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## GENERAL INSTRUCTIONS

1. The work to be done in the practical classes comprises of study of machines, measuring instruments and practice on jobs in different shops.
2. The manual gives the details of practical work to be done in each shop.
3. Observe safety precautions while working. Do not come wearing loose garments.
4. Do not meddle with equipments or operate machines, which you are not familiar.
5. It is in your own interest not to absent yourself because the schedule of work is tight and no extra turn is likely to be available.
6. When a student misses practical class due to some genuine reasons, he/she must complete the missed exercise after the regular classes are over, at the end of the session.
7. The students should not leave the classes before time.
8. If the students spoils the practise job he/she will approach the workshop supervisor for new job.
9. Always report for attendance first before proceeding for the practical work.
10. Each student will maintain a practical record book & bring it on each turn. Get it signed by the teacher. Students who do not bring their practical file are not allowed in workshop.

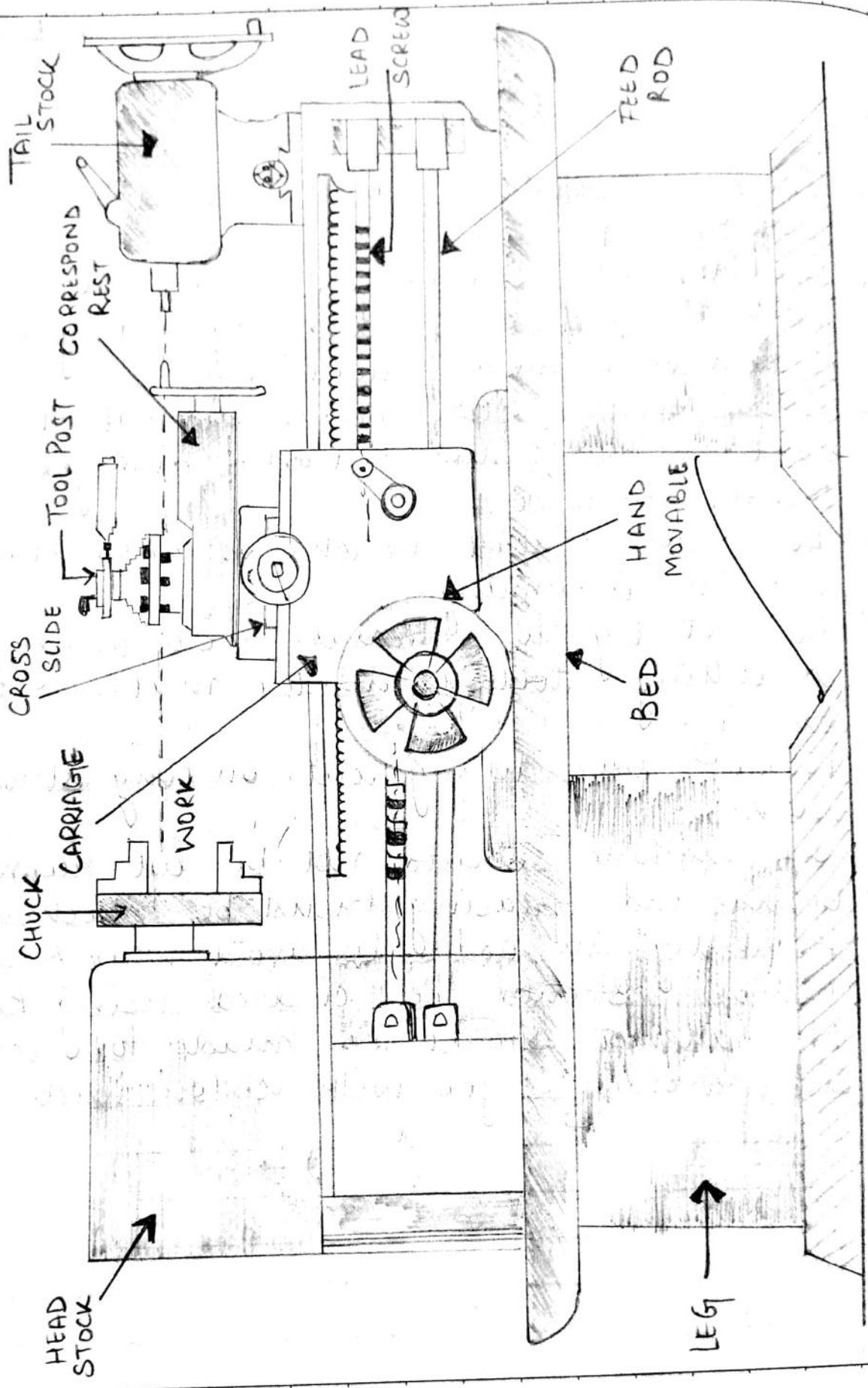
Teacher's Signature \_\_\_\_\_

# Machine Shop...

## SAFETY MEASURES

1. Always wear proper dress and shoes in a work shop.
2. The students should not wear loose clothes, neck ties etc to guard against getting caught with moving machinery.
3. Before switching on power, see that the tail slide, tool holder and job are properly clamped.
4. Do not shift or change gears while the machine is running.
5. Do not try to measure work or adjust a cutting tool when the machine is running.
6. Do not take heavy cut on long slender work.
7. The machine should not be left running.
8. Oiling and Greasing must be checked frequently in order to avoid wear & tear.
9. Chips should be cleared using Brush.
10. No attempt should be made to clean the revolving job with cotton waste.

# LATHE MACHINING



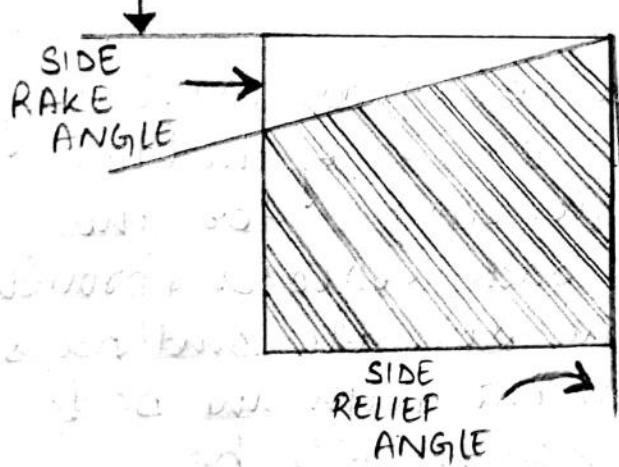
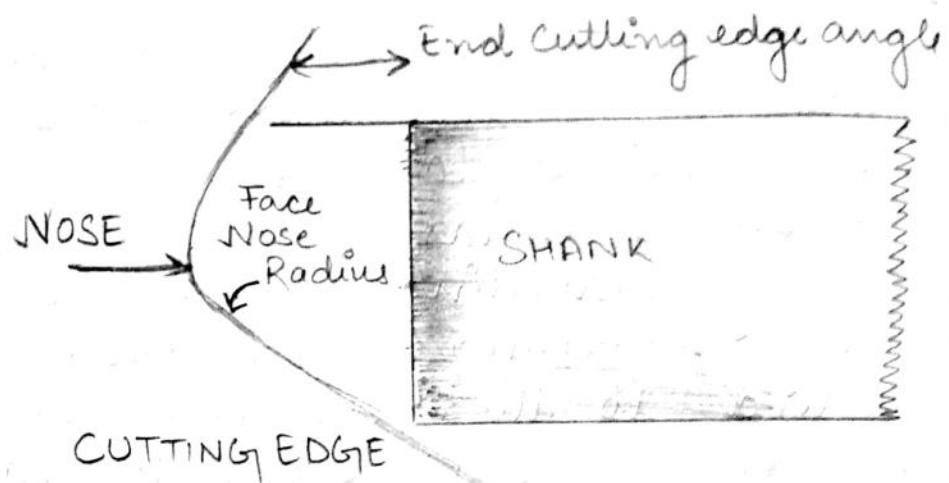
# Lathe Machine...

It is the mother of all Machines. A lathe is a tool that rotates the workpiece on its axis to perform various operations such as cutting, sanding, knurling, drilling or deformation, facing, turning, with tools that are applied to the workpiece to create an object with symmetry about an axis of rotation.

## PARTS OF LATHE MACHINE :

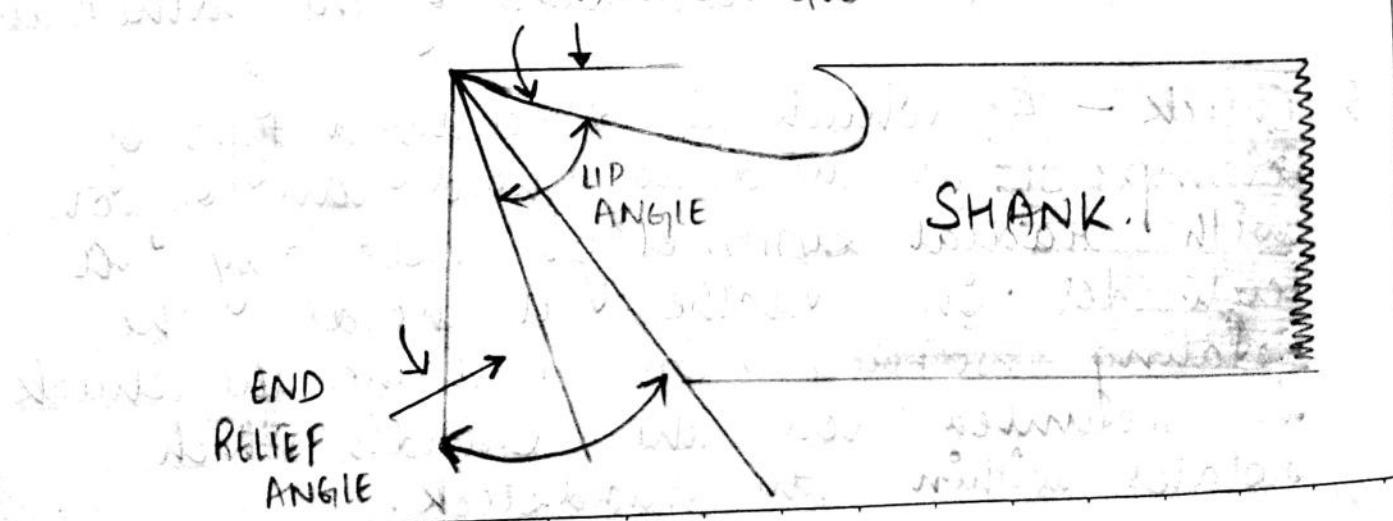
1. Head stock - It is used for gear assembly. The head stock is the part of the lathe which serves as a housing for the drawing pulleys and back gears, provides bearing for the machine spindle and keeps the latter in alignment with the bed. It is a fixed part which will be present on the left side of the lathe bed.
2. Chuck - A chuck is specialized type of clamp. It is used to hold an object with radial symmetry, especially a cylinder. In lathe it holds the rotating workpiece. On a lathe the chuck is mounted on the spindle which rotates within the head stock.

