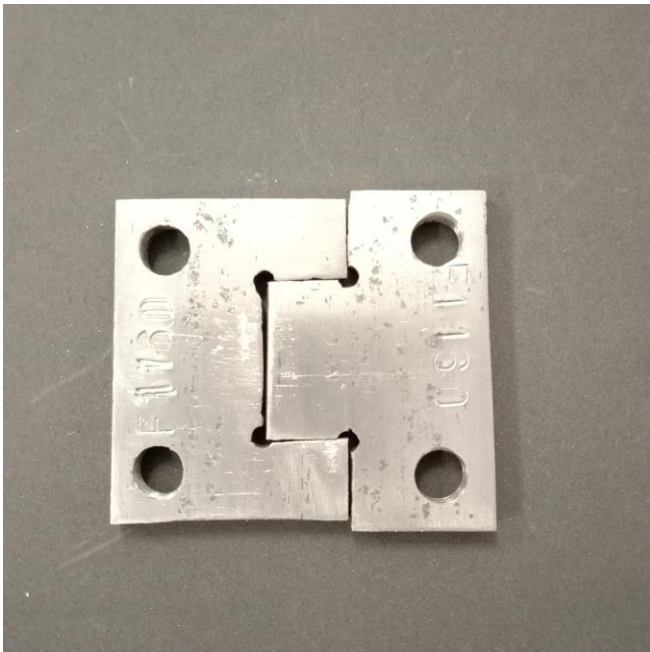


# **FITTING WORKSHOP WRITE-UP**

**By ANEESH PANCHAL (2K20/A6/56)**

## **INTRODUCTION:**

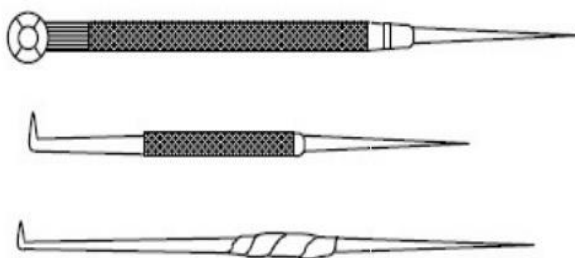
In engineering fields, fitting and bench work play an important role in yielding the desire shape and accuracy. Bench Work is the production of a job by hand on the bench. Fitting is the proper assembling of 2 or more parts.



## **TOOLS AND DEVICES IN FITTING WORK:**

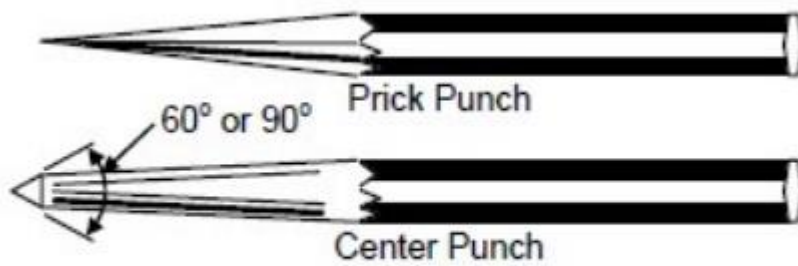
### **a) Marking and Measuring Tools:**

1. Engineering Scale: Used for taking linear measurements of any surface.
2. Surface Plate: Used for marking out works and for testing the flatness of work.
3. Scriber: Used to scratch the lines on a given surface.



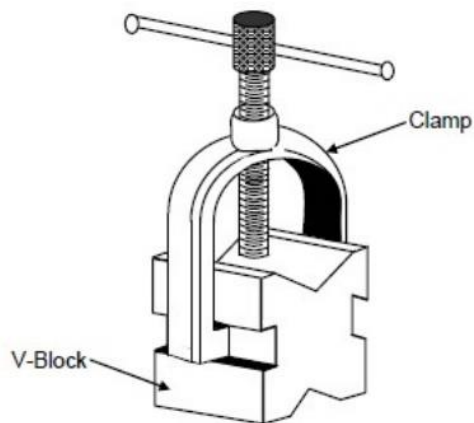
Scriber

4. **Universal Surface Gauge:** Used to scribe parallel lines at desired heights.
5. **Punch:** Used for marking out work and locating canters in permanent manner.



**Punch**

6. **V-Block:** For marking and drilling on a cylindrical workpiece, it serves useful support to the workpiece.

