

# FITTING SHOP



## **SAFETY PRECAUTION**

1. Never operate any machine unless you know how to operate it.
2. Always wear uniform in the workshop, never wear loose clothes.
3. Never touch moving parts, belts or rotating tools etc.
4. In case of any fire, the electric supply should be disconnected.
5. Always move the hacksaw in perfect straight and horizontal direction.
6. Never tilt the hacksaw blade while sawing.
7. The blade should be tightened sufficiently.
8. Grip the job in bench-wise properly.
9. Hacksaw blade should be fixed in proper direction and tightened.
10. Use water as a coolant while sawing.
11. Hold the chisel firmly while chipping.
12. Drill the holes centralizing on pop marks, give gradual feed.
13. Check the dimensions time to time carefully with Vernier clipper.
14. Tap should be held perpendicular and rotated every half turn forward reverse quarter turn backward.
15. Use lubricating oil during tapping.
16. Always keep your mind on the job.

## **LIST OF PRACTICALS**

1. To study the different type of hand tools use in fitting shop.
2. To perform the operations of marking, Filing & Sawing on the given Mild steel work piece as per given dimensions
3. To perform the operations of Drilling for making the holes on the given Mild steel work piece (M.S. Flat) by the use of drilling machine..
4. To perform the operations of making internal threads by the use of Tapes.

## **INTRODUCTION**

Fitting jobs involves the removal of excess/ unwanted material from blanks with the help of hand tools so that they could be assembled as specified in drawing. It is done for the assembly practice by mating surfaces/edges of components leading to assembly.

## EXPERIMENT NO.1

**OBJECTIVE:** - To study the different type of hand tools use in fitting shop.

### CLAMPING TOOLS

Clamping tools are used for holding the job firmly during various fitting operations.

- (i) **Bench vice:** It is a common tool for holding the jobs. It consists of cast iron body and iron jaws .The jaws are opened up to required length, job is placed in the jaws and is fully tightened with handle (see fig.1)
- (ii) **Leg vice:** It is stronger than bench vice and used for heavy work.( see fig.2)
- (ii) **Hand vice:** It is used to grip very small objects (see fig.3)
- (iii) **Pin vice:** Pin vice is used to hold wire or small diameter rods. (see fig.4)
- (v) **Pipe vice:** It is used to hold pipes. It grips the pipe at four places and is fixed on bench or can be grouted. (see fig.5)

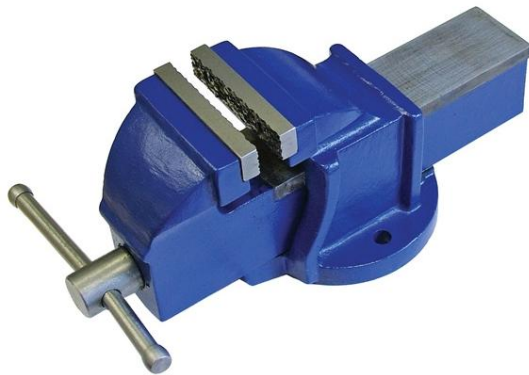


fig.1



fig.2



fig.3



fig.4



fig.5

## MEASURING AND MARKING TOOLS

- (i) **Try Square**: It is used for checking squariness of two surfaces. It consists of a blade made up of steel, which is attached to base at  $90^\circ$  (see fig.6)
- (ii) **Bevel Protector**: It consists of a steel dial divided into  $360^\circ$  divisions, used for measuring angles (see fig.7)