# Tool Signature :-



SLIDE CUTTING  
edge angle

BACK RAKE ANGLE



Chuck can be 3 jaw chuck or 4 jaw chuck etc.

### 3 jaw chuck

Central

Used for light work

Only for circular work

Depth of cut is comparatively less

- Less Gripping power
- Setting up of work is simple.

### 4 jaw chuck

- Independent
- Used for heavy work
- Used for every work.
- The more depth of cut can be given
- More gripping power
- Setting up of work is not easy.

3. Bed — The bed of lathe acts as the base on which the different fixed and operation parts of the lathe are mounted. Lathe beds are usually made as single piece casting of semi steel (i.e. toughened cast iron). with the addition of small quantity of steel scrap to the "cast iron". facilitating an easy sliding act. It holds the machine.

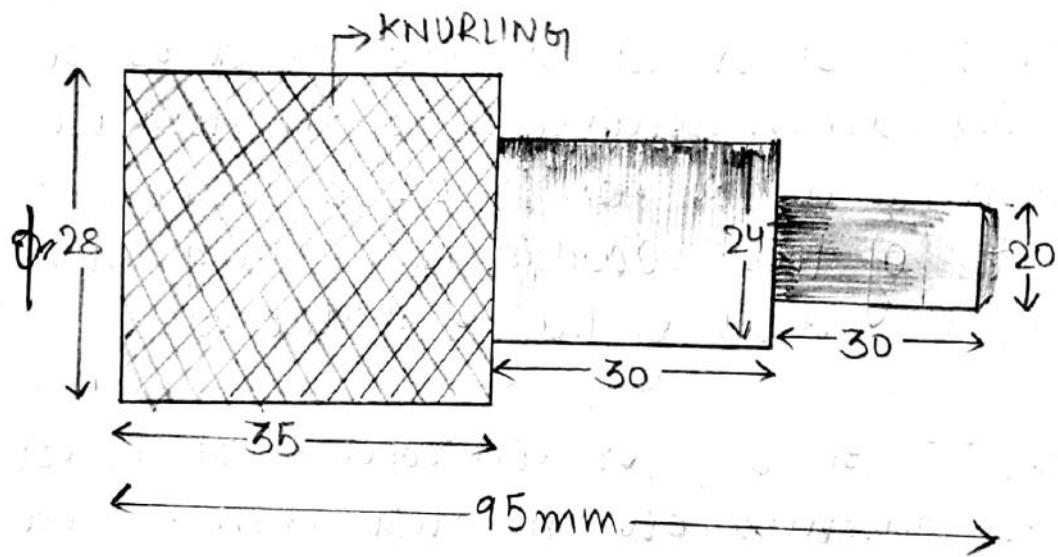
4. Carriage — The lathe carriage serves the purpose of supporting, guiding and feeding the tool against the job during the operations of the lathe. It is used to move machines.

5. Rack and Pinion - It is a type of linear ~~alvator~~ that comprises a pair of gears which convert rotational motion into linear motion. It gives smooth motion.
6. Compound Rest - It is a part of carriage. It is placed over the cross slide and it consists of a graduated circular base which is having swiveling machine. It moves the tool post.
7. Tool Post - It is also a part of carriage. It is the topmost part of carriage and is used for holding the tool or tool holder in position. It is used to cut and is adjusted accordingly. Tool post can be of types; 1 way tool post, 4 way tool post etc.
8. Cross Slide - It moves tool post to left and right. It is to provide cutting action to the tool and action of cutting tool will be perpendicular to central line of lathe. It can either be operated by hand, by means of cross feed screw, or may be given power feed through the apron mechanism.

9. Apronex - It is also a part of carriage. It houses the feed mechanism, clutch mechanism split half nut, gears, levers. The apron wheel can be rotated by hand for longitudinal motion of the carriage.
10. Dead Screw - It is a screw used as a linkage in a machine, to translate mechanism, used for precise linear movement of the carriage along the longitudinal axis of the lathe.
11. Feed shaft - It is for autofeed. It is a power transmission mechanism, used for precise linear movement of the carriage.
12. Tail stock - It is used for the supporting of longitudinal rotatory axis of workpiece being 2. It is also used for drilling. It will drill only in centre.
13. Coolent Pump - It is a type of pump used to recirculate a coolent. generally liquid that is used to transfer heat away from engine. Cutting oil is mixed and is used to cool down the engine.

**AIM:** Practising in facing, Simple turning, Step turning, Knurling and chamfering.

**DIAGRAM:**



**NOTE:**

All dimensions  
are in mm.

# Job Performed

Aim : Practicing in facing, simple turning, step turning, knurling and chamfering.

TOOLS REQUIRED : Vernier calliper, Scale, chalk, jaw holder, cutter, toolbox holder, tool box holder, wrenches, sandpaper.

CUTTING TOOL MATERIAL : High Speed Steel

MATERIAL REQUIRED : Mild steel of diameter 32mm and length 95mm.

## PROCEDURE :

1. The material on which the job is to be performed is taken and fitted in the jaws.
2. Then speed of jaw chuck is set and is rotated in forward direction.
3. Then the tool post is rotated in  $45^\circ$  dir<sup>n</sup>, and facing is done.
4. The least count of the carrier is 0.2mm and in each step 1mm is done of 3 jaws chuck.
5. The turning is done by keeping the tool post in  $90^\circ$ . The material is brought in its length = 95 mm

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6. For whole material the cutted diameter is 28mm by facing.
7. Then for 35mm, the diameter = 28 is maintained and for 30mm, 24mm is kept and next 30mm, the diameter is 20mm.
8. Then for removing sharpness, sharpening is done.
9. Then knurling is performed on 35mm portion. It is done for better Grip.

#### PRECAUTIONS :

1. Always wear Apron while practising the job.
2. Always wear shoes.
3. Keep yourself away from chuck.

#### CONCLUSION :

The desired length of tool is obtained.

M 21/11/17

Teacher's Signature —

## Operations :

Facing → It is the operation of machining the end of a piece of work to produce flat surface square with the axis. The operation involves feeding the tool perpendicular to the axis of rotation of the work.

Turning → In lathe is to remove excess material from the workspace to produce a cylindrical surface of required shape and size

3. Step Turning → It is the process of turning different surface having different diameters. The work is held between centres and the tool is moved parallel to the axis of the lathe.

4. Chamfering → Operation of beveling extreme ends of the workpiece. It smoothes the sharp edge of a job.

5. Knurling → Process of embossing different patterns on the surface of workpiece by pressing it against hardened steel rollers with edges of required pattern.

Fittings

# Shop

Mr. Miller's residence is a 23<sup>rd</sup> floor apartment at  
the Park Plaza Hotel on 5th Avenue. He has no servants  
and does his own cooking. His wife is a widow  
and has no children.

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## SAFETY PRECAUTIONS

1. Loose clothing must be avoided.
2. Do not take excessive cut than required.
3. The workpiece should be tightly firmed and vice-versa.
4. Avoid using blunt tools.
5. The hand & hack saw and blade should be adjusted properly in the frame.
6. Don't wear wrist watch and bracelets while doing in the frame.
7. Antirust should be applied on the tools when not to be used for long time.
8. Get the first aid immediately in case of any injury.
9. Always chip the material away from yourself.
10. Don't apply too much pressure while acting on the workshop (workpiece) or cutting with a hand hack saw.

## Introduction

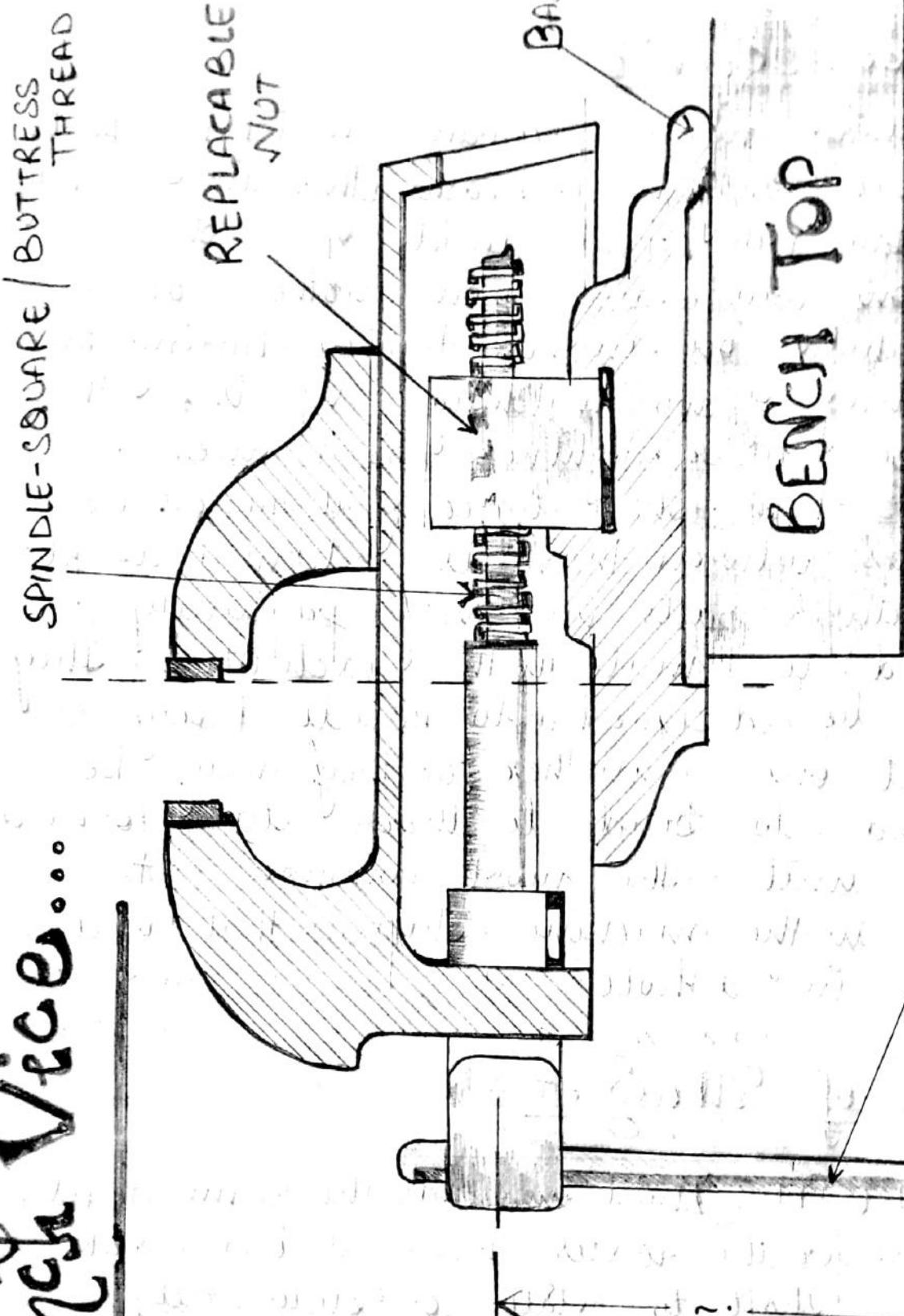
Fitting means preparing matching parts so touch or join each other in a way that one will turn inside of another and one will slide upon another or the parts hold on another tightly. During the assembling of two matching parts, there may be either tightness or looseness between them. The degree of tightness or looseness between them is termed as fit. Manufactured parts are very frequently required to mate with each other. They may be designed to slide freely against one another or they may be designed to bind together to form a single unit. The most common fit found in the machine shop is that of a shaft in a hole.