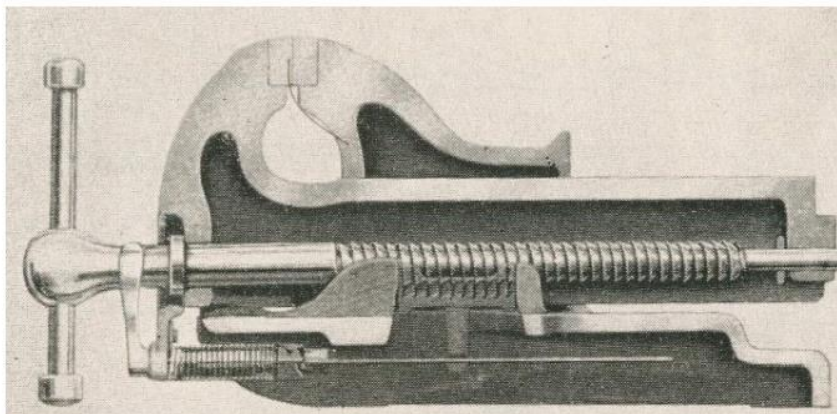


**V-Block**

7. **Try square:** Used to check 90 degrees angle between 2 adjacent surfaces.
8. **Vernier Calipers:** Used to measure height components.
9. **Micro meter:** Used to measure the thickness of the components.

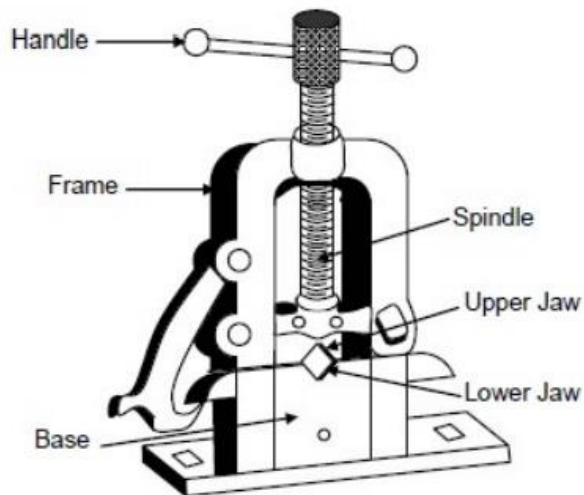
### **b) Holding and Supporting Tools:**

1. **Bench Vice:** It consists of cast-iron body with two jaws, a handle of mild steel, a square threaded screw of high carbon steel and a box nut of gun-metal.



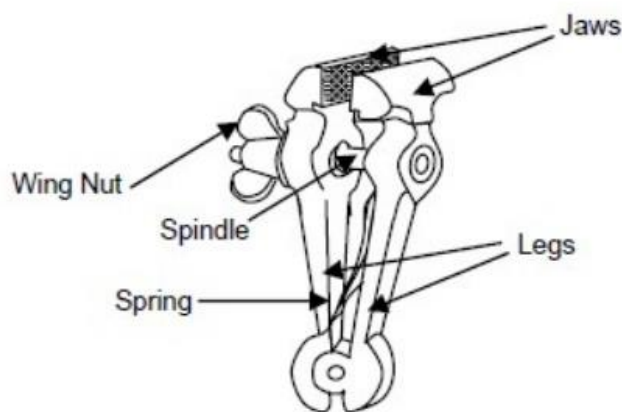
**Bench Vice**

2. **Pipe Vice:** It consists of a cast iron frame and base. The frame is made in 2 halves, i.e. top and bottom parts. It is used for holding round section metals.



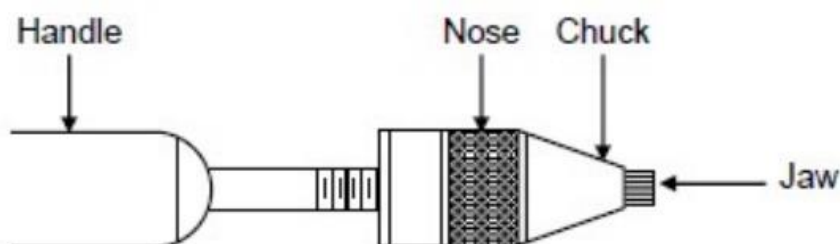
**Pipe-vice**

3. **Hand Vice:** It consists of 2 steel legs which are hinged together at the bottom and carrying the 2 hardened steel jaws at the top end. It is used for small jobs.