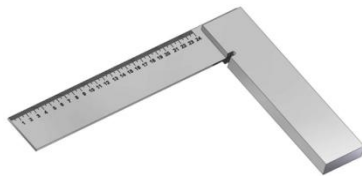


fig.6

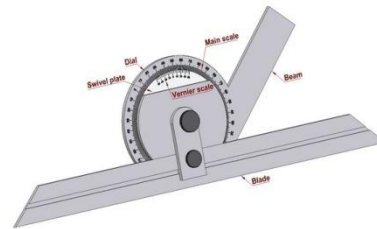


fig.7

- (iii) **Scriber and Surface Gauge** – It is used for marking of lines parallel to a surface. Scriber mounted on a vertical bar is called surface gauge. (see fig.8)
- (iv) **Dot Punch** – It is used for marking dotted lines. Angle of punching end is  $60^\circ$  (see fig.9)

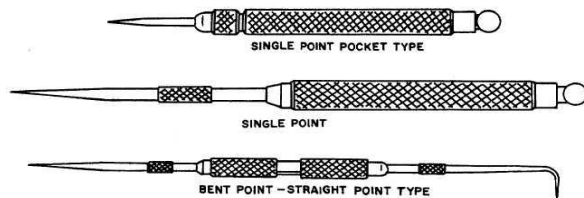


fig.8

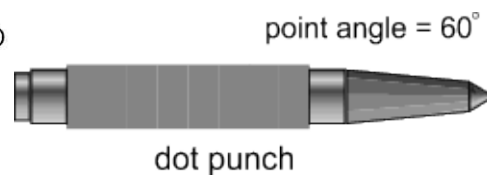


fig.9

- (v) **Centre Punch** – It is like a dot punch used to mark the centre of hole before drilling. Angle of punch end is  $90^\circ$  (see fig.10)
- (vi) **Surface Plate** – Surface plate is used for testing the flatness, trueness of surfaces; its upper face is planned to form a very smooth surface. (see fig.11)



- (vii) '**V**' Block: It is used for supporting as well as marking of round jobs (see fig.12)
- (viii) **Steel Rules** – It is made up of stainless steel and marked in inches or millimeters, available in various sizes 6” ft to 36 “(see fig.13)
- (ix) **Dividers** – Dividers have two legs having sharp feet. It is used for marking arcs, dividing a line or transferring the dimensions.( see fig.14)
- (x) **Calipers:** it is generally used to measure the inside or outside diameters. (see fig.15)
- (xi) There are four types of calipers.
- (xii)
  - a) Outside calipers
  - b) Inside calipers
- (xiii)
  - c) Spring calipers
  - d) Odd leg calipers





Divider

fig.14



Inside



Outside

fig.15

## CUTTING TOOLS

1. **Hacksaw** – It is used of cutting of flats, rods etc. The blade of hacksaw is made up of high carbon steel and frame is made from mild steel. The blade is placed inside the frame and is tightened with the help of a flange nut. The teeth of hacksaw blades are generally forward cut. There are two types of hacksaw frames, fixed frames and adjustable frame. The material to be cut with hacksaw is clamped in a vice. The hacksaw should be moved perfectly straight and horizontal. (see fig.16 &17)



fig.16

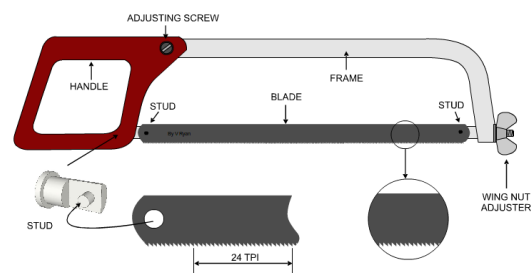


fig.17

2. **Files**–It is used to remove material by rubbing it on the metal.

### Classification of files.

- i) **Size** – The length of file vary from 4 inch to 14 inch.
- ii) **Shape**–The shapes available are flat, square, round, half-round, triangular etc.
- iii) **Cuts** – Single and Double Cut.
- iv) **Grade** –Rough - 20 Teeth per inch.

