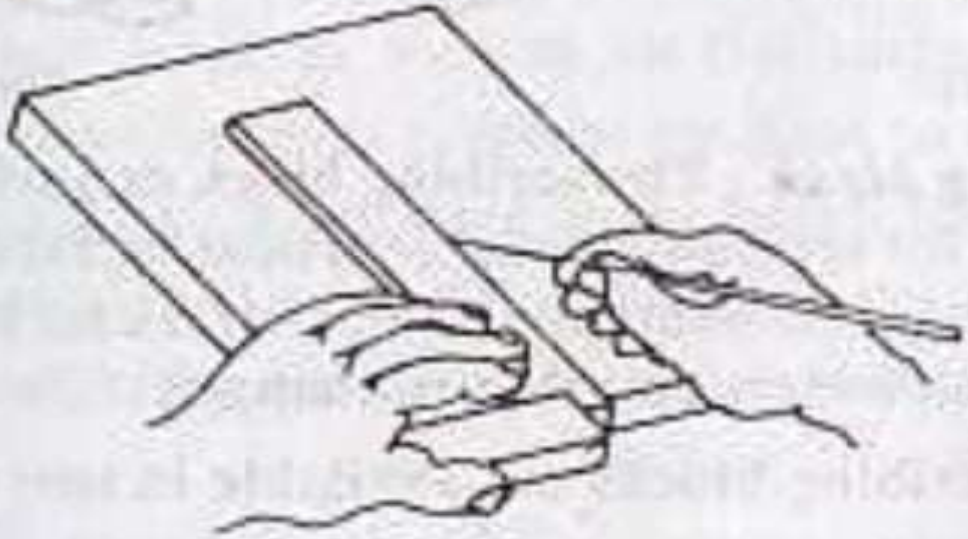
1. Scriber
2. divider
3. Jenny caliper
4. scribing block
5. Angle plate
6. V-block
7. Punch
8. Try square
9. Surface plate
10. Straight edge

Scriber



(i) Single Point Scriber

(ii) Double Point Scriber



(iii) Use of Scriber

Fig. 3.30 (a) SCRIBER AND ITS USE

Devider & jenny caliper

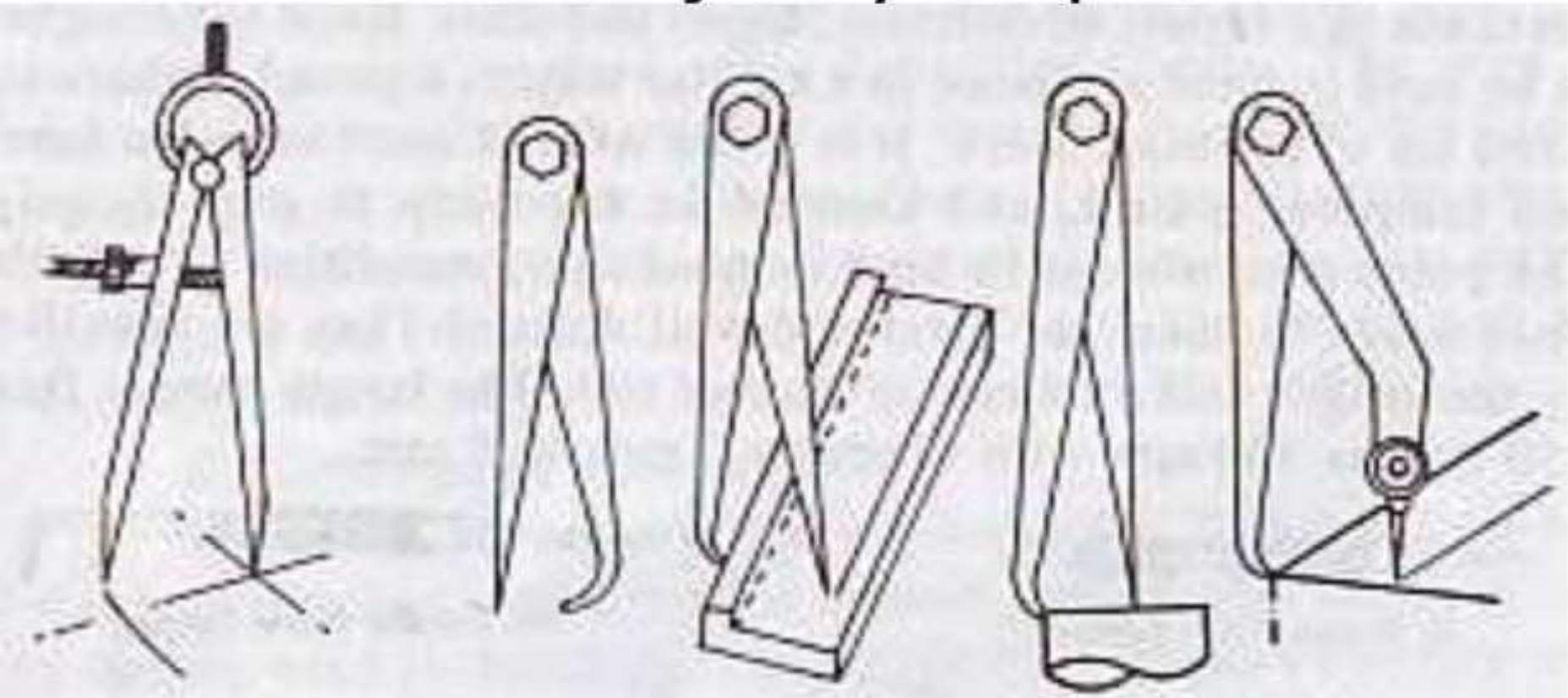


Fig. 3.30 (b)

Fig. 3.30 (c)