### Types of fitting :-

CLEARANCE FIT : Also termed as the running fit, they are for the cases when it is desirable for the shaft to rotate or slide freely with the hole.

Transition fit : Also known as the push fit, it is for the cases when it is desirable that

# BENCH VICE...



The shaft is held precisely, yet not so tightly that it can't be disassembled.

(ii) INTERFERENCE FIT: Also referred to as the force fit, it is used when it is desirable for the shaft to be securely held within the hole and it is acceptable that some force to be necessary for assembly.

## FITTING TOOLS :-

### 1. CLAMPING TOOLS -

The clamping tools that are used in a fitting shop are called vices and they are used for holding the jobs firmly during various fitting operations.

(i) Bench Vice: It consists of cast iron body and cast iron jaws. Two jaw plates are fitted with the jaws. Jaw plates are made up of high carbon steel and are wear resistant.

(ii) Hand Vice: It is used to grip very small objects. These are made in different shapes and sizes. It consists of the two steel legs hinged together at the bottom. A spring is provided between two legs. The jaws may be adjusted from a flange nut.

(iii) Pin Vice: It is used to hold wire or small diameter rods. It is also used for grinding

Small Drills : It consist of a small chuck made up of tool steel and a mild steel handle.

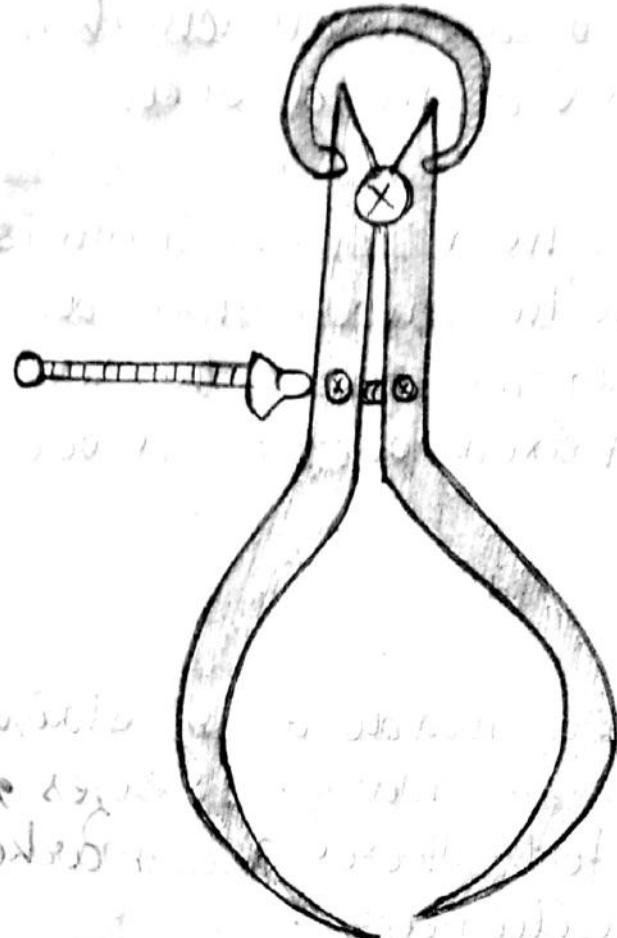
Pipe Vice : It is used to hold pipes. It consist a vertical screw with square threads. A handle is attached to the top of the screw. A movable jaw is fixed on the lower end of the screw.

## MEASURING TOOLS -

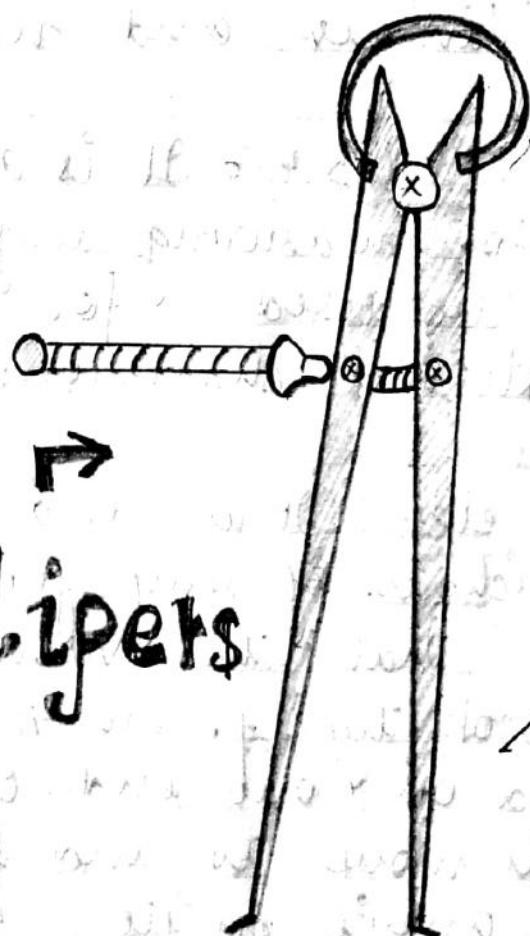
Steel foot tools : These are made up of stainless steel and are available in many sizes, ranging from  $\frac{1}{2}$  to 2 foot. They are marked in inches and millimeters.

Vernier Calliper : It is a precision instrument used for measuring lengths and diameters. It can be used for measuring internal and external dimensions.

Micrometer : It is used for measuring diameters or thickness of any job. It is of more precision than the vernier callipers. It consist of a hook type frame. A hard anvil is screwed on one end. On the second end, a spindle moves to and fro, carrying another small anvil on its end.



← Outside Calipers



→ Inside Calipers

(iv) Vernier height gauge : It is used for measuring diameters or thickness of the workpiece. It consists of a vertical bar mounted on a heavy base. A sliding head with pointer is carried on to the rectangular bar.

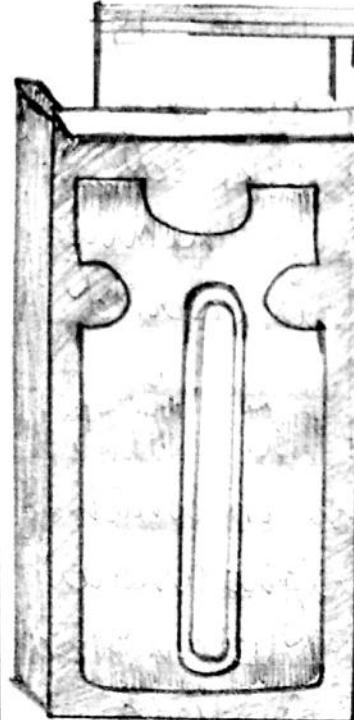
(v) Angle plate : It consists of cast iron in which two ribs of metal are standing at right angles to one another. Holes are provided for clamping purpose. It is used for holding and supporting the jobs.

(vi) Callipers : Those are generally used to measure the inside and outside diameters. It is made in different sizes and shapes. It consists of two bent legs connected at one end by means of rivets or bolts. The edges are made to just join/touch the job, then the dimension is measured with the help of steel rules. Types include:

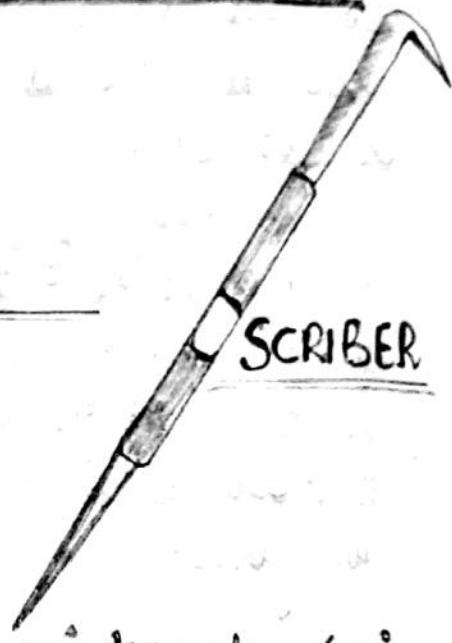
- (a) Outside callipers  
(b) Inside callipers.

### 3. MARKING TOOLS -

(i) Try Square : It is used for checking the squareness of two surfaces. It consists of a blade made up of steel, which is attached to a base at  $90^\circ$ . The base is made up of cast iron or steel.