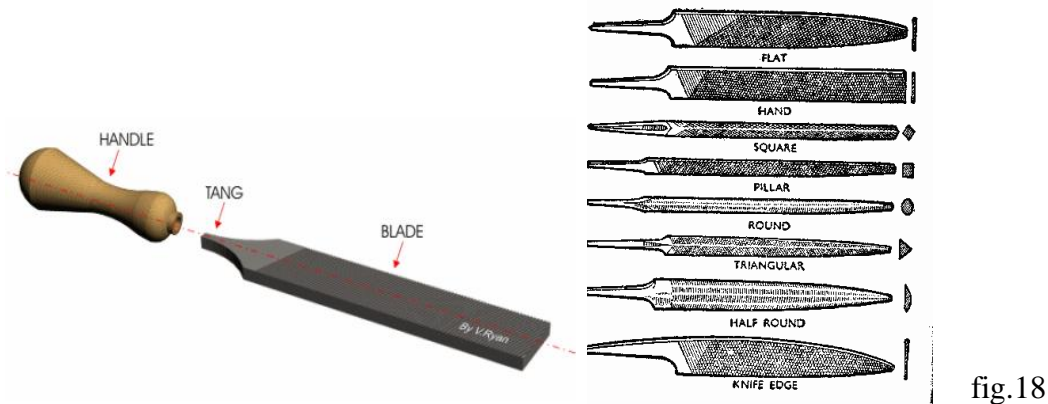
**Bastard** - 30 Teeth per inch.

**Second Cut** - 40 Teeth per inch.

**Smooth** – 50-60 Teeth per inch.

**Dead Smooth** - 100 Teeth per inch.

Rough and Bastard files are used for rough cutting, smooth and dead smooth files are used for finishing work. Files should be used in perfect horizontal position. Pressure should be applied on the forward stroke only. Work is held in a vice (see fig.18)



## **STRIKING TOOLS**

**Hammers:** - are the only tools used for striking in fitting shop like chipping, fitting, punching etc. They are three types mostly use in fitting shop.

1. Ball Peen Hammer
2. Straight Peen Hammer
3. Cross Peen Hammer

### **Ball Peen Hammer**

A ball-peen hammer, also known as a machinist's hammer, is a type of peening hammer used in metal working. It is distinguished from a cross-peen hammer, straight-peen hammer, cross peen by having a hemi spherical head. (see fig.19)

### **Straight Peen Hammer**

A straight peen hammer is used like the cross peen but differs from the cross peen since its penning edge is turned ninety degrees. This keeps the handle parallel to the struck surface. (See fig.20)

### **Cross Peen Hammer**

A cross peen hammer is used as a chisel for removing rivet heads and for stretching or bending metal. (see fig.21)



Fig. 19



Fig. 20



Fig. 21

## **EXPERIMENT NO.2**

**OBJECTIVE:** - To perform the operations of Marking, Filing and Sawing on the given Mild steel work piece as per given dimensions.

**Tools and equipment used:** - Bench vice, Hacksaw. Files, Scriber, Steel rule, Try square, Hammer, Surface plate, surface gauge, Ball peen hammer etc.

**Materials required:** - Mild steel flat 48mm x 48mm x 7mm.

**Drawing:** - (See fig.22)

### **Theory:-**

**Marking** – Measurement is performed on the job by measuring instrument and scriber does marking.

**Filing** – This operation is performed with the help of files, pressure should be exerted in the forward stroke and backward stroke is ideal.

**Sawing** – This operation is required to cut the metal in different sizes and shapes by hacksaw.

### **Procedure:-**

1. Mark the M.S flat 50 x 50mm and cut the metal pieces with Hacksaw, clamping in a Bench vice.
2. File the two sides at right angle, check with try square.
3. Mark the other two sides with surface gauge on a surface plate supporting by angle plate to dimension 48 x 48 mm.
4. Cut extra metal and file to accurate 48 x 48 mm square piece. Finish the surface with smooth file keeping tolerance  $\pm 0.5$  mm; check the dimension with steel scale.
5. Mark parallel lines at 15mm distance on a finished square piece of 48 x 48 mm as shown in diagram.
6. Punch mark at equal distance Drill 7 mm dia. hole.
7. Draw an arc of radius 33 mm from centre of 7mmdia. Hole, and cut the exterior metal with hacksaw and filing them with flat file.