Angle plate & V-Block

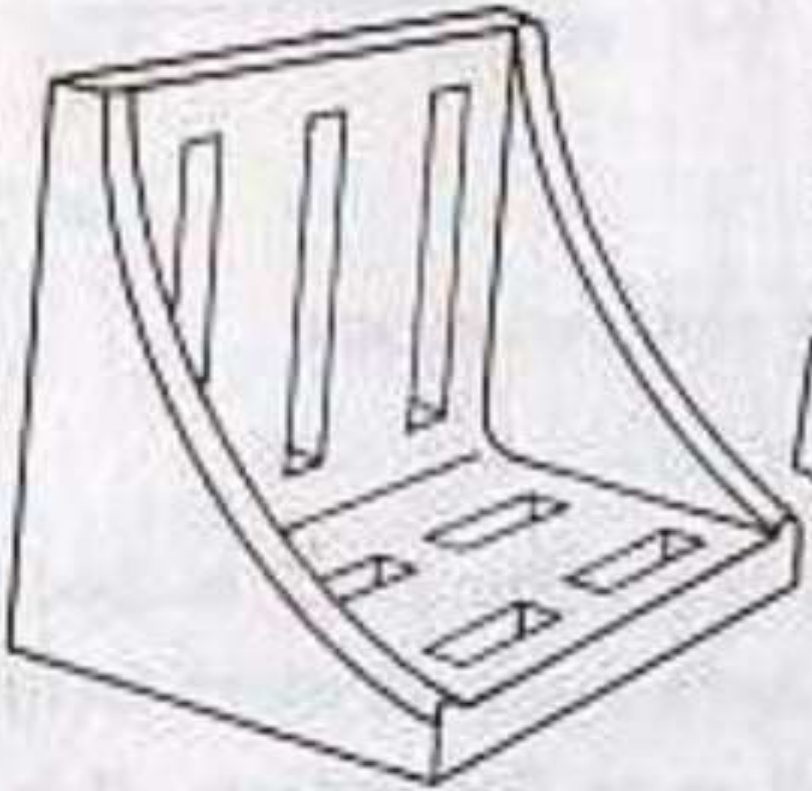


Fig. 3.30 (e) ANGLE PLATE

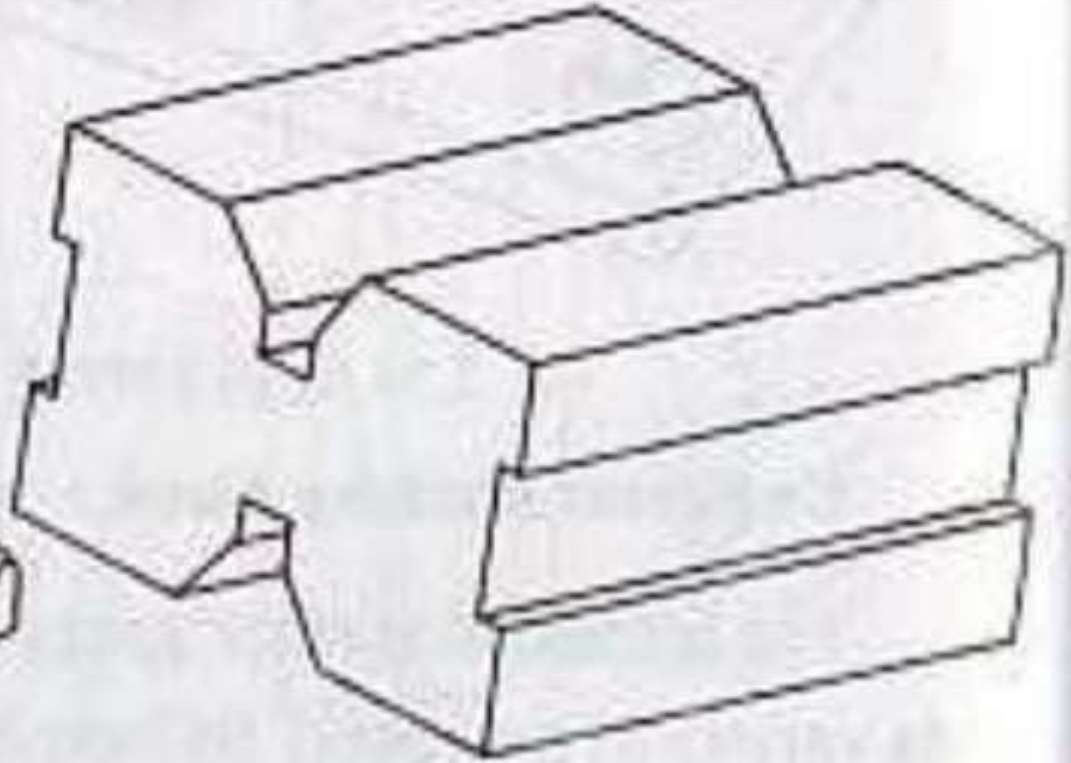
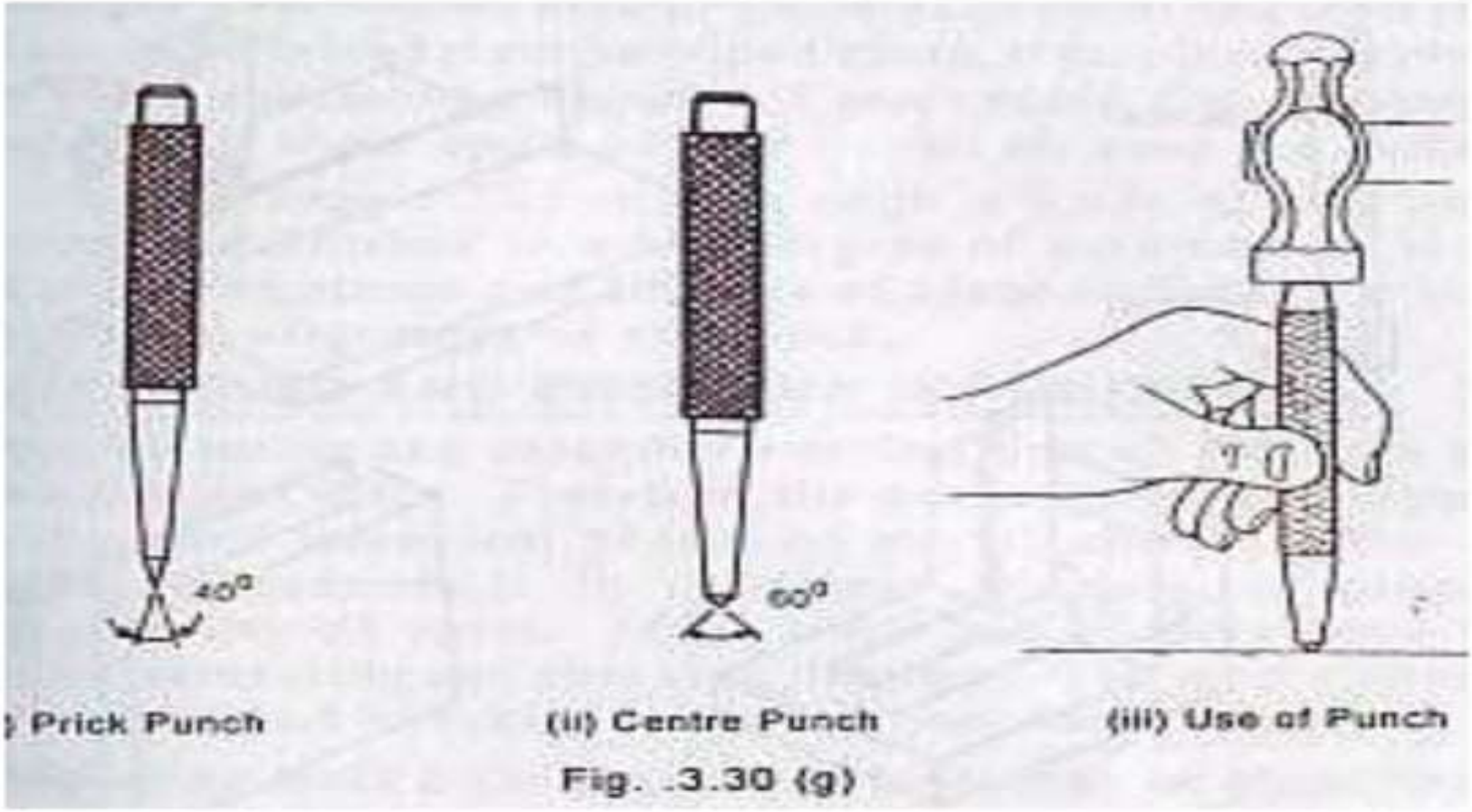