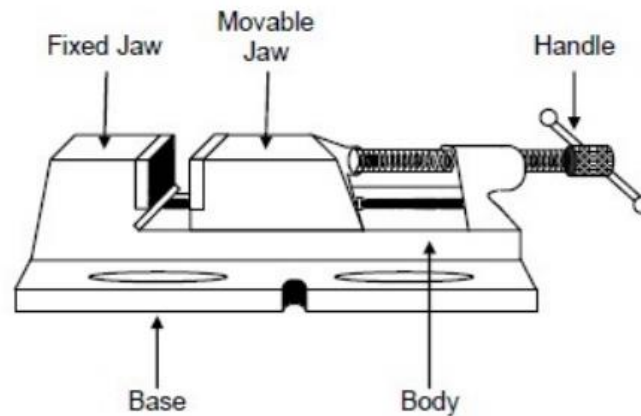
**Hand-vice**

4. **Pin Vice:** It consists of a handle and a taper nose carrying a small collect chuck at its end. It is used for holding round jobs of small diameters.



**Pin-vice**

5. **Tools Maker's Vice:** It is made of mild steel. It is used for holding small sizes of jobs which require filing and drilling etc.

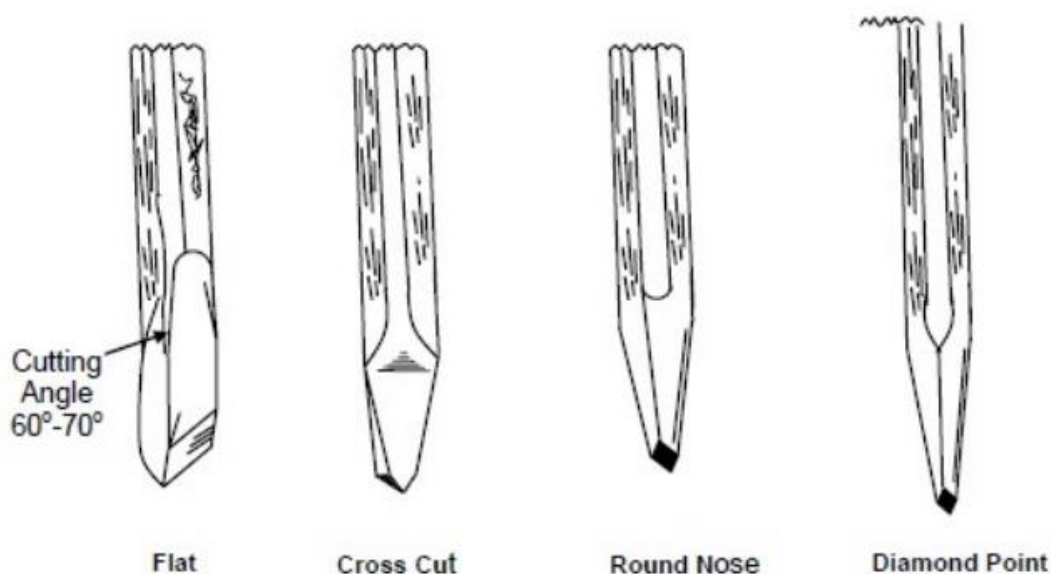


**Tool Maker's-vice**

### **c) Cutting, Filing and Scraping Tools:**

**i) Chisels:** Used for cutting and chipping away pieces of metal. These are made up of high carbon steels.

1. **Flat chisel:** Its cutting edge is given a slight curve so as to prevent the corners from digging into the metal.
2. **Cross Cut chisel:** Used for cutting grooves in large surfaces and keyways in shafts.
3. **Round Nose chisel:** Specific use of this type of chisel is in cutting oil grooves in bearing, bosses and pulleys etc.
4. **Diamond Point chisel:** One end of this chisel is drawn to a small square section by using forging operation and then this end is ground off at an angle producing the "Diamond" shape.



**Some common types of chisels**

**ii) Files:** These are made up of high carbon steels.

Functions of Files:

1. Remove extra metal from any surface.
2. Finish the final shape of a work piece.
3. Remove the burr from cuts.
4. Make a surface smooth.
5. Fitting metal parts.

