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CENTRAL WORKSHOP

SUBJECT: WORKSHOP PRACTICES
(INTRODUCTION TO FITTING SHOP)

CONTENT

INTRODUCTION

1. The term fitting, is related to **assembly of parts**, after bringing the dimension or shape to the near required size or form, in order to secure the necessary fit. The operations required for the same are usually carried out **on a work bench**, hence the term **bench work** is also added with the name **fitting.**
2. The bench work and fitting plays an important role in engineering. Although in today's industries most of the work is done by automatic machines which produces the jobs with good accuracy but still it (job) requires some hand operations called fitting operations.
3. The person working in the fitting shop is called **fitter.**

OBJECTIVES

1. To understand different type of raw-materials useful for fitting shop work.
2. To understand different types of tools useful for fitting shop work.
3. To understand entire manufacturing process of fitting job.
4. To understand different advantages and application of fitting work.

MATERIALS USED IN FITTING SHOP WORK

- A wide variety of metals (Specifically Steel), in the solid metallic form are used in fitting shop. The most commonly used are tabulated below.

Sr. No	Plain Carbon Steel	Alloy Steel
01	Mild Steel	High Speed Steel
02	Dead Carbon Steel	Stainless Steel
03	Low carbon steel	--
04	Medium Carbon Steel	--
05	High Carbon Steel	--

TOOLS USED IN FITTING SHOP WORK

- For accurate fitting shop operation various types of hand tools and machine tools are used in fitting shop. A list of them is given below,

1. Measuring and Marking Tools.
2. Work Holding Devices/ Clamping Tools.
3. Cutting Tools.
4. Striking Tools.
5. Drilling Tools.
6. Threading Tools.

CONTI…

- **Measuring and Marking Tools** – The following types of tools are commonly used in fitting shops to measure and mark the dimensions of work-pieces:

Sr No	Measuring Tools	Marking Tools
01	Steel Rule	Surface Plate
02	Calipers	Angle Plate
03	Vernier Caliper	Scriber and Surface Gauge
04	Micrometer	Punches
05	Vernier Height Gauge	Try Square

CONTI…

• Measuring Tools-

•**Steel Rule-** These are made up of stainless steel and are available in many sizes ranging from 1/2 ft. to 2 ft.

•**Calipers-** These are generally used to measure the inside or outside dimensions.

•**Vernier Caliper-** It is used for measuring the outer dimensions of round, flat, square components and also the inner size of the holes and bore.

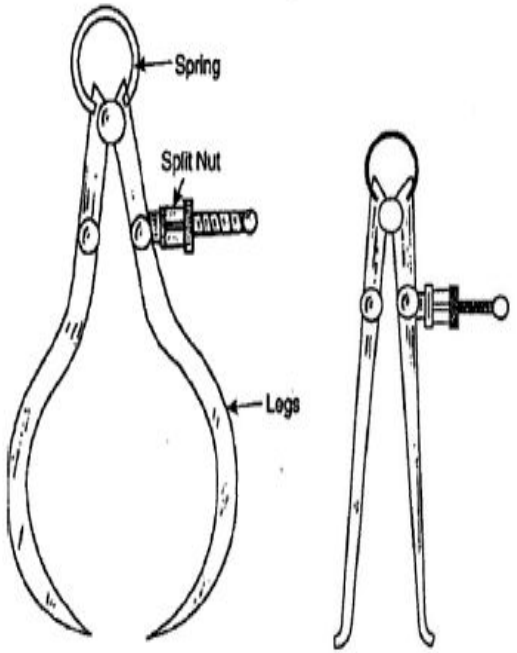
•**Micrometer-** It is used for measuring the outer dimensions of round, flat, square components with better precision

•**Vernier Height Gauge-**The Vernier height gauge is mainly useful for measurement of height of raw material or finish product.