Fig. 3.30 (f) V-BLOCK

Punch



) Prick Punch (ii) Centre Punch (iii) Use of Punch

Fig. .3.30 (g)

Try square

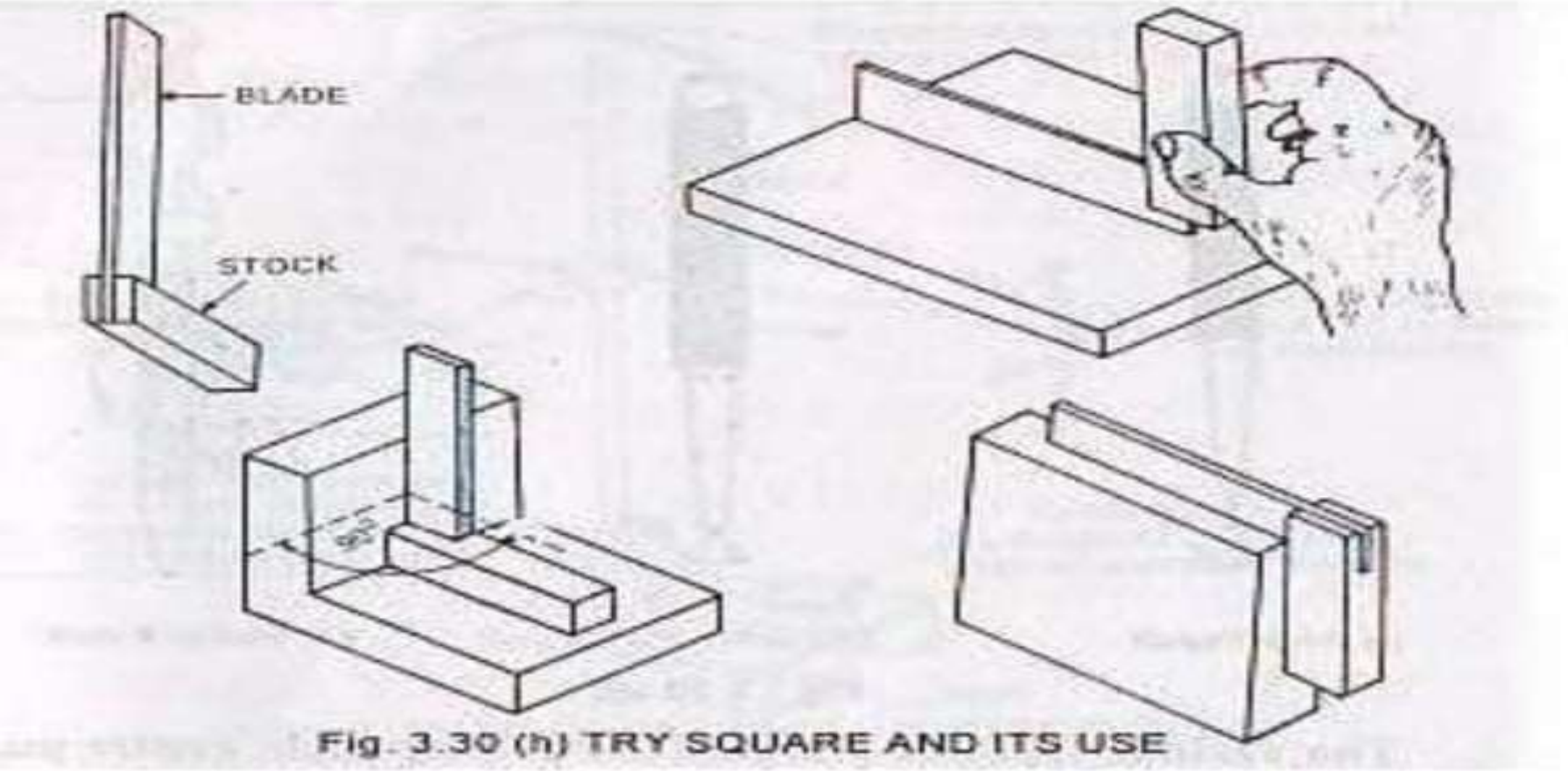
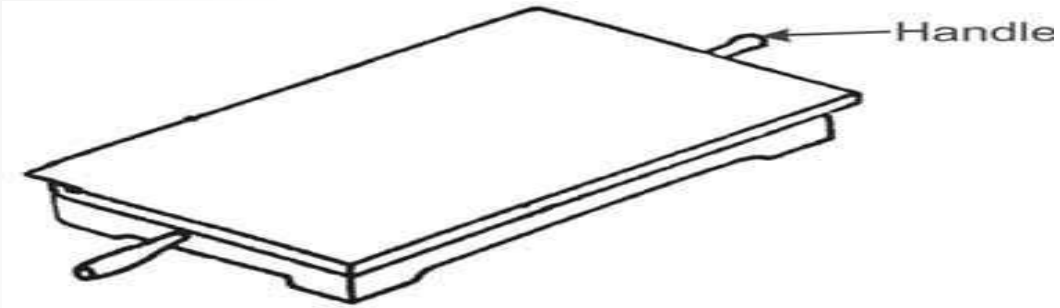