Factors for classification of files:

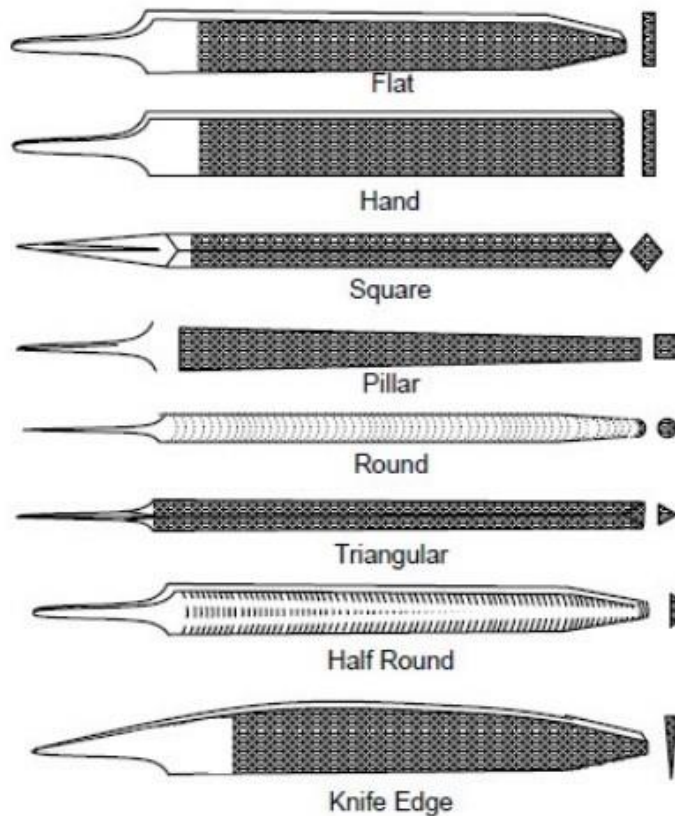
1. Effective length, i.e. excluding the length of tang.
2. Shape or cross section.
3. Cut of teeth.
4. Grade.

**1. Effective Length:** Files of length between 100 mm to 150mm are used for fine work, between 150 mm to 250 mm for medium sized work and above 250 mm for heavy and large sized of work.

**2. Shape or Cross Section:**

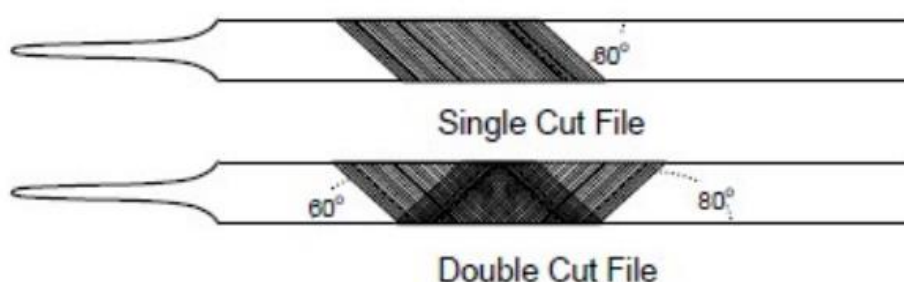
- a) **Flat File:** This is tapered in width and thickness both. Flat file is always double cut on the faces and single cut on the edge. It is used for general work only.
- b) **Hand File:** This is tapered in thickness and parallel in its width. They are always double-cut on the faces and single cut on one edge only. They are also known as Safe Edge File. It is used for filing a surface which is at right angle to an already finished surface.
- c) **Square File:** It is square in cross-section, double-cut and tapered towards the point used for finishing or enlarging square or rectangular sections as splines and keyways.
- d) **Pillar File:** This is double-cut, narrow and of rectangular section. It has one safe edge, and is used for narrow work such as slots, grooves and keyways.
- e) **Round File:** A round file has a circular cross-section and carries single-cut teeth all around its surface. They are used for filing curved surfaces and enlarging round holes and forming fillets.
- f) **Triangular File:** It carries single-cut teeth on all the faces and is made tapered towards the end. The cross section of this file is an equilateral triangle. They are used for filing corners less than 90 degrees and filing on rectangular cuts.

- g) **Half Round File:** It normally has single-cut teeth on the curved surface and double-cut teeth on flat surface. This file is used for filing on round or curved surfaces.
- h) **Knife Edge File:** It carries double-cut teeth on two broad faces and single cut teeth on the edge. Specifically used in filing narrow and intricate sharp corners having an inclined angle of less than 90 degrees.