STAINLESS STEEL RULE


VERNIER CALIPERS

MICROMETERS



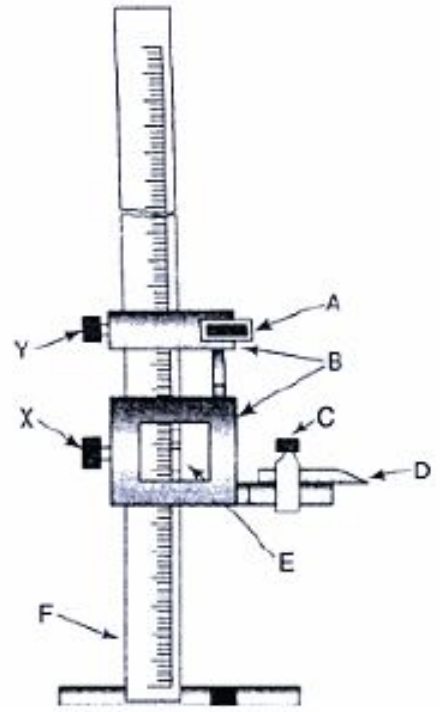


Fig. Vernier height gauge

CONTI…

• Marking Tools-

•**Surface Plate-** It is used for testing the flatness, trueness of the surfaces. It is made up of cast iron or graphite.

•**Angle Plate-** It is made up of cast iron in different sizes; it has two planed surfaces at right angles to each other and has various slots in each surface to hold the work by means of bolts and clamps.

•**Scriber and Surface Gauge-** It consists of a cast iron base on the center of which a steel rod is fixed vertically.

•**Punches-** Punches are used for marking purposes. Dot punches are used for marking dotted line and centre punch is used to mark the centre of hole before drilling.

•**Try Square-** It is used for checking squareness of two surfaces. It consists of a blade made up of steel, which is attached to a base at 90 degree. The base is made up of cast iron or steel.

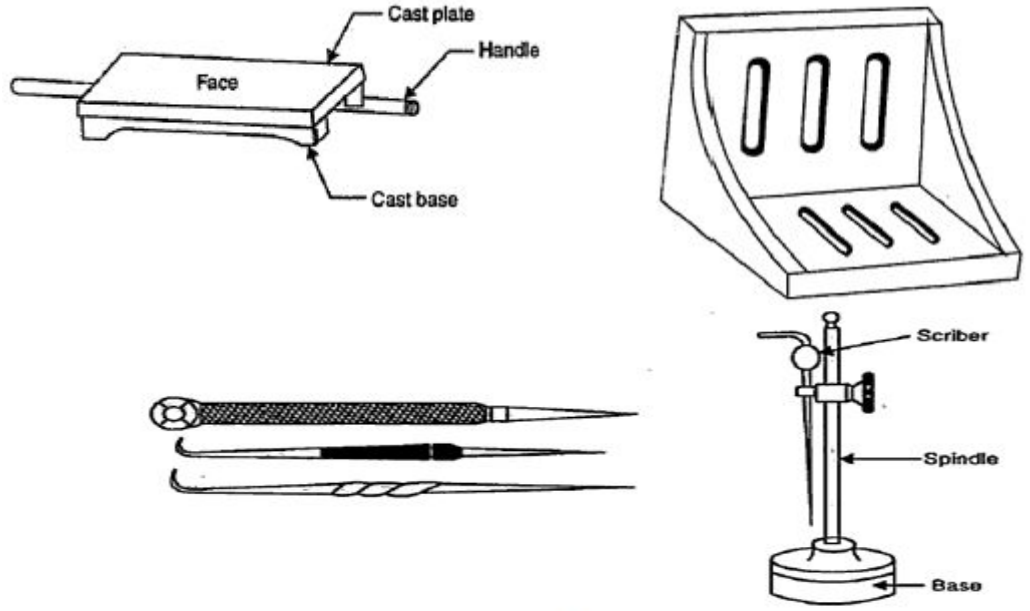
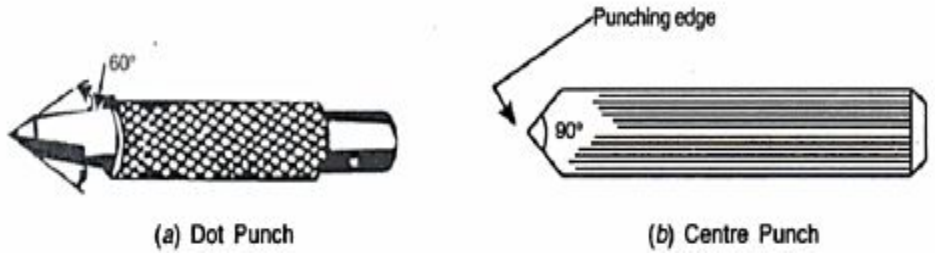
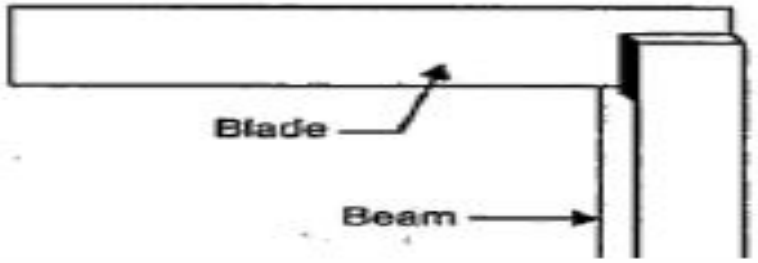