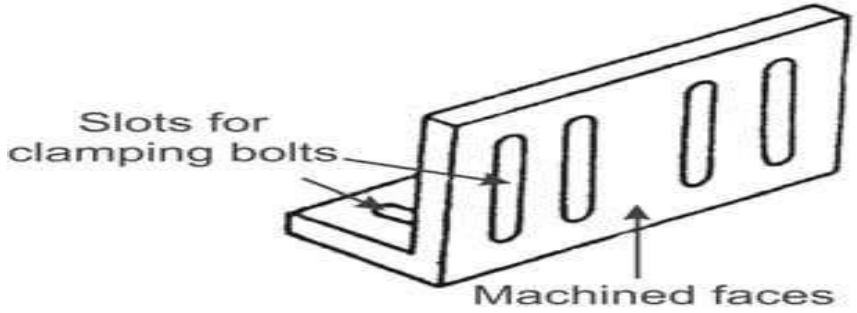
Fig. 3.30 (h) TRY SQUARE AND ITS USE

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 plates are made of C.I. or hardened steel, ground and scraped to the required precision. Now-a-days surface plates made of special granite stone are manufactured in wide range of precision grades, colours and sizes. It is specified by length × width × height × grade. Example: 600 × 400 × 100 × grade A has a flatness upto 0.005 mm.



Surface plate



Angle plate

Straight edge

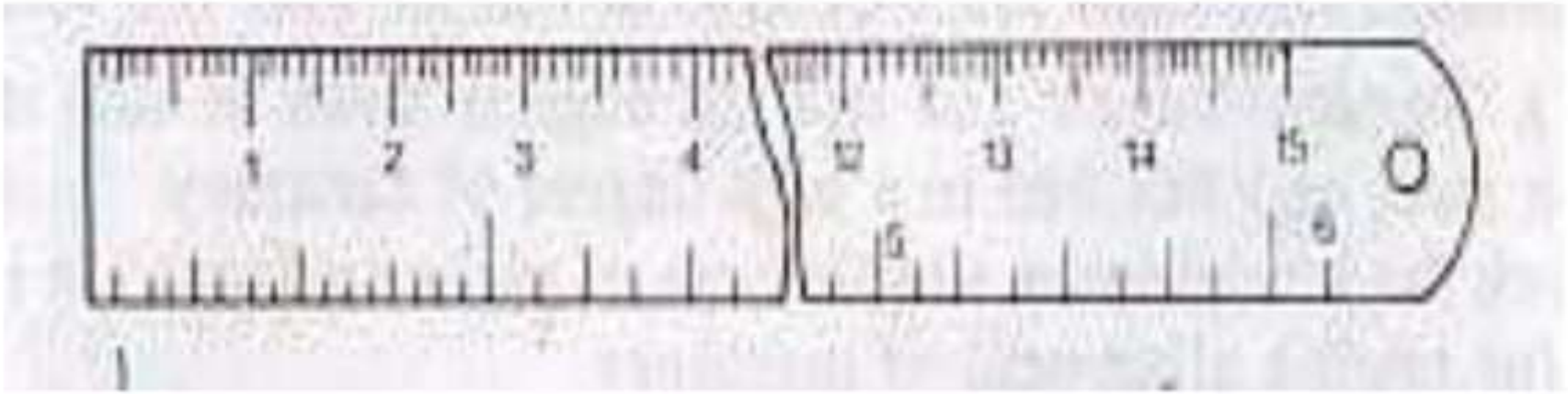
- The straight is made up of cast iron or carbon steel and finished to high degree of accuracy.
- It is used to check the straightness or flatness of surfaces
- It is also used for testing alignment of machines