### 3. Cut of Teeth:

- a) **Single Cut:** Teeth are cut parallel to each other at an angle of 60 degrees to the centre line of file. Single cut files are commonly used on very hard metal.
- b) **Double Cut:** In double-cut, there are two sets of teeth; one similar to those of a single-cut file and the other running diagonally across the first set and inclined at an angle of about 75 degrees to 80 degrees to the centre line of face on which the teeth are cut. It is used for filing on surfaces steel and softer materials.



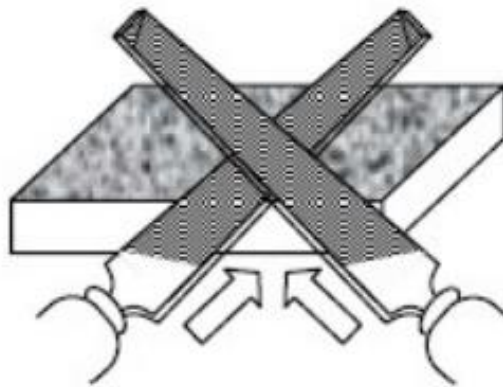


4. **Grade:** Classification according to Grade is as follows:

- a) Rough: 8 Teeth per cm
- b) Bastered: 8-12 Teeth per cm
- c) Second cut: 12-16 Teeth per cm
- d) Smooth: 16-24 Teeth per cm

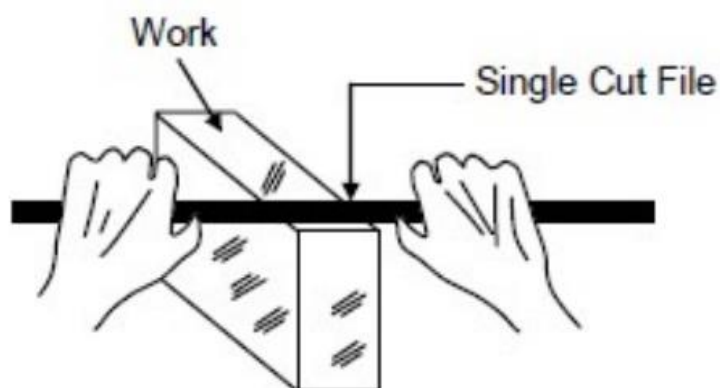
5. **Methods of Filing:**

- a) **Cross Filing:** In this method, the file strokes run alternately from right to left and then left to right. It is the commonest form of filing to remove the maximum amount of extra metal from any surface. This method of filing is preferred for general shaping purpose.



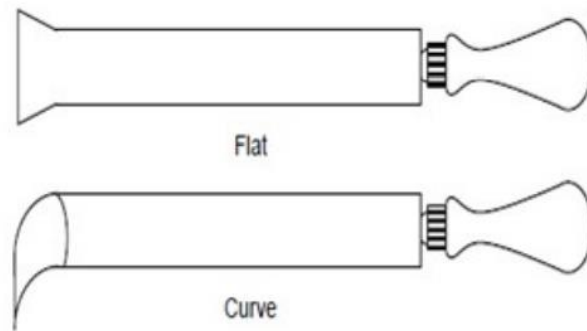
**Cross Filing**

- b) **Straight Filing:** This method of filing is preferred on long and narrow piece or work whose width is less than that of the file. Movement is given only in forward direction while on the back stroke, the file should be lifted clear of the work not to blunt the teeth.
- c) **Draw Filing:** In this method, the handle of file is not held. Instead, both hands are placed together on the blade. The position of file is placed at right angle to the axis of work. File moves up and down along the length of metal and finish the surface in both forward and backward strokes.



**Draw Filing**

**iii) Scraper:** Scrapers are used for scraping purpose. Scraping means shaving for obtaining a fine surface finish on the work and the tools used for doing this operation are known as “scrapers”. They are generally made from rejected files.



Scrapers

**iv) Hacksaw:** It is used for parting off operation or in making a slot on metallic surface. It consists of a metallic frame either fixed type or adjustable type which is fitted with a wooden handle. Hacksaw blades are made of high carbon steel or high speed steel. Hacksaw Flat Curve blades are specified according to width and length.