Fig. Scriber and Surface Gauge



(a) Dot Punch (b) Centre Punch



METHOD OF MARKING

- Marking means setting out dimensions with the help of a working drawing or directly transferring them from a similar part. The procedure of marking is as follows:

1. The surface to be marked is coated with the paste of chalk or red lead and allowed to dry.
2. Then the work is held In a holding device depending upon shape and size. If it is flat, use surface plate, if it is round use V block and clamp, else use angle plate etc.
3. Lines in horizontal direction are scribed by means of a height gauge. Lines at right angles can be drawn by turning the work through 90 degree and then using the scriber. If true surface is available, try square can also be used.
4. The circles and arcs on a flat surface are marked by means of a divider.
5. After the scribing work is over, indentations on the surface are made using dot punch and hammer.

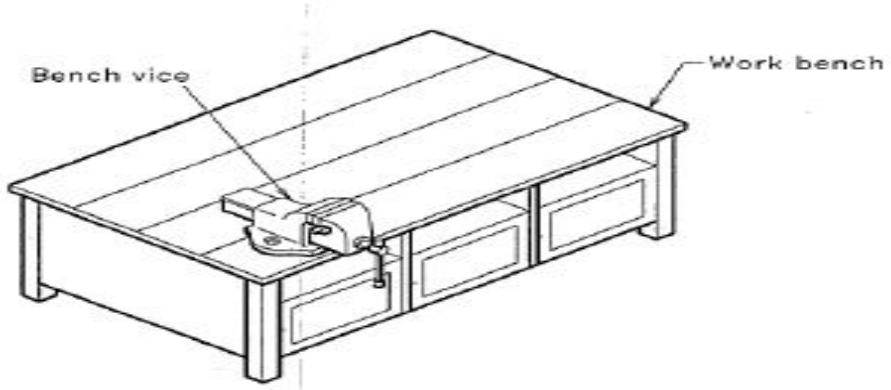
CONTI…

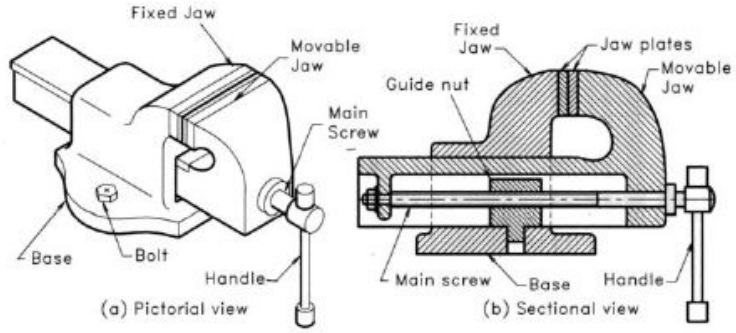
- **Work Holding Devices/ Clamping Tools–**

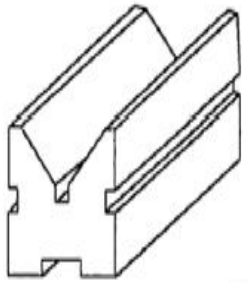
- **Work Bench-** A fitting process can be done at various places, but most of the important operations of fitting are generally carried out on a table called work bench.