Measuring Tools

The most commonly used measuring tools are described below

1. Steel rule
2. caliper
3. Depth gauge
3. Vernier caliper
4. Micrometer
5. Gauge block

Steel rule



caliper

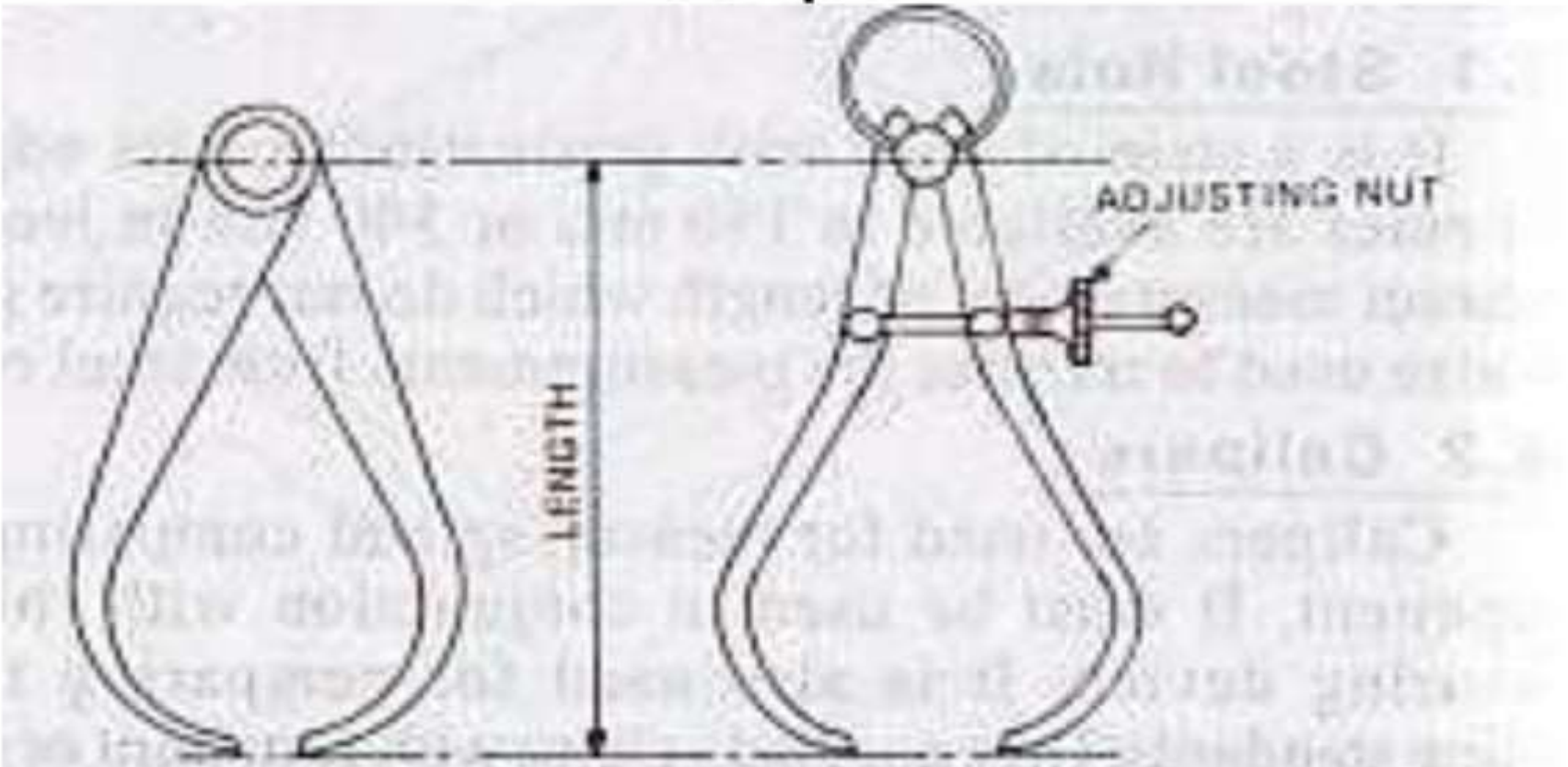


Fig. 3.32

Depth Gauge

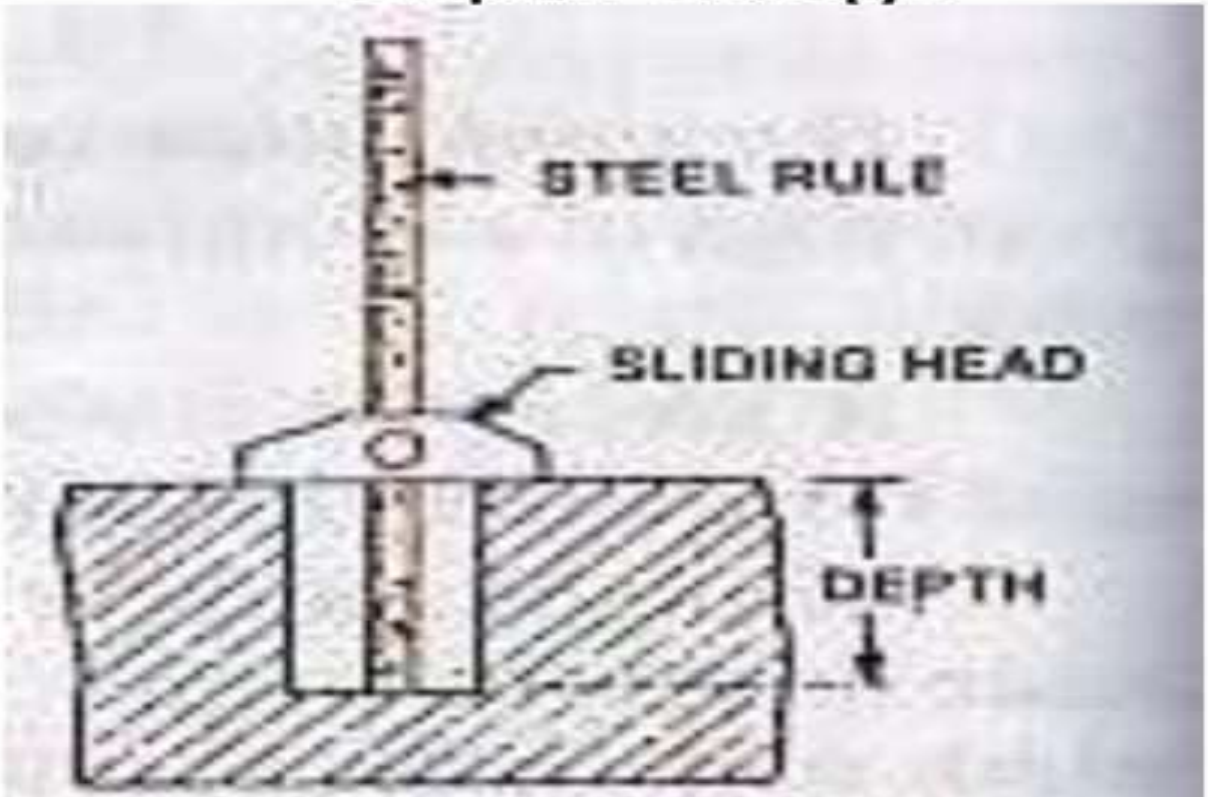
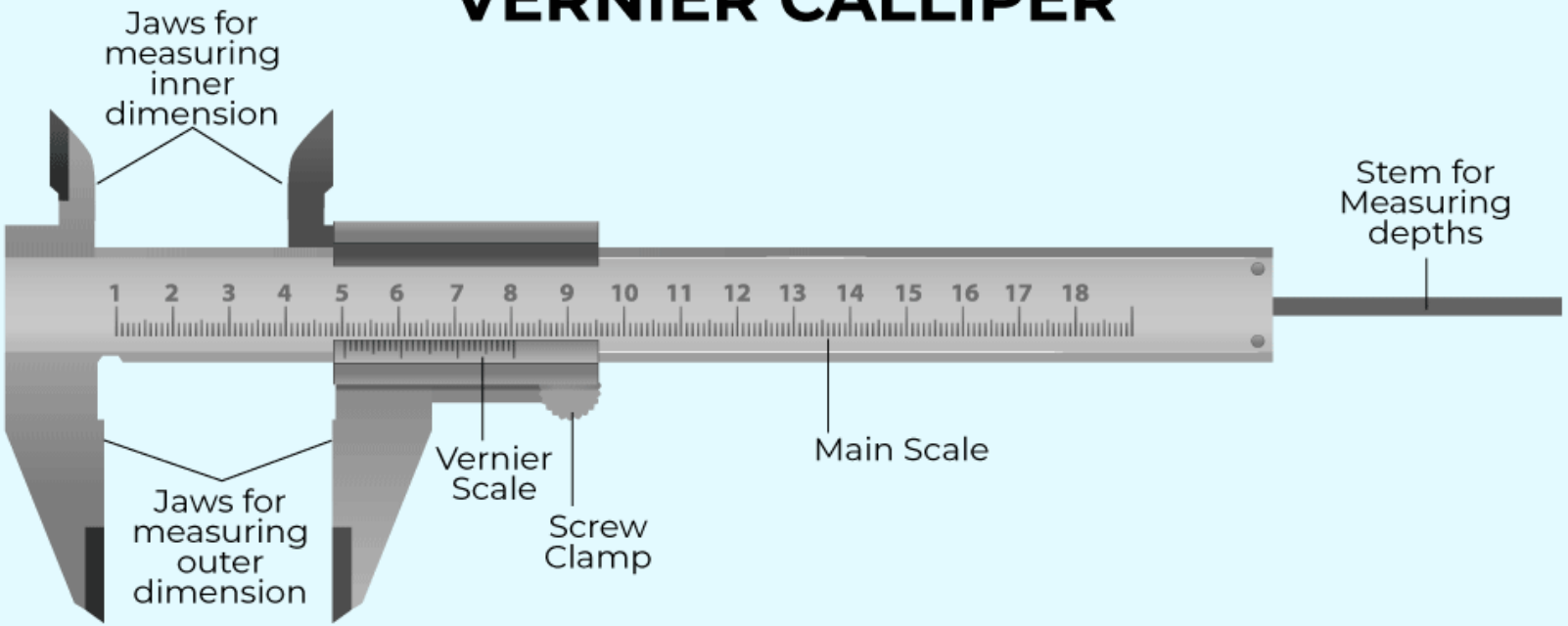