### **Safety Precaution**

1. Grip the Job in the vice properly.
2. Always move the hacksaw in perfect straight and horizontal position.
3. Hacksaw blade should be fixed in proper direction and tightened sufficiently with correct tension.
4. Check the dimension time to time carefully, check with Try square and steel scale.

**Outcomes:** - On successful completion of this experiment, the students will be able to understanding the “Marking, Filing & Sawing process with hand tools.

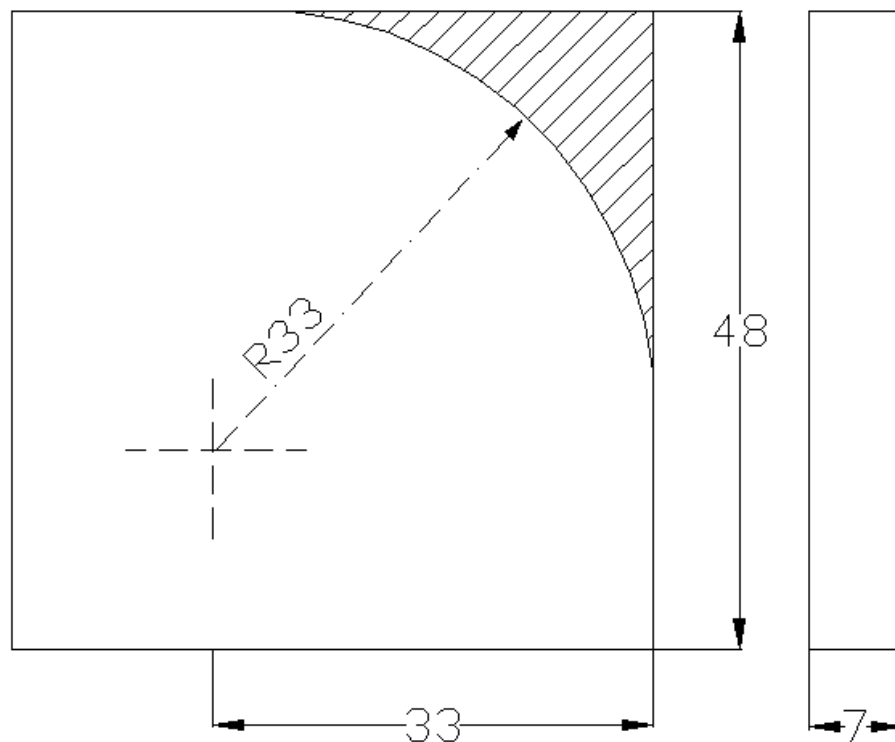


fig.22

**Note: - All dimensions are in mm**

### **EXPERIMENT NO.3**

**Objective:** - To perform the operations of Drilling for making the hole on the given Mild steel work piece (M.S. Flat) by the use of Drilling machine.

**Tools and equipment used:** - Drilling machine, vice, Scriber, Steel rule Ball peen hammer.etc

**Materials required:** - Mild steel flat 48mm x 48mm x 7mm.

**Drawing:** - See fig.23

#### **Theory:-**

A drilling machine, called a drill press, is used to cut holes into or through metal, wood, or other materials. Drilling machines use a drilling tool that has cutting edges at its point. This cutting tool is held in the drill press by a chuck or Morse taper and is rotated and fed into the work at variable speeds. Drilling machines may be used to perform other operations. They can perform countersinking, boring, counter boring, spot facing, reaming, and tapping Drill press operators must know how to set up the work, set speed and feed, and provide for coolant to get an acceptable finished product. The size or capacity of the drilling machine is usually determined by the largest piece of stock that can be center-drilled. To determine the size of the drill press is by the largest hole that can be drilled, the distance between the spindle and column, and the vertical distance between the worktable and spindle.