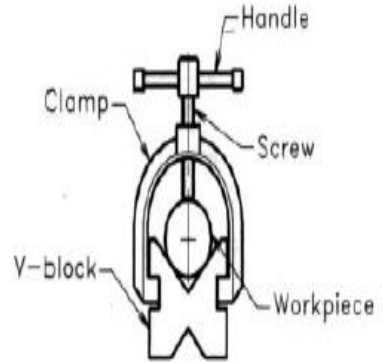
- **BENCH VICE-** It is firmly fixed to the bench with the help of nuts and bolts. It consists of a cast Iron body and cast iron jaws. Two jaw plates are fitted on both the jaws. The holding surface of the jaw plates is knurled in order to increase the gipping.

- **V Block-** In V Block, V grooves are provided to hold the round objects longitudinally. The screw of the clamp applies the holding pressure. When the handle is rotated there is movement in the screw.









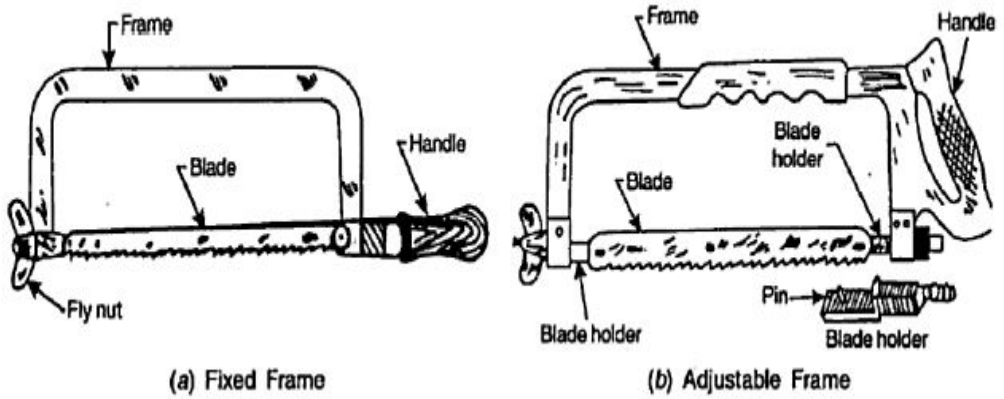
CONTI…

• Cutting Tools-

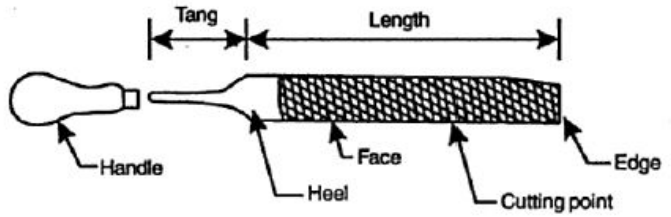
- **Hacksaw -** Hacksaw is used for cutting of rods, bars, pipes, flats etc. It consists of a frame, which is made from mild steel. The blade is placed inside the frame and is tightened with the help of a flange nut. The blade is made up of high carbon steel or high speed steel.
- **Files-** Files are multi points cutting tools. It is used to remove the material by rubbing it on the metals. Files are available in a number of sizes, shapes and degree of coarseness.

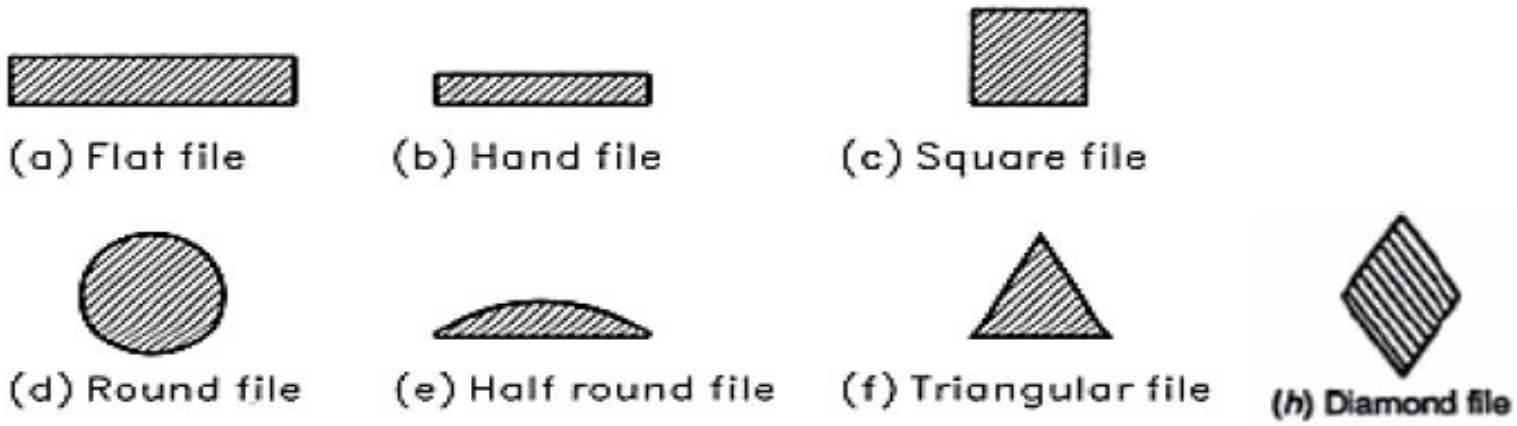
Types of file according to their use are as follows-