Fig. 3.36 DEPTH GAUGE

VERNIER CALLIPER



Vernier height gauge

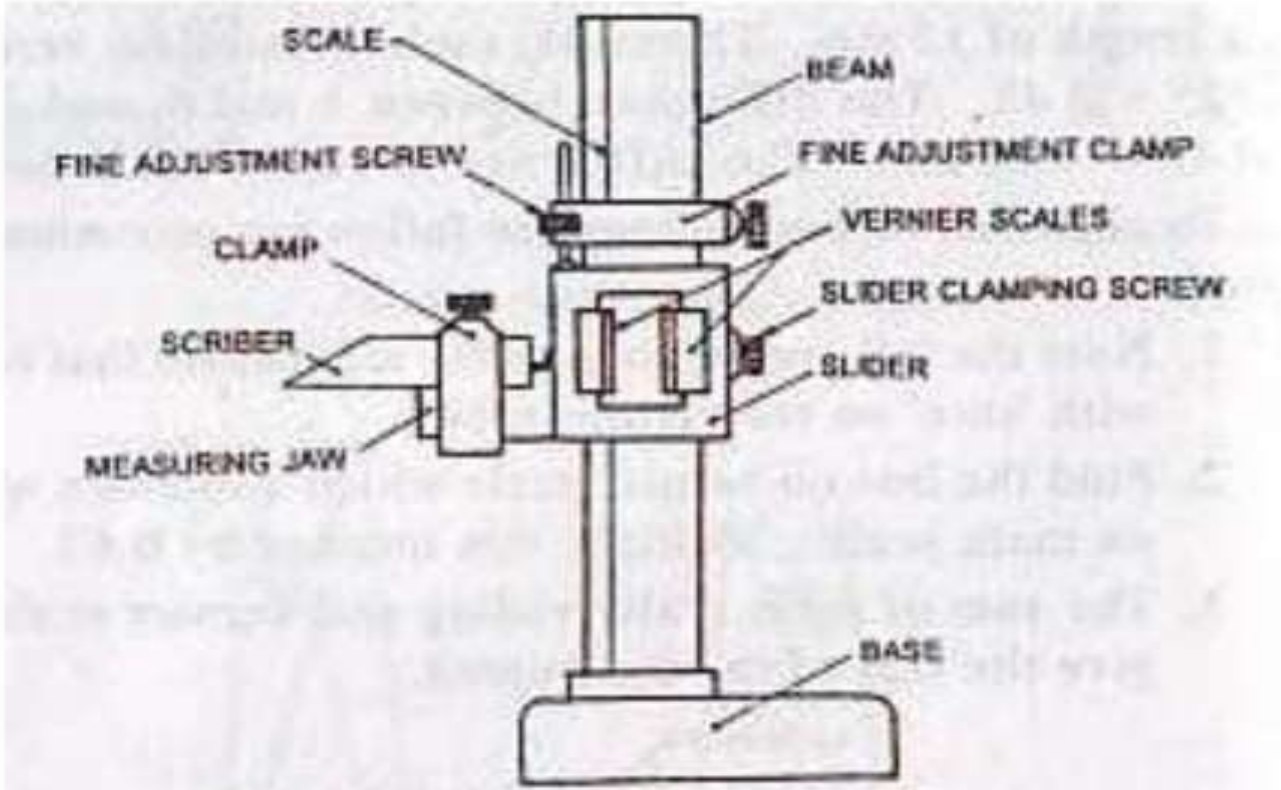
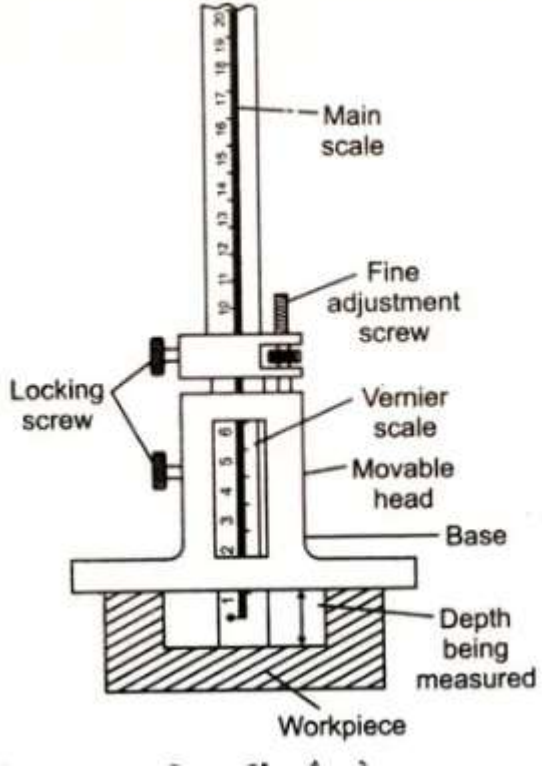