**Drilling** – This is done to produce holes with the help of drills. It is done on a drilling machine and job is held in a machine vice. Drill is fixed on the drilling machine.

**Drill Bit**– It is used for making round holes. Twist drill is most commonly used for making holes. (See fig.24)

#### **Procedure:-**

1. Mark the M.S flat 50 x 50mm and cut the metal pieces with Hacksaw, clamping in a Bench vice.
2. File the two sides at right angle, check with try square.
3. Mark the other two sides with surface gauge on a surface plate supporting by angle plate to dimension 48 x 48 mm.
4. Cut extra metal and file to accurate 48 x 48 mm square piece. Finish the surface with smooth file keeping tolerance  $\pm 0.5$  mm; check the dimension with steel scale.
5. Mark parallel lines at 15mm distance on a finished square piece of 48 x 48 mm as shown in diagram.
6. Punch mark at equal distance Drill 7 mm dia. hole.
7. Hold the work piece in drilling machine vice and doing drilling hole of 7mm dia. with the use of drill bit and with the help of drilling machine.

### **Safety Precaution**

1. Grip the Job in the vice properly.
2. Drill the holes centralizing on popper marks, give gradual feed.

**Result:** - The hole of given dimensions is completed by the use of drilling machine.

**Outcome:** - On successful completion of this experiment, the students will be able to understanding the working drilling machine and also understand the different drilling machine operation.

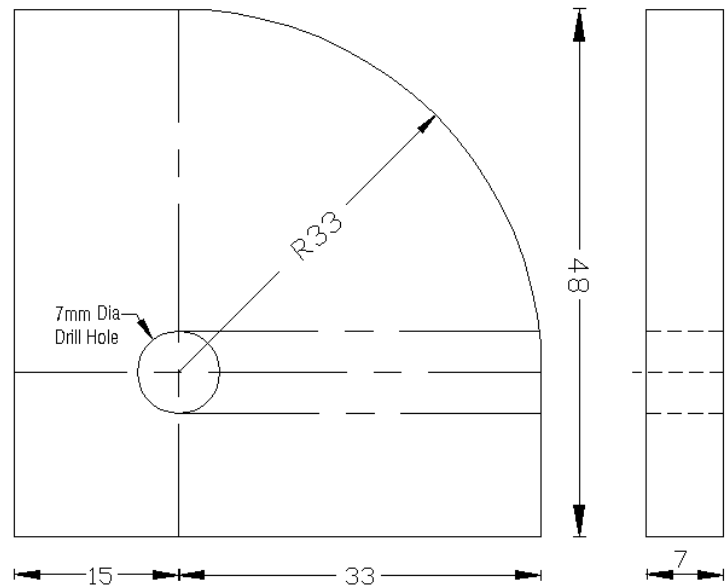


fig.23

Note: - All dimensions are in mm

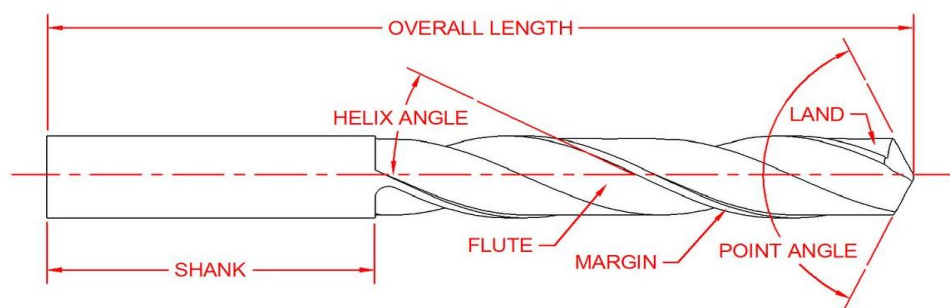


fig.24