- Flat File
- Hand File
- Square File
- Round File
- Half Round File
- Triangular File
- Diamond File



(a) Fixed Frame (b) Adjustable Frame





CONTI…

- **Striking Tools –** The following are different striking tools are mainly useful in fitting shop operation.
- **Ball- Peen Hammer -** Ball- Peen Hammers are named, depending upon their shape and material and specified by their weight. A ball peen hammer has a flat face which is used for general work and a ball end, particularly used for riveting.
- **Cross-Peen Hammer-** It is similar to ball peen hammer, except the shape of the peen. This is used for chipping, riveting, bending and stretching metals and hammering inside the curves and shoulders.
- **Straight-Peen Hammer** -This is similar to cross peen hammer, but its peen is in-line with the hammer handle. It is used for swaging, riveting in restricted places and stretching metals.

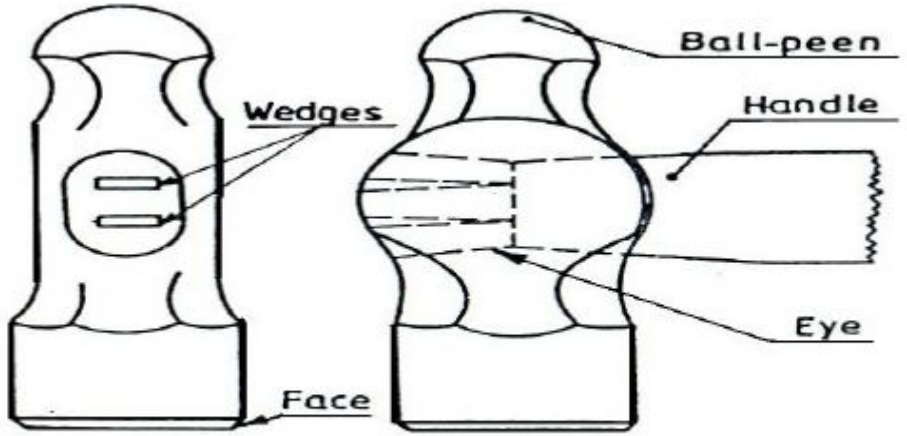


Figure 1.25: Ball peen hammer

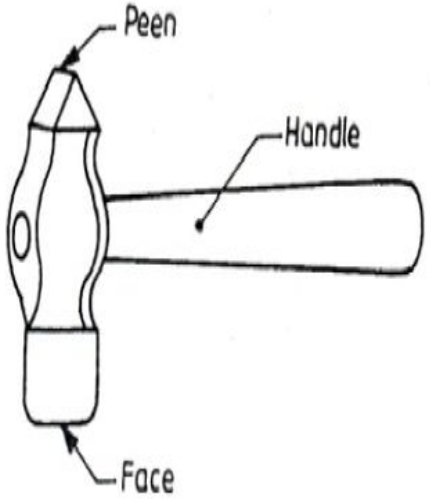


Figure 1.26: Cross peen hammer

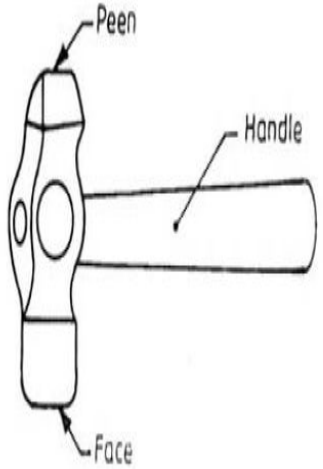


Figure 1.27: Straight peen hammer

CONTI…

- **Drilling Tools–** The following are different drilling tools are mainly useful in fitting shop operation.
- **Bench Drilling Machine -** Holes are drilled for fastening parts with rivets, bolts or for producing internal thread. Bench drilling machine is the most versatile machine used in a fitting shop for the purpose. Twist drills, made of tool steel or high speed steel are used with the drilling machine for drilling holes.