Fig. 3.39 VERNIER HEIGHT GAUGE

Vernier depth gauge



Gear Tooth Vernier

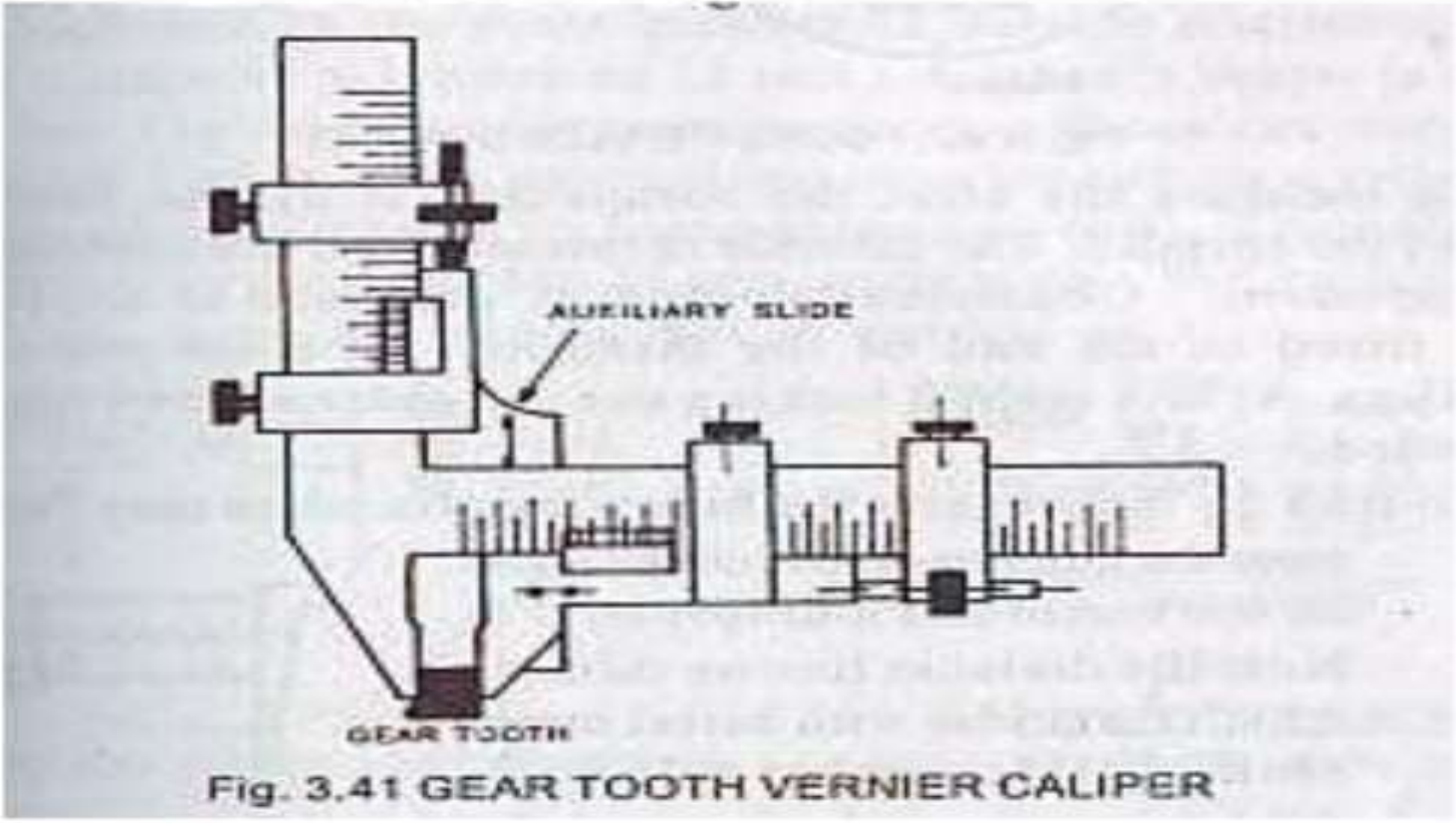


Fig. 3.41 GEAR TOOTH VERNIER CALIPER

Micro meter

- Micrometer is precision tool used to measure upto an accuracy of 0.01mm.
- Used to measure outside diameter, inside diameter and thickness of objects

Types of micrometers

1. Out side micrometer
2. Inside micrometer
3. Depth micrometer

Micro meter

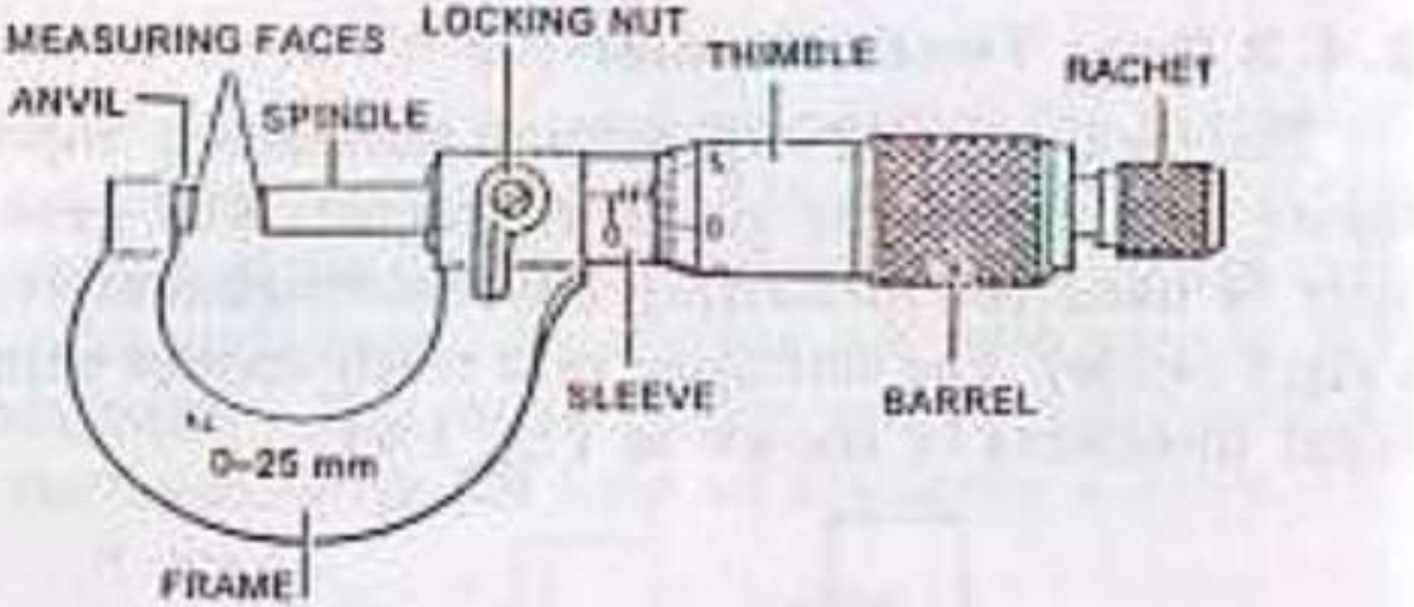


Fig. 3.42.1 OUTSIDE MICROMETER

Inside micrometer

Depth micrometer

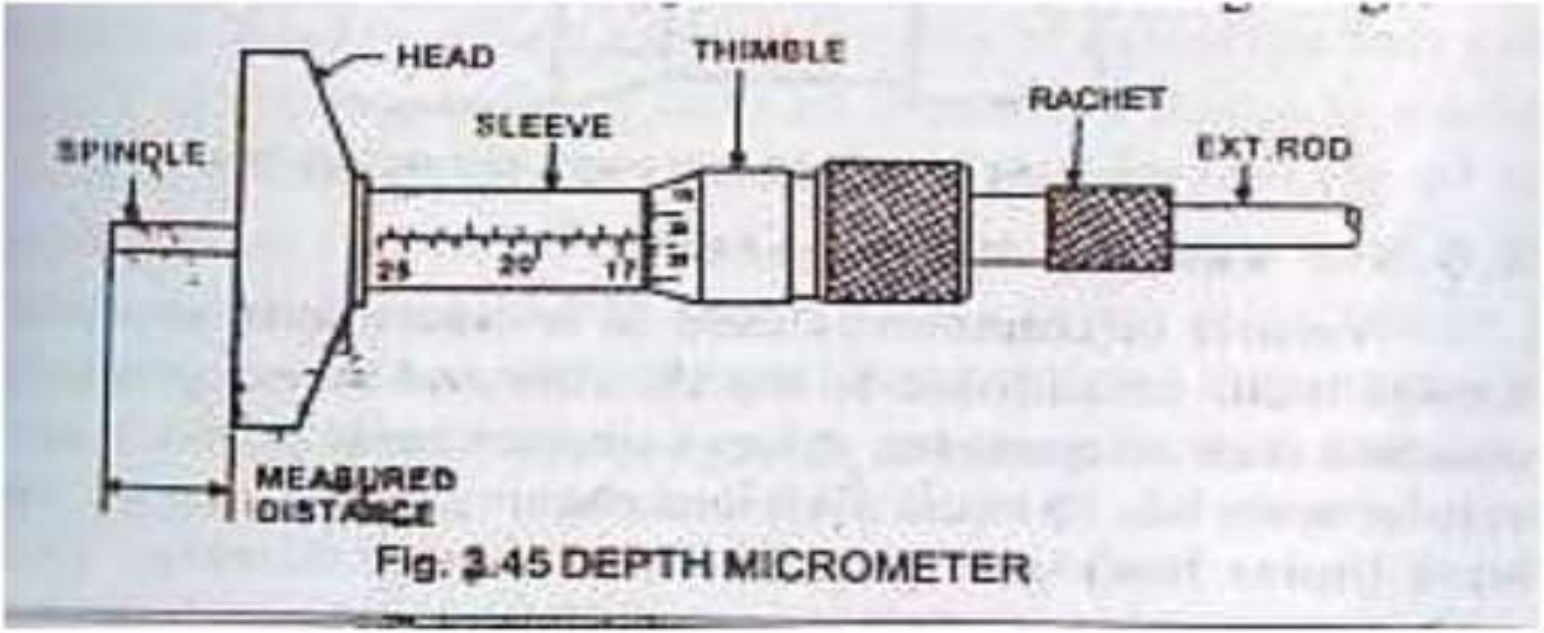


Fig. 3.45 DEPTH MICROMETER

Thank You…