#### **d) Striking Tools:**

- i) **Ball Peen Hammer:** The peen has a shape of ball which is hardened and polished. Particularly this type of hammer is used for riveting and chipping purpose.
- ii) **Cross Peen Hammer:** It is similar to ball peen hammer except the peen which is across the handle. It is mainly used for bending and hammering into shoulders etc.
- iii) **Straight Peen Hammer:** It has a peen straight with the handle that is parallel to the handle and is specially used for peening or stretching the metal.

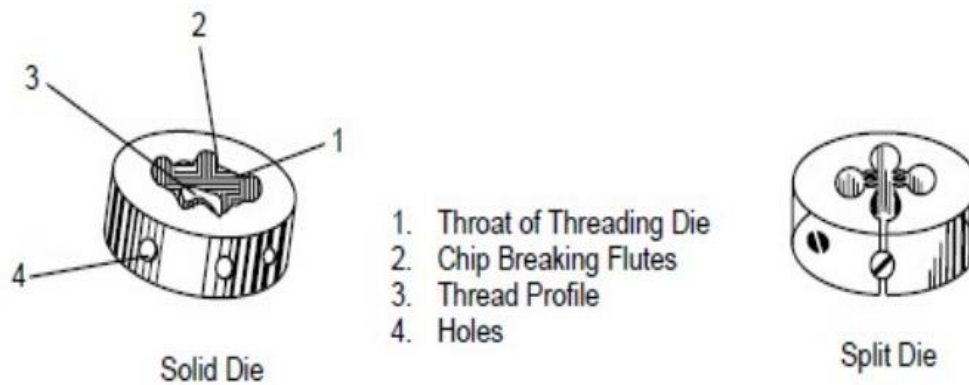


Hammers



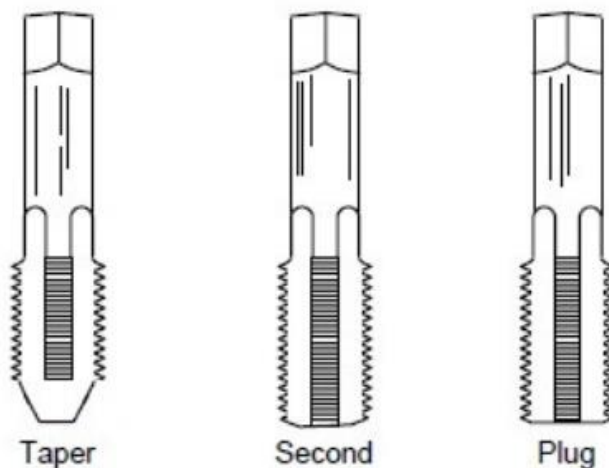
### e) Drilling, Reaming, Dieing and Tapping Tools:

- i) **Drill:** It is a tool for making hole in a given metallic piece. Drills are made of high carbon steel or high speed steel. They are simply used in carpentry work.
- ii) **Twist Drill:** It is usually made of high speed steel. Twist drill has a cylindrical body carrying the spiral flutes cut on its surface.
- iii) **Reamer:** It is used just to finish a drilled hole or to bring it to the correct size. It consists of two main parts which are Shank and Body. Reamers are made of high speed or high carbon steel.
- iv) **Die:** It is used for cutting external thread on a cylindrical surface such as bolt and stud etc. Dies are made of high carbon or high speed steel.



**Different Types of Die**

- v) **Tap:** It is used for cutting internal thread in a cylindrical hollow surface such as nut and hollow shaft. Taps are also made of high carbon or high speed steel.



**Tapping tools**

### f) Miscellaneous Tools:

- i) **Screw Drivers:** These are very useful for rotating the screws. Loose and tight position of a screw is adjusted by it.
- ii) **Spanners:** These are made of forged steel. They are used for holding and adjusting nuts and bolts in their exact positions.
- iii) **Pliers:** These are used for grabbing wires and screws.