Try Square

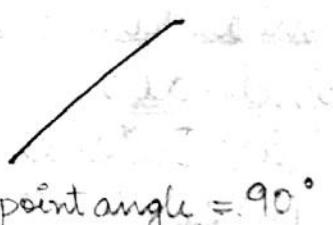


SCRIBER

point angle =  $60^\circ$



DOT PUNCH



point angle =  $90^\circ$

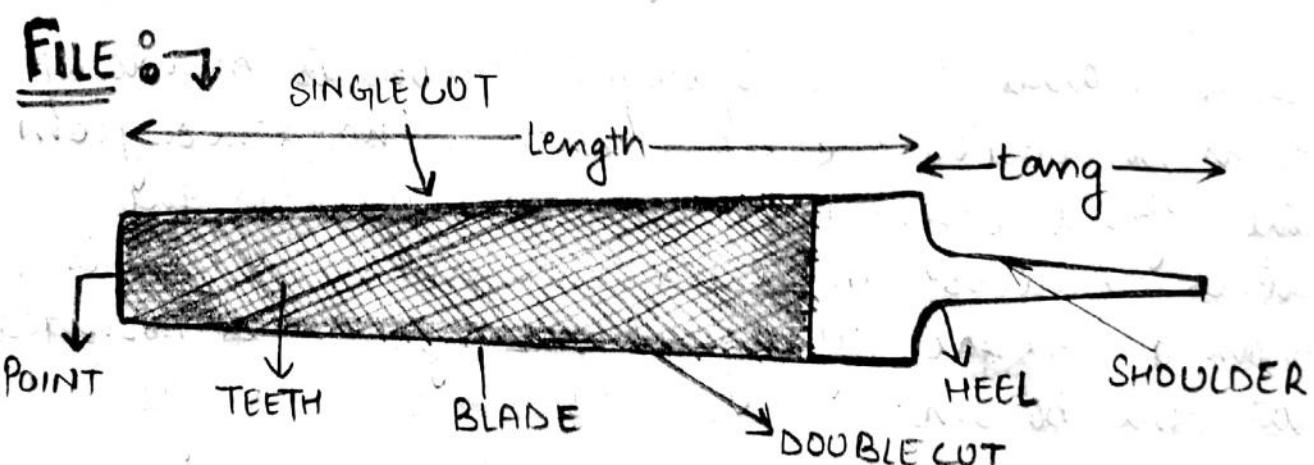
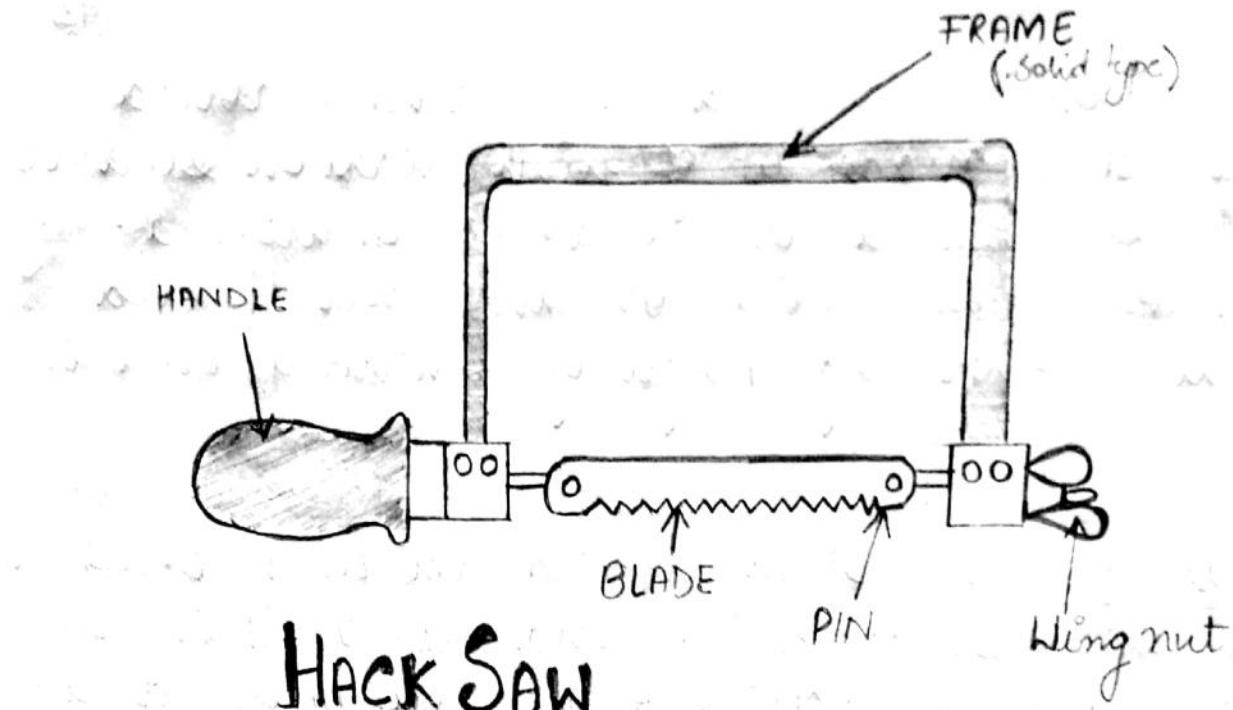


CENTRE PUNCH

- Brought to you by https://KaiExamHai.GitHub.io
- (ii) Dot punch: It is used for marking dotted lines. It is made up of high carbon steel or high speed steel. One end is sharpened. Hammering is done on the second end while working. Angle of punching end is  $60^\circ$ .
- (iii) Centre punch: It is like a dot punch except the fact that its punching end is  $90^\circ$ . It is used to mark the centre of the hole before drilling.
- (iv) Scriber and Surface Gauge: Scriber is made up of high carbon steel and is hardened from the front edge. It is used for marking the lines. Scriber mounted on vertical bar is named surface gauge. A heavy base is provided at the bottom.

#### 4. CUTTING TOOLS :-

- (i) Hacksaw: It is used for cutting rods, flats, etc. The blade of the hacksaw is made up of high carbon steel or speed steel. The frame on the other hand, is made up of mild steel. The blade is placed inside the frame and is tightened with the help of flange nut. The teeth of saw blades are generally forward cut.



Types of files:



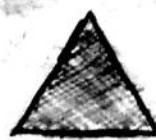
flat



half-Round



Square



triangle



Knife

The thickness and width of the blade are 1mm and  $\frac{1}{2}$ " respectively. Blades are classified as -

(a) Depending upon the direction of cut - Forward Backward

(b) Depending upon the pitch of the teeth - Coarse (8-14 TPI)  
Medium (16-20 TPI)  
Fine (24-32 TPI)

Types of hacksaw frames:

- Fixed frame

- Adjustable frame

In fixed frame, only one type of blade is used whereas in adjustable frame, the length of the frame can be increased or decreased as per the requirements. And the blade from 8"-14" long can be used in it.

(ii) FILES: It is a multi tooth tool, which is used to remove material by rubbing it on the metal. Files are available in a no. of sizes, shapes and degree of coarseness.

Classification of files -

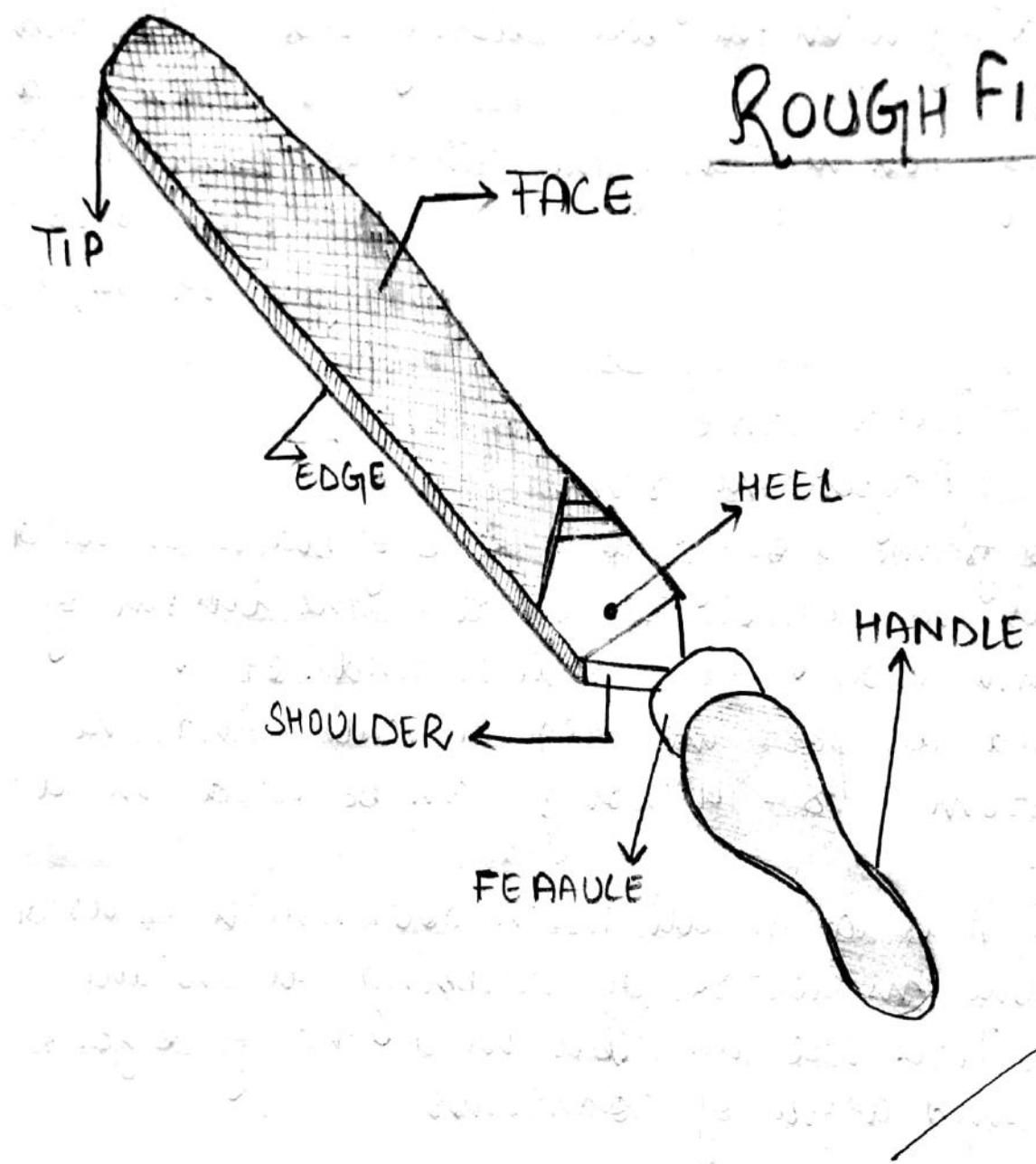
1. Rough file = 20-25 TPI

2. Second cut file = 30-35 TPI

3. Smooth file = 40-60 TPI

4. Dead smooth file = 80-100 TPI

## ROUGH FILE...



Classification on the basis of number of cuts:

1. Single cut files
2. Double cut files.

In single cut, the teeth are cut in parallel rows at an angle of  $60^\circ$  to the face. Another row of teeth is added in opposite direction in case of double cut files.

Classification on the basis of shape and size:

- |                    |                          |
|--------------------|--------------------------|
| 1. Flat file       | 4. V Triangular file     |
| 2. Round file      | 5. Needle file           |
| 3. Half Round file | 6. Knife edge file, etc. |

### SOFT EDGE FILE -

It is a file having only one edge with teeth. It is used in complex work pieces in order to avoid cutting with upper side of the file.

### (iii) DRILL BIT -

It is a cutting tool used to remove material to create holes, almost always of circular cross section. Drill bits are available in many sizes and shapes and can help create different kinds of holes in a variety of materials. In order to create holes, drills bits are attached to a drill, which powers them to cut through the workpiece, typically by rotation. The drill will grasp the

upper end of a bit called the shank in the shank.

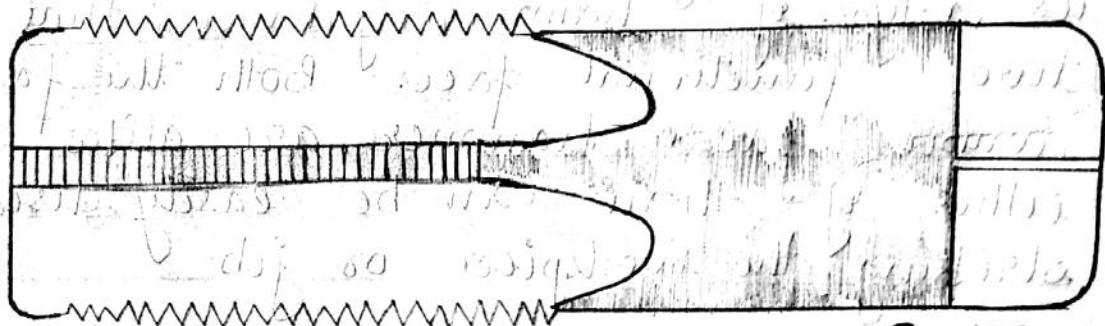
## 5. STRIKING TOOLS -

Ball peen hammer: Also known as ball pein hammer, or the machinist's hammer, it is a type of peening hammer used in metal working. It is distinguished from a cross peen hammer by having a hemispherical head.

(ii) Double face hammer: Literally as the name suggests, a double faced hammer is a type of hammering device, that possesses two functional faces. Both the faces of a double faced hammer are alike and either of them can be easily used for striking the workpiece or job.

(iii) Sledge hammer: It is a tool with a large, flat, often metal head, attached to a lever (or handle). The size of its head allows a sledge hammer to apply more force than all other hammers of similar size. Along with the mallet, it shares the ability to distribute force over a wider area.

- 100% of all public ser-



2nd Tapper

## INTERMEDIATE TAP

Tapers

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## THREADING Tools :-

- (i) Die and die stock: It is used for cutting external threads. Dies are made from tool steel and have internal threads. Before starting the operation, the job is held firmly in a vice or by any other job holding device. The proper die is selected for the desired threading and then starting point of the job is chosen so that the die is properly adjusted on the job.
- (ii) Tapers:  
1. Taper tap (Front 6-8 teeth are missing)  
2. Middle tap (Front 3 teeth are missing)  
3. Plug tap (No teeth is missing)

Taps are used for making internal threads. It is inserted into the face of the hole at right angle. In the hand tapping, three taps are used. Taps have toothed bodies with a cylindrical shape. It also consists of a flute. Tap is held by a tap holder and before tapping, tap which be held at right angle to the plane of the work piece.

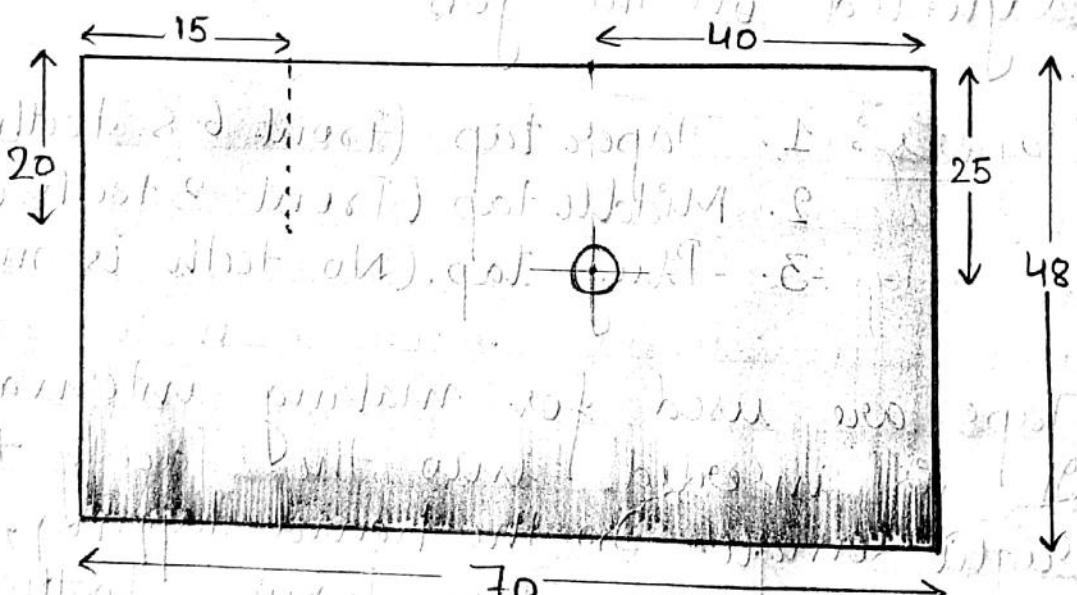
Teacher's Signature \_\_\_\_\_

AIM: To practice in making fitting, chipping and drilling.

TOOLS REQD: Flat file, half-round file, hand hacksaw, vernier callipers, drill bit & dot punch, centre punch, ball peen hammer, try square.

Steel foot Rule and dry chalk powder.

DIAGRAM:



Note: Diameter 10mm hole  
--- Cutting along outer outline of the rectangle.

Cutting

All DIMENSION IN 'MM'.

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## Job Performed

AIM: To practice in making fitting, chipping and drilling.

TOOLS REQUIRED: Flat file, half-round file, hand hacksaw, Vernier calliper, drill bit, dot punch, ball peen hammer, try square, steel foot tool, centre punch.

MATERIAL REQUIRED: Mild steel

MACHINE REQUIRED: Drilling machine.

### PROCEDURE:

1. Study the drawing
2. File the job i.e. the mild steel slab to dimension ( $70 \times 48$ ) mm<sup>2</sup>
3. Mark the position to be removed.
4. Punch along the marked position.
5. Chisel cutting along the punch marks.
6. File the cutting surface to the final position dimensions.
7. Mark the point for drilling a punch this position, and drill the respective hole.
8. File out burns (if any)

PTO

Teacher's Signature \_\_\_\_\_

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## PRECAUTIONS:

1. Proper use of tools to prevent injuries.
2. Don't test the sharpness of tools on your skin.

✓ 9/3/19

— \_\_\_\_\_ Signature

Foundry

Shop...

## SAFETY PRECAUTIONS

Loose clothing should always be avoided possibly wear apron

Do not operate any or tool until you know about its operation.

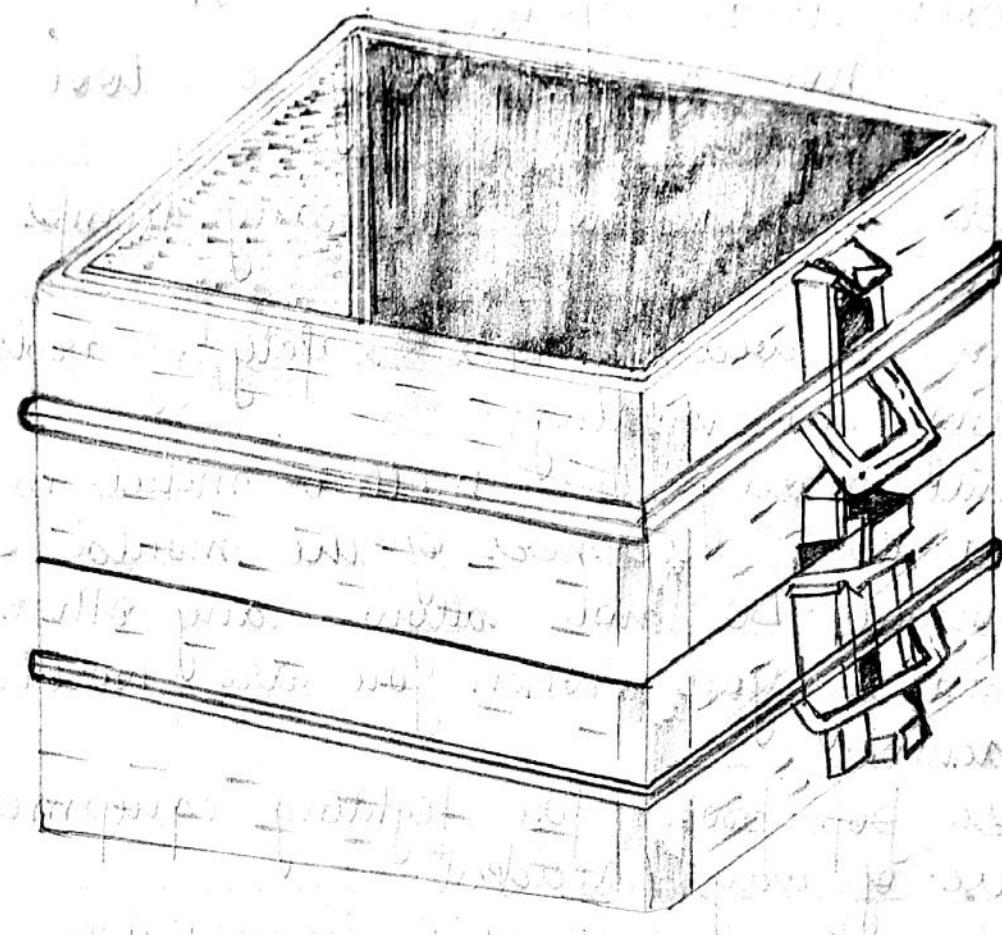
There should not be any lumps in the gun sand.

Always wear proper safety guards while doing the casting.

While pouring the molten metal make sure that the corners of the mould should not brought. Do not allow any other person to stand by you, when you are working on the machine.

6. Use proper fire fighting equipments in case of any accident.
7. Get the first-aid immediately in case of any injury.





Moulding flask

# Introduction...

## PATTERN

A pattern is a model or the replica of the object (to be casted). It is embedded in moulding sand and suitable ramming of molding sand around the pattern is made. The pattern is then withdrawn for generating cavity (known as mold) in molding sand.

## Common Pattern Materials

The common materials used for making patterns are wood, metal, plastic, plaster, wax or Mercury.

## FOUNDARY

The place where jobs are prepared by meeting and pouring then molten metal into the moulds is known as foundry.

## MOULD

A mould is cavity so prepared that can be used to make casting by pouring molten metal into it.

## CASTING

The molten metal poured into mould, on cooling is known as casting.

Teacher's Signature \_\_\_\_\_

## FORGABILITY

The capacity of a metal to get forged is called forgability.

## Types of Patterns :

1. Solid Pattern
2. Split Pattern
3. Multi-piece pattern
4. Match-plate Pattern

## Moulding and Casting Processes :

Acc. to this method used :

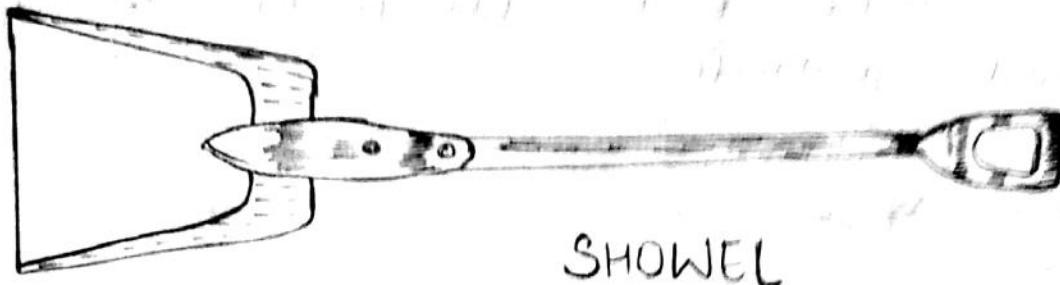
1. Floor moulding
2. Bench Moulding
3. Pit Moulding
4. Machine Moulding

## Types of Sand :

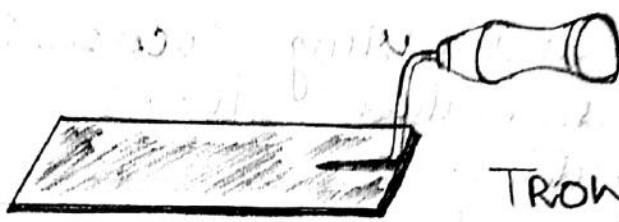
1. Green Sand
2. Dry Sand
3. Molasses Sand

## Quality of Sand :

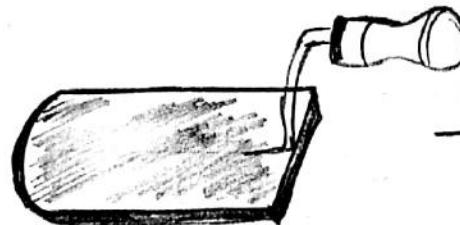
1. Good Refractoriness
2. Good Permeability
3. Good Flowability or Plasticity
4. Good Adhesiveness



SHOVEL



TROWEL  
(SQUARE NOSE)



TROWEL  
(ROUND NOSE)

Good Cohesiveness  
Good Collapsibility.

### CORES :

A core can be defined as a body of sand which is used to form a cavity of desired shape and sand in casting. Cores are prepared separately in core boxes.

### MELTING FURNACE :

A melting furnace is very necessary equipment in foundry shop. It is used to melt the metal to be casted.

## TOOLS USED IN FOUNDRY SHOP →

### 1. SNOVEL :

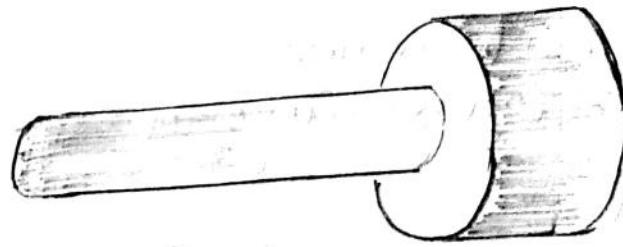
It consists of a steel pan fitted with a long wooden handle. It is used in mixing, tempering and conditioning of the foundry sand by hand. It is also used in moving and transforming the moulding sand to the container and moulding.

### 2. TROWELS :

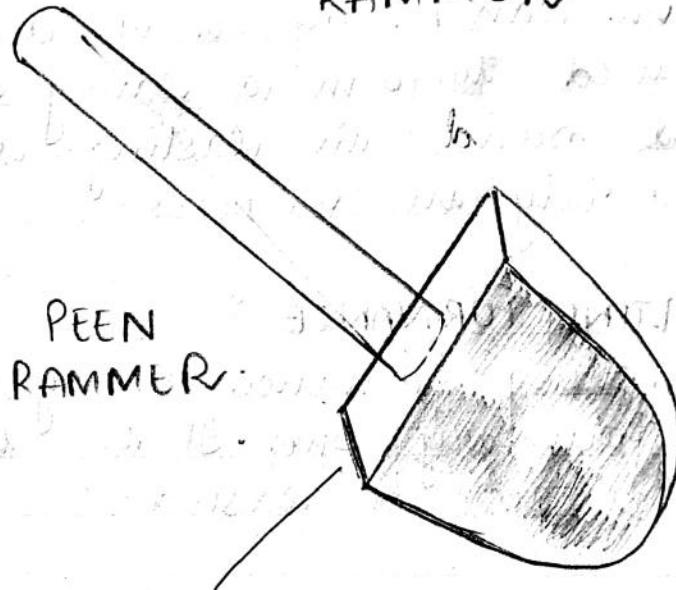
These are used for finishing flat surface and corners inside a mould. Common shapes



WOODEN  
RAMMER



BOTT  
RAMMER

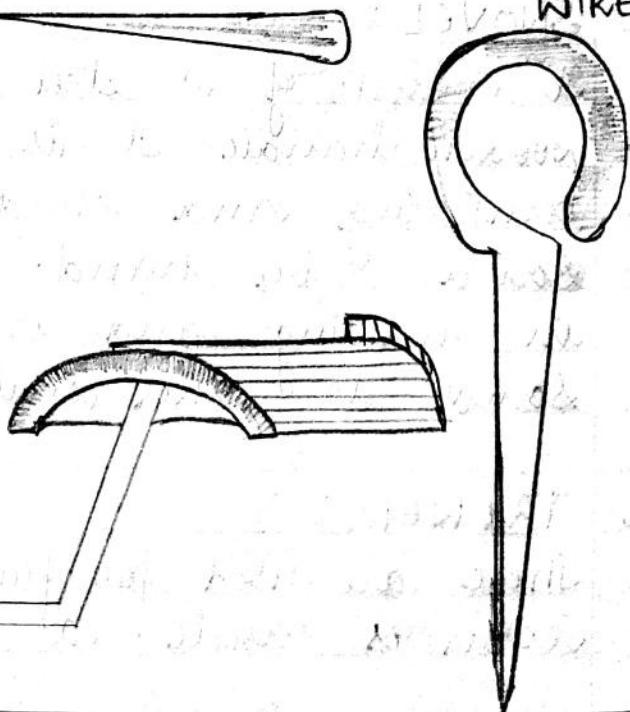


PEEN  
RAMMER



LIFTER

VENT  
WIRE



GATE CUTTER



NAVNEET

of trowels are made. They are made up of iron with wooden handle.

### 3. RAMMERS:

They are reqd. for striking the moulding sand mass in the molding box to pack or compact it uniformly all around the pattern.

### 4. LIFTER:

A lifter is a finishing tool used for repairing the mould sand and finishing the mould sand. Lifter is also used for removing loose sand from the mould.

### 5. VENT WIRE:

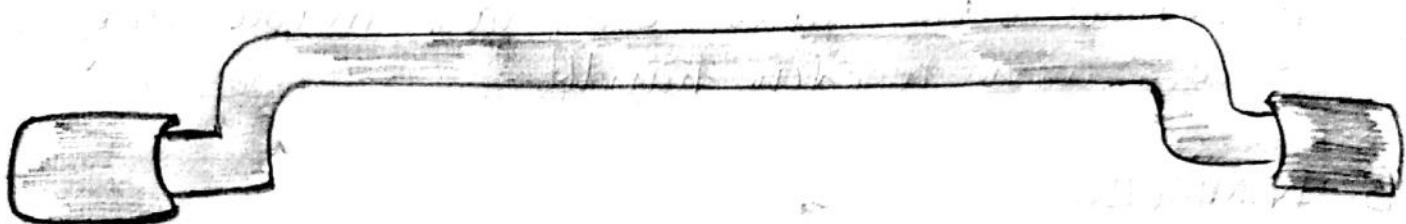
It is a thin steel rod or wire carrying a pointed edge at one end and a wooden handle or a bent loop at the other. After ramming sand and striking off the excess sand it is used to make small holes to allow the exit of gases and steam during casting.

### 6. GATE CUTTER:

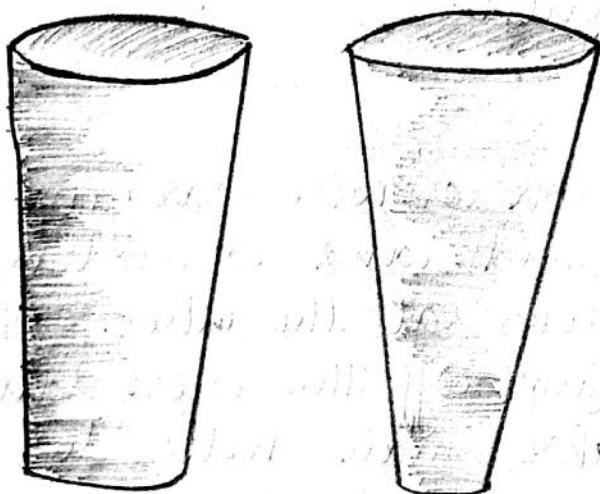
It is a small shaped piece of sheet metal commonly used to cut runners and feeding gates for connecting sprue hole with the mold cavity.

Teacher's Signature \_\_\_\_\_

## STRIKE OFF BAR



SUCKS



SWAB



SPRUCE PINS

## 7. STRIKE OFF BAR:

It is a flat bar, made of wood or iron to strike off the excess sand from the top of a box after ramming.

## 8. SLICKS:

They are also recognized as small double ended mold finishing tool which are generally used for repairing and finishing the mold surfaces and their edges after the withdrawal of the pattern.

## 9. SPREE PINS:

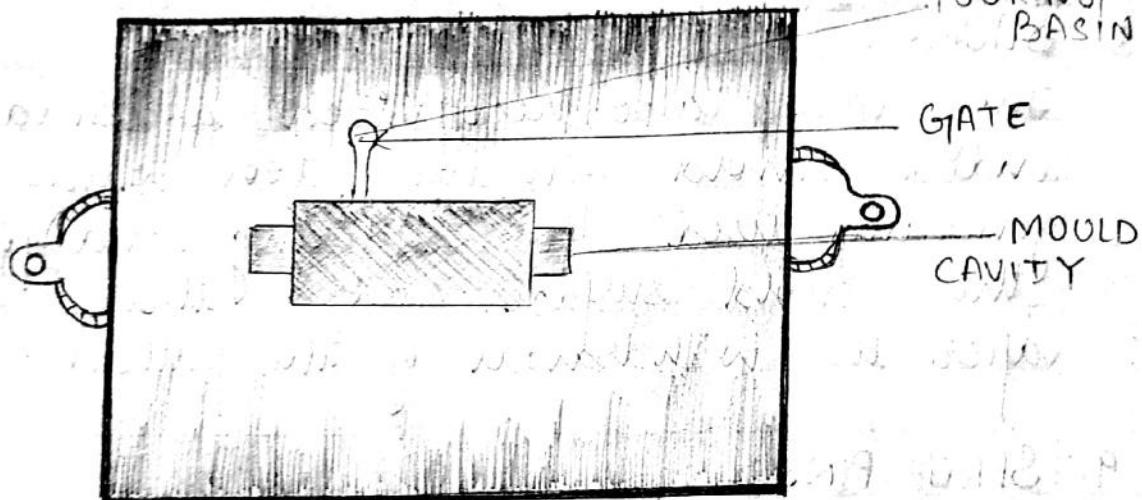
It is a tapered rod of wood or iron which is placed or pushed in cope to fair mold cavity while the moulding sand in the cope is being rammed.

## 10. SWAB:

It is small hemp fibre brush used for moistening the edge of sand mould, which are in contact with the pattern surface before withdrawing the pattern and for sweeping away the molding sand from the mold surface and pattern.

Aim: To prepare a mould by Solid piece pattern.

Solid Pattern:



## Job Performed.

AIM : To prepare a mould by solid piece pattern

### TOOLS REQD.:

Drag Box, Cope box, Bottom board, Butt hammer,  
Pin hammer, Vent-Wire, Swab, Runner-Riser pins,  
Bellows.

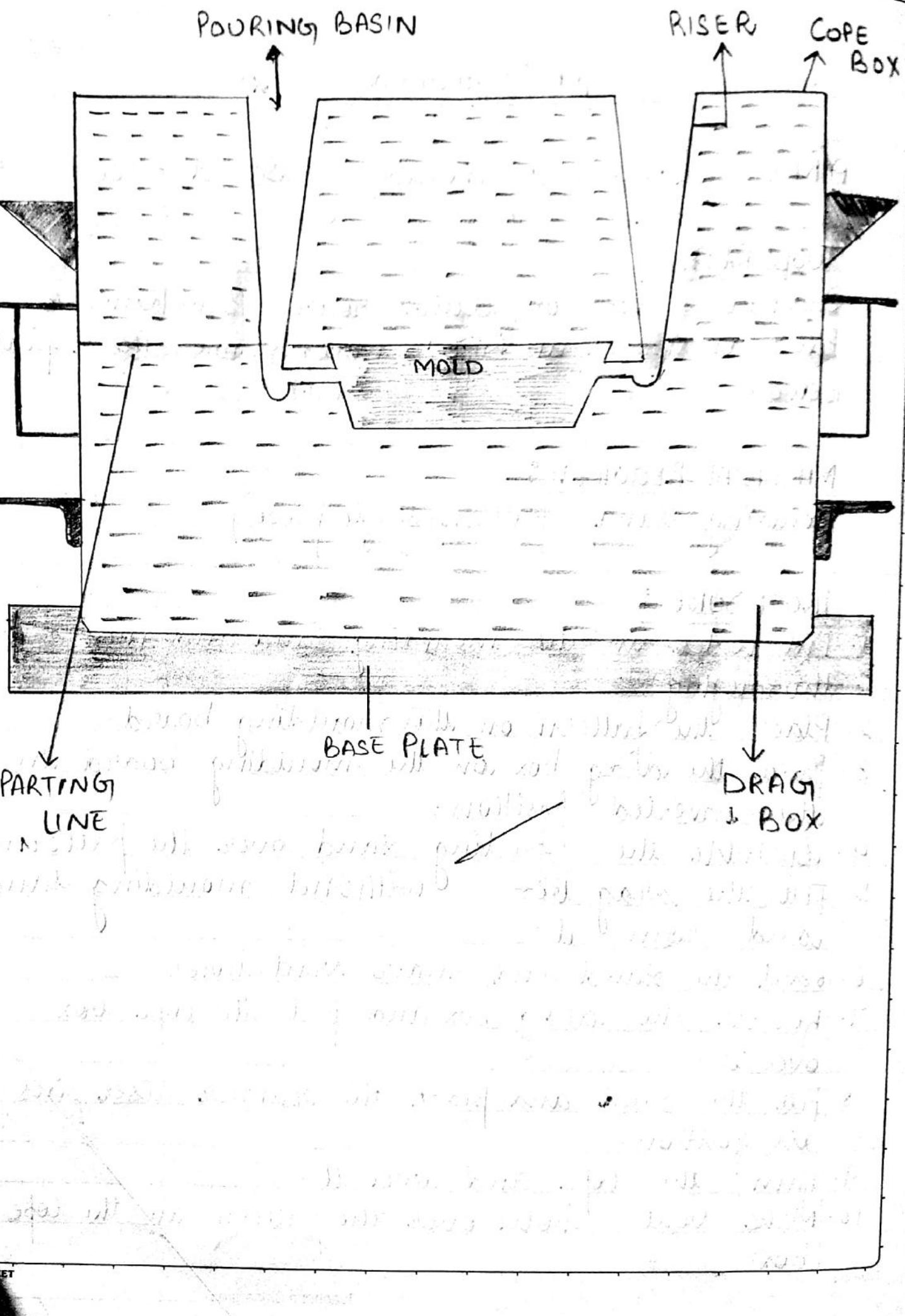
### MATERIAL REQUIRED:

Moulding sand, pattern (single piece)

### PROCEDURE :

1. Put water in the moulding sand and mix thoroughly
2. Place the pattern on the moulding board.
3. Place the drag box on the moulding board in the inverted position.
4. Sprinkle the parting sand over the pattern.
5. Fill the drag box with wet moulding sand and ram it.
6. Level the sand and make vent holes.
7. Reverse the drag box and fit the cope box over it.
8. Fill the sand and place the runner riser pins in position.
9. Ram the cope and level it.
10. Make vent holes over the pattern in the cope box.

Teacher's Signature \_\_\_\_\_



11. Remove both the pins and make pockets around the runner and rises pins.
12. Lift the core box, reverse and keep aside.
13. Put a little water with swab around the pattern.
14. Fix the draw screw to the pattern and remove it by slightly shaking.
15. Lift the pattern vertically up and make runner and gate.



6/4/18

CARPENTRY

Shop...

## SAFETY PRECAUTIONS

1. Loose clothing should always be avoided.
2. Don't take excessive cut than required.
3. The workpiece should be tightened firmly in the vice.
4. Avoid using blunt tools.
5. Avoid taking a cut against the direction of grains.
6. Don't wear rings, watches, bracelets, while doing the job.
7. Get the first aid immediately in case of any injury.
8. Always cut the material away from the body.
9. Never check the sharpness of tool by finger tips.

Teacher's Signature \_\_\_\_\_

# Introduction

Carpentry is the process of shaping Timber, using hand Tools. The products produced are used in foundries, etc. It involves mainly of the joining together of wooden pieces and finishing the surfaces after shaping them. Hence, the term joining is also used commonly for carpentry.

## MATERIALS USED IN CARPENTRY :

Basic materials used in carpentry shop are timber and plywood. Auxiliary materials used are nails, screws, adhesives, paints, varnishes etc.

## CLASSIFICATION OF WOOD :

The timber used for commercial purpose can be divided into two classes as soft wood and hard wood

### I. SOFT WOOD -

A soft wood is light in weight and light colored. They may have distinct annual rings but the medullar rays (radial lines) are not visible and the colours of the 'sap wood' (outer layers) is not distinctive from the heart wood. (inner

layers). These woods cannot resist stresses developed across their fibres; hence, not suitable for wood working.

## II. HARD WOOD -

In this type of wood the annual rings are compact and thin and the medullar rays (radial lines) are visible in most cases. Hardwoods are nearly equally strong both along and across the fibre. Hardwood is the material used for wood working.

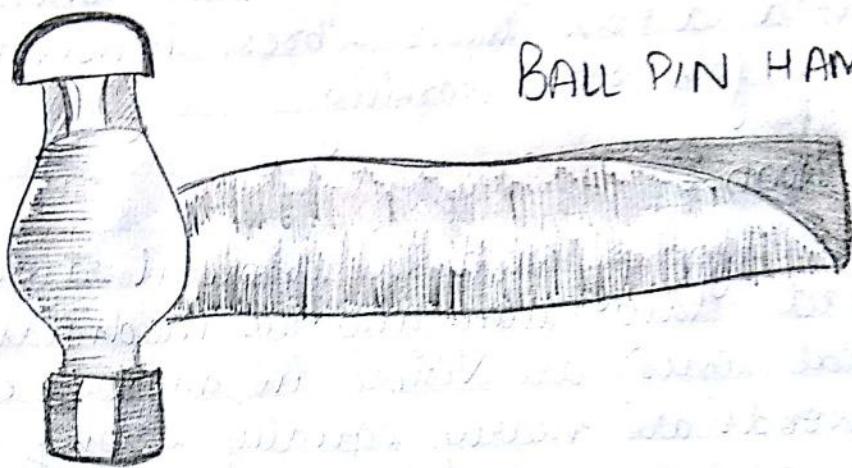
## SEASONING :-

Seasoning of wood is carried out for removing the sap and reducing the moisture content. The pressure of sap and moisture will render the wood unsuitable for engineering works due to uneven shrinkage, cracks, warping and decay.

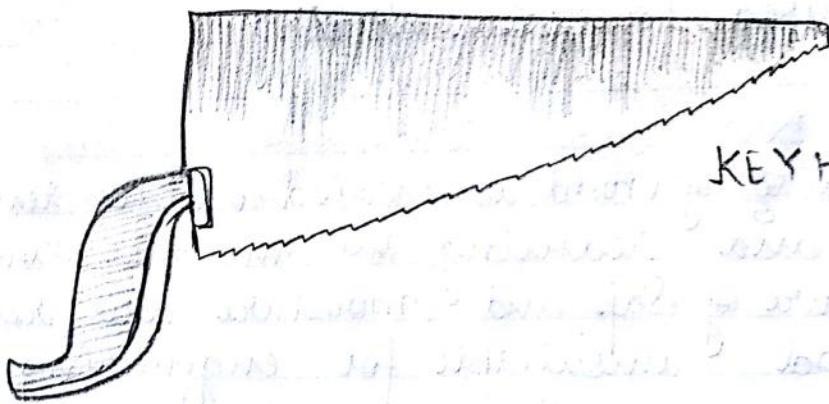
### Different Methods of Seasoning -

1. Air seasoning or natural seasoning
2. Water seasoning
3. Electrical seasoning
4. Kiln seasoning

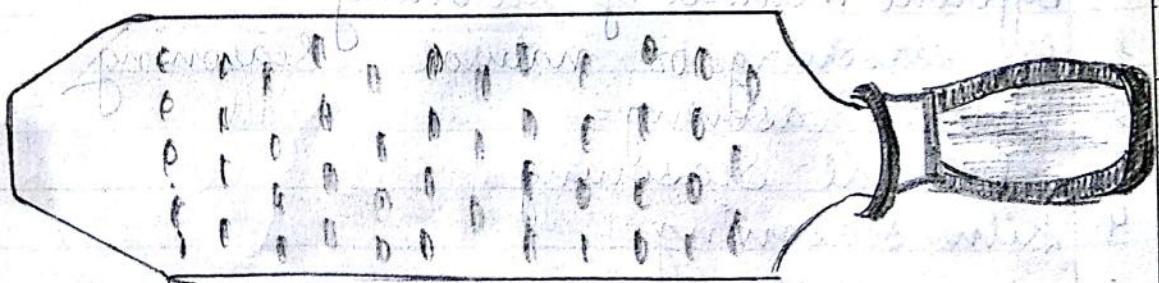
Teacher's Signature \_\_\_\_\_



BALL PIN HAMMER



KEY HOLE SAW



RASP FILE

## TOOLS USED IN CARPENTRY ARE :-

### 1. BALL - PEEN HAMMER -

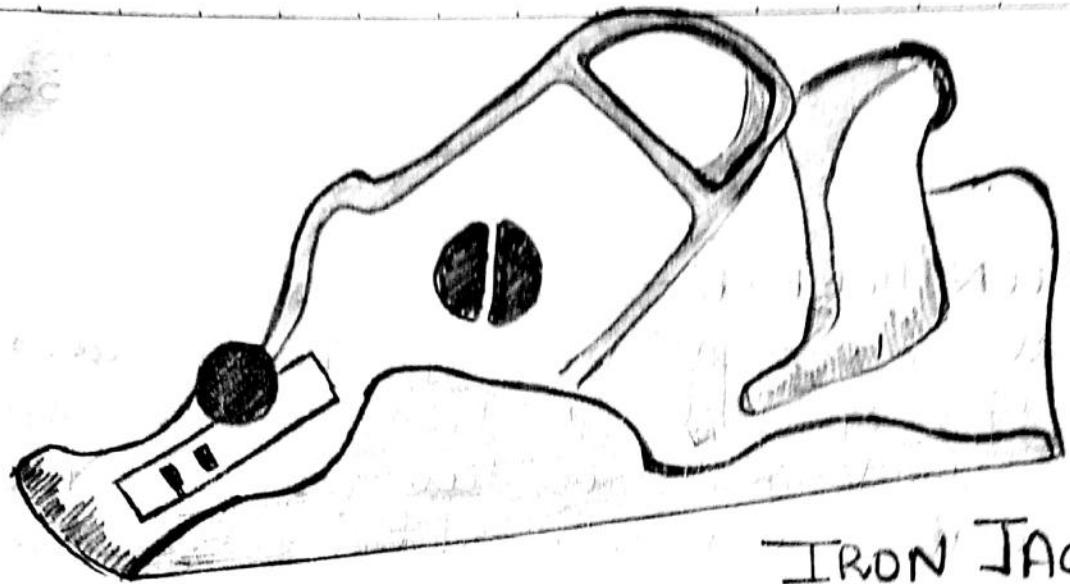
It is also known as machinist's hammer and it is a type of peening hammer used in metal working. Its steel head is harder than that of a claw hammer, so is less likely to chip on impact. Ball-peen hammer are commonly used to drive old chisels, set rivets, bend and shape metal.

### 2. KEYHOLE - SAW -

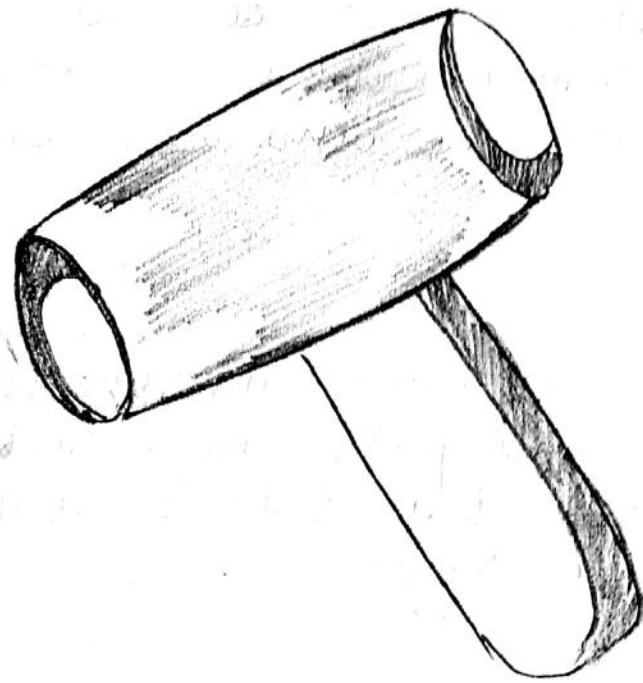
A key hole saw is a long, narrow saw used for cutting small features in various building materials. It has 8 to 13 teeth per inch of the saw.

### 3. RASP FILE -

A rasp is coarse form of file used for coarsely shaping wood or other material. Typically, a hand tool, it consists of a generally tapered rectangular round, or half-round sectioned bar of case hardened steel.



IRON JACK  
PLANE



MALLET



TENON-SAW

#### 4. IRON JACK PLANE -

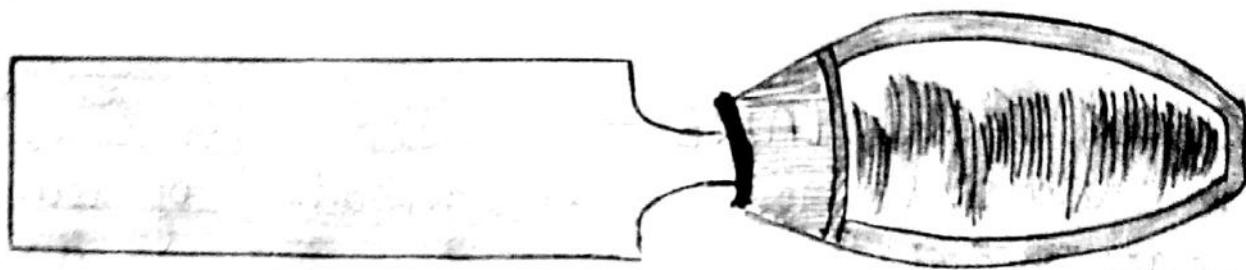
A jack plane is general smoothing of the edges sizing of the bimber but only marking fit to correct size - wood edge jointing. They are about 12-15 inches long, and blade can have either a slightly curve edge for smoothing stock or straight edge for jointing stock.

#### 5. RATCHET BRACE :

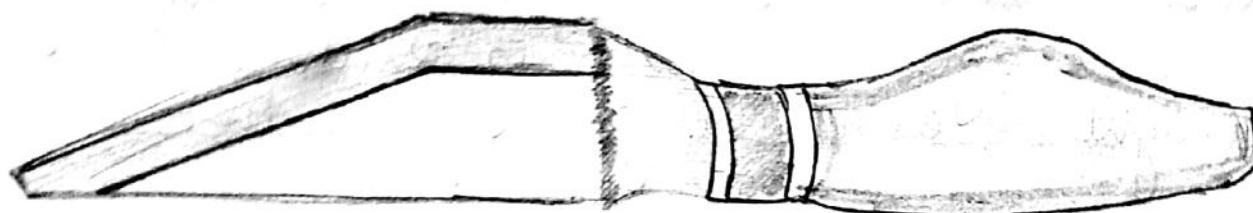
A carpenter's clamp used in confined spaces where a full turn of the braces cannot be achieved it is fitted with a pawl mechanism allowing the bit to be rotated while in the holes.

#### 6. TENON - SAW -

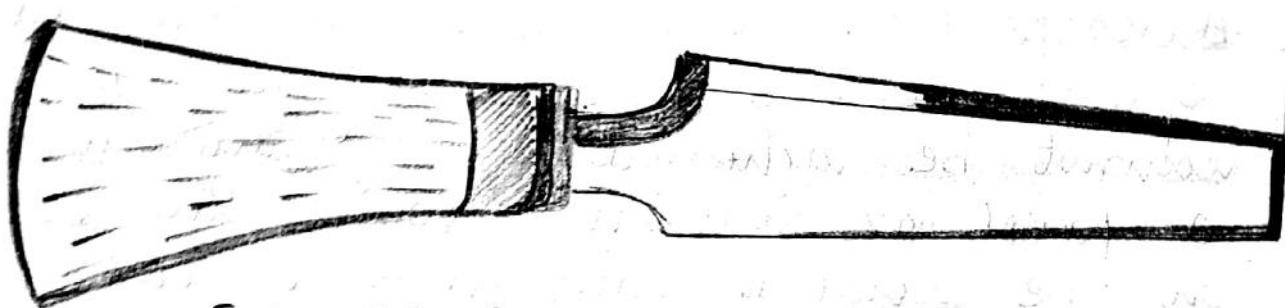
It is used for straight cutting purpose. It has a strong brass or steel back for pricer work. It is a back saw used for making deep, accurate cuts in furniture journey.



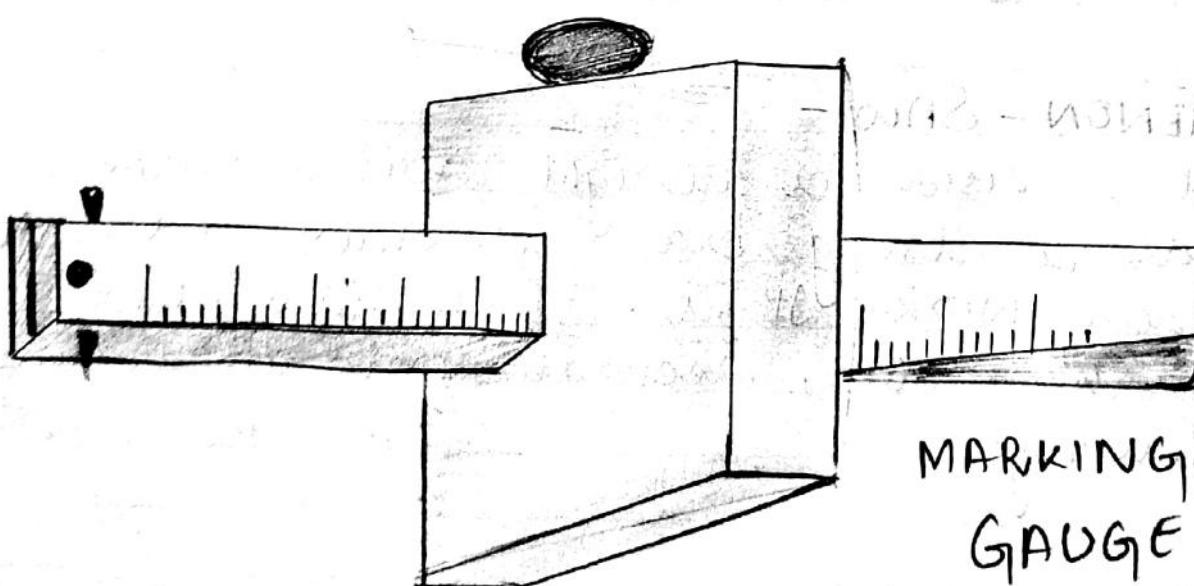
SMOOTH FILE



MORTISE CHISEL



FIRMER CHISEL



MARKING  
GAUGE

#### 7. SMOOTH FILE :

A type of file having teeth so fine as to make out almost smooth surfaces. Used for finishing metals. It is rectangular in shape, single cut on sides and edges. A file should not be used without a handle.

#### 8. MORTISE CHISEL :