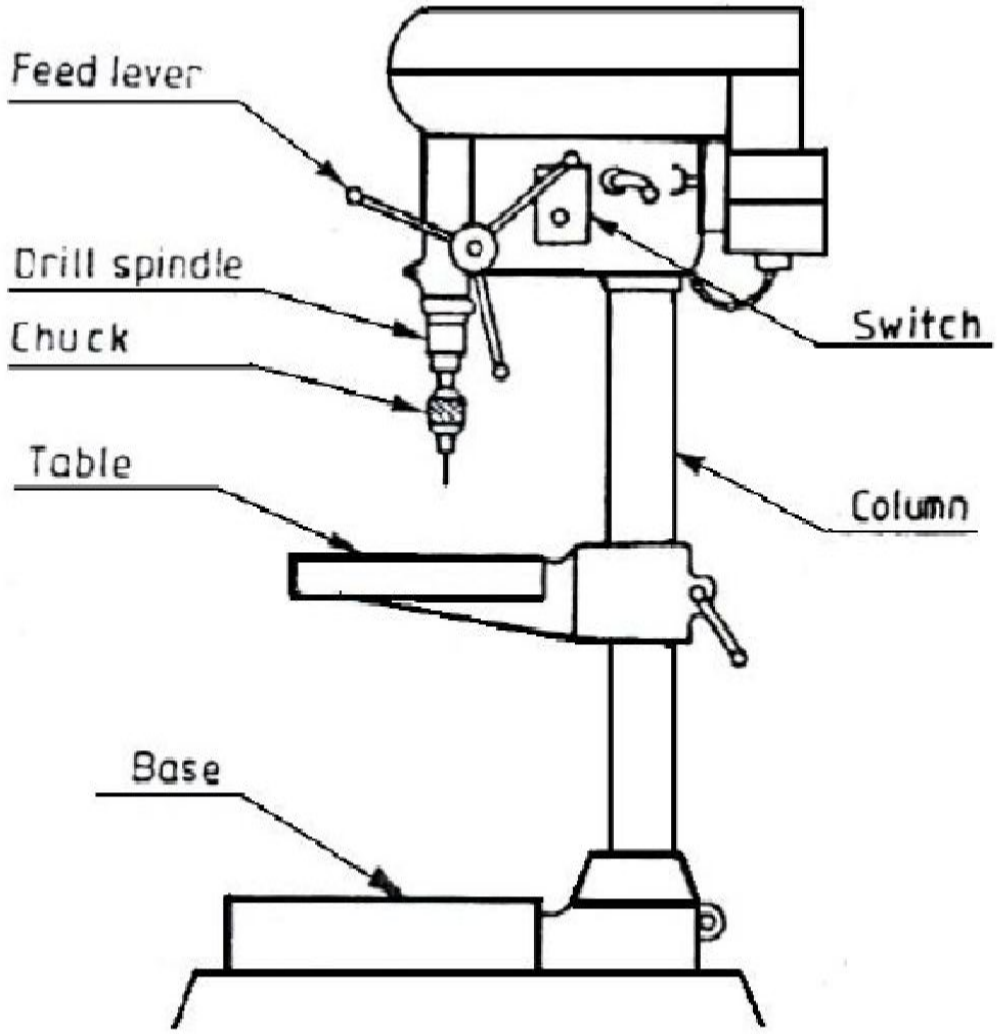


Figure 1.19: Bench drill

CONTI…

- **Threading Tools –** The following are different threading tools are mainly useful in fitting shop operation.
- **Taps and Tap wrenches -** A tap is a hardened and steel tool, used for cutting internal thread in a drill hole. Hand Taps are usually supplied in sets of three in each diameter and thread size. Each set consists of a tapper tap, intermediate tap and plug or bottoming tap. Taps are made of high carbon steel or high speed steel.
- **Dies and die-holders -** Dies are the cutting tools used for making external thread. Dies are made either solid or split type. They are fixed in a die stock for holding and adjusting the die gap. They are made of Steel or High Carbon Steel.

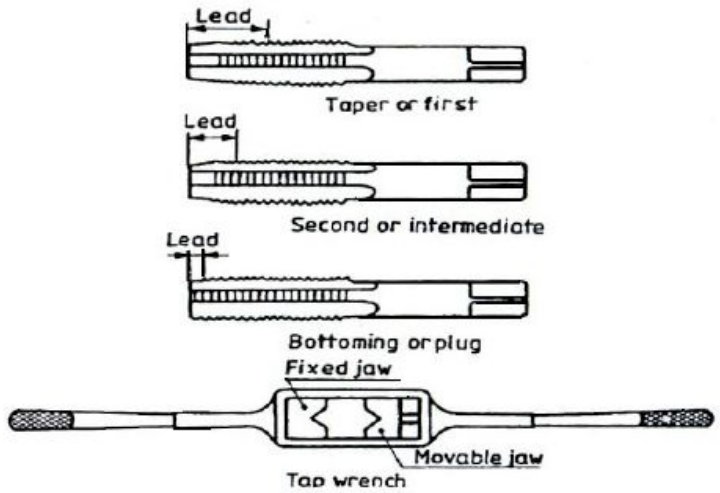


Figure 1.17: Taps and tap wrench

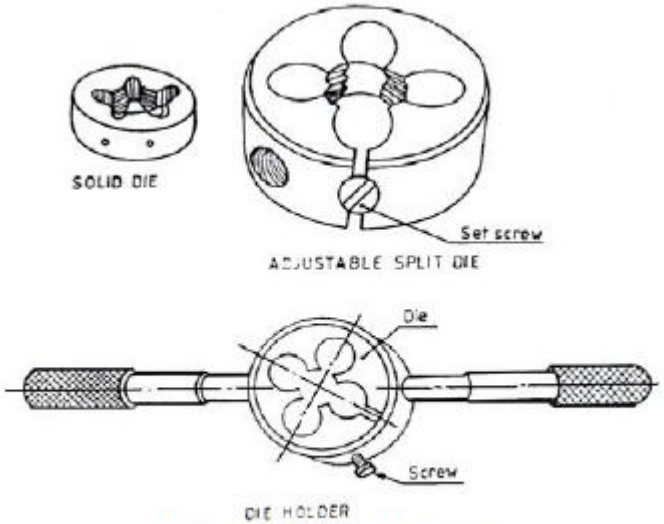


Figure 1.18: Dies and die holder

MANUFACTURING PROCESS OF FITTING SHOP

- Following steps should follow for manufacturing of Fitting Shop Job.

1. Required size of rectangular mild steel strip (MS Flat) is firstly cut via hacksaw from a long steel strip.
2. The dimensions of the given piece are checked with the steel rule.
3. The job is fixed rigidly in a bench vice and the two adjacent sides are filed, using the rough flat file first and then the smooth flat file such that, the two sides are at right angle.
4. The right angle of the two adjacent sides is checked with the try‑square.
5. Chalk is then applied on the surface of the work piece.
6. The given dimensions are marked by scribing two lines, with reference to the above two datum sides by using Vernier height gauge, Angle plate and Surface plate.
7. Using the dot punch, dots are punched along the above scribed lines.
8. The two sides are then filed, by fitting the job in the bench vice; followed by checking the flatness of the surfaces. As the material removal through filing is relatively less, filing is done instead of sawing.
9. With the help of drilling machine a hole is made so that the cylindrical rod after external threading would properly fix into that hole.
10. Internal threading was made with the help of taps and tap wrenches and external threading with the help of dies and die holders.

ADVANTAGES IN FITTING SHOP PROCESSING

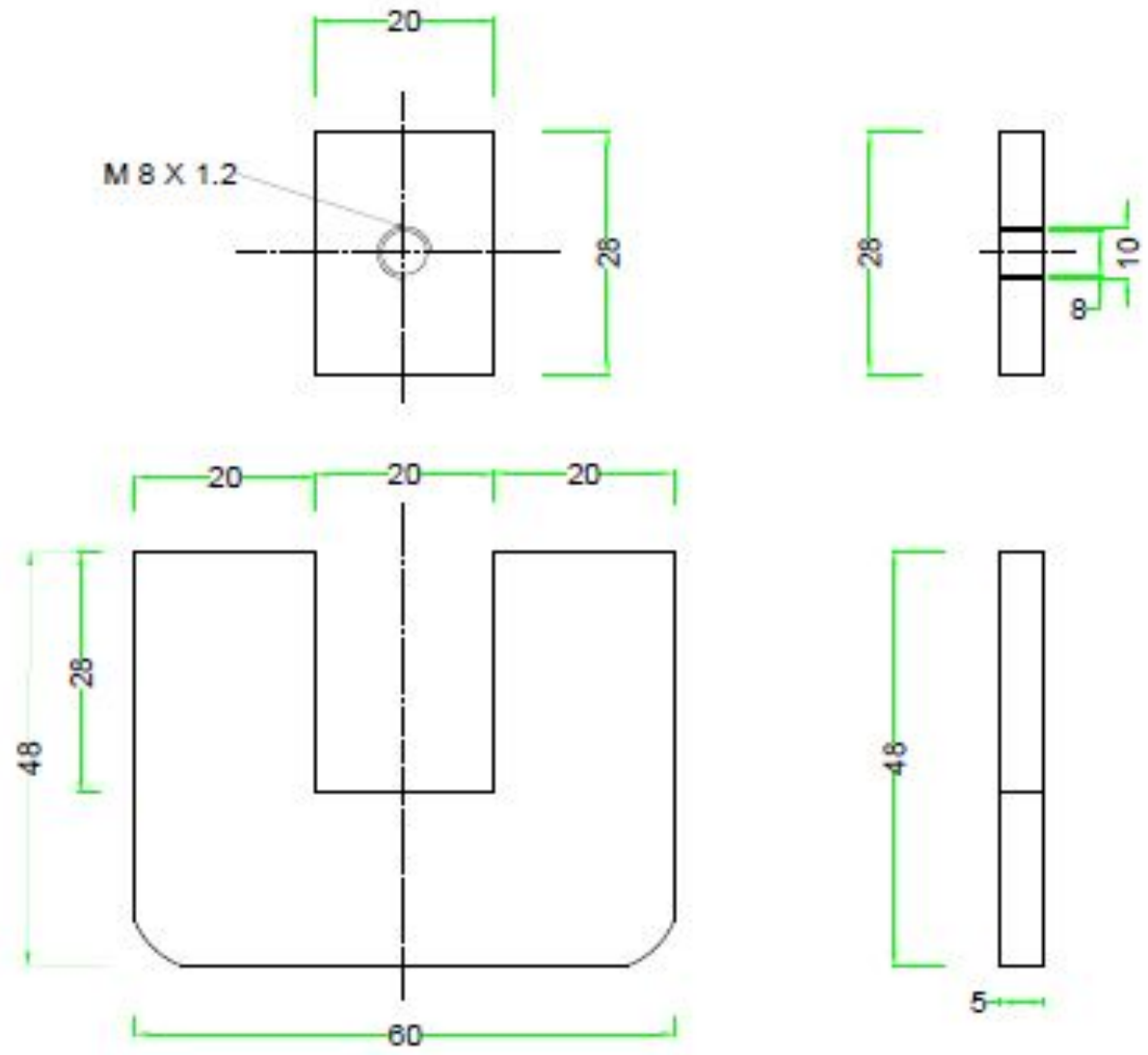
1. Tools and equipmens required are inexpensive.
2. Required semi skill operator
3. Better Surface Finish
4. Low Cost operation method
5. Close tolerances can be achieved.

APPLICATION OF FITTING SHOP OBJECT

- Following are main application of sheet metal process,

1. Industrial Metal components fitment.
2. Different Types Of Male Female Join
3. Different Types Of Fits Between Mating Parts

Actual Job Information



OPERATIONS PERFORMED:

1. Surface Filing
2. Making Right angle
3. Marking
4. Punching
5. Drilling
6. Sawing
7. Tapping
8. Fitting
9. Finishing

Raw Material:
Part A - 62 x 50 x6 mm
Part B - 30 x 22 x 6 mm

- **THANK YOU**