## **OPERATIONS IN FITTING WORK:**

1. **Marking and Measuring:** Most important as finished job totally depends on it.
2. **Chipping:** Operation of removing thick layers of metal from any metallic piece by means of cold chisel and hammer.
3. **Filing:** Serves to remove the burr from cuts, clean the face of the cuts and finish the final shape of a work piece.
4. **Hacksawing:** Blade of hacksaw cuts the metal, but it do so only on forward stroke.
5. **Scraping:** Operation done for producing more accurately finished surfaces than those which can be produced by filing.
6. **Grinding:** Through this operation, usually 0.25 to 0.5 mm metal can be removed from any surface.
7. **Drilling:** Operation produces standard sizes of circular holes through a metal piece.
8. **Reaming:** Used to remove little metal from the drilled hole.
9. **Dieing:** Cutting external threads on a round bar by means of die.
10. **Tapping:** Cutting internal threads in a round hollow section by means of tap.

# WRITE UP / EXPERIMENT-III

## AIM:

To prepare a T (Internal Fit) joint in Fitting workshop.

## TOOLS AND MACHINERY USED:

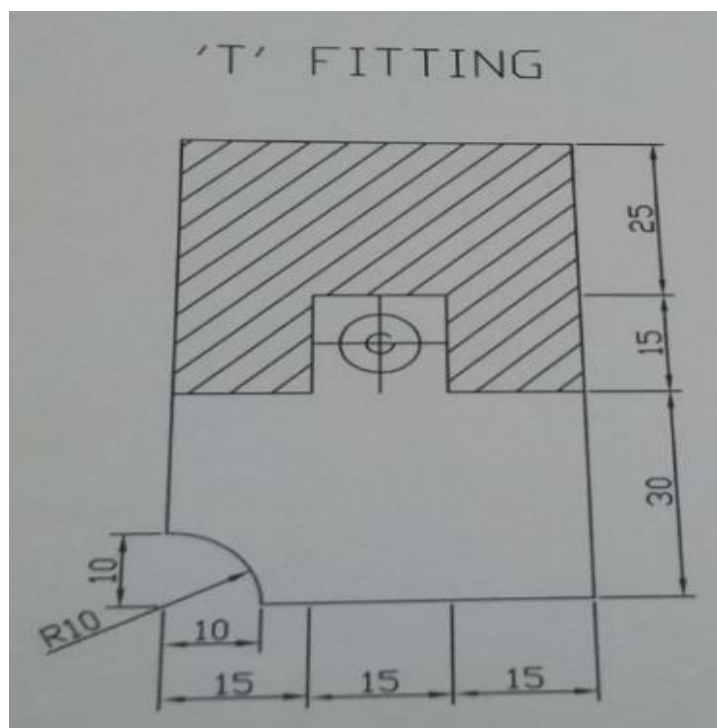
Hack-Saw frame, Files, Bench Vice, Try-Square, Marking Tools, Drilling Machine (Drills and Taps).

## MATERIAL:

MS Plate 5mm thickness.

## STEPS FOR THE PREPARATION:

1. First to cut the two MS work pieces using hacksaw.
2. Filing of the two work pieces to desired shape.
3. At appropriate intervals, check the right angle edge using try square.
4. Paste wet chalk on the pieces and when the chalk is dry, mark using vernier calipers.
5. Punching is done at appropriate markings.
6. Make holes by drilling the work piece.
7. Make the T out of the 2nd piece using a hacksaw and then filing is done.



## PROCEDURE(IN OWN WORDS):

1. After cutting the raw material edges have some excess material which may harm our hand.
2. Extra material or excess material is known as Burr. So we remove these burrs by filing them by using 14 inches Bastard File.
3. After this we do flattening and right angle filing.
4. After De-Burring clamp the work piece in Bench-Vice (it should be parallel and perpendicular to the jaw plates).
5. Use Double-Cut File then do the Cross Filing.
6. After filing check the flatness by using Tri-Square.
7. Again De-Burr all the sides.
8. Repeat the process for the work-pieces again.
9. Then do the marking process using dot punch and scribes. Dot punch is used using ball pin hammer.
10. The 2 drill holes are called vent holes or relief holes. Marking of the other (female) part is done through chain drilling process.
11. After marking is done clamp the female work-piece in the bench vice.
12. Then using hacksaw cut the materials according to their marking.
13. After Hacksawing is done, take the chisel and do chipping i.e. cutting process using hammer and chisel.
14. After this clamp the male work-piece in the bench vice.
15. Then using hacksaw cut the materials according to their marking.
16. After this process again do the filing of all the sides of work-piece.
17. The required male and female part is now ready.

## RESULT:

The desired T (Internal Fit) joint is now obtained.

**THANKS FOR READING !!!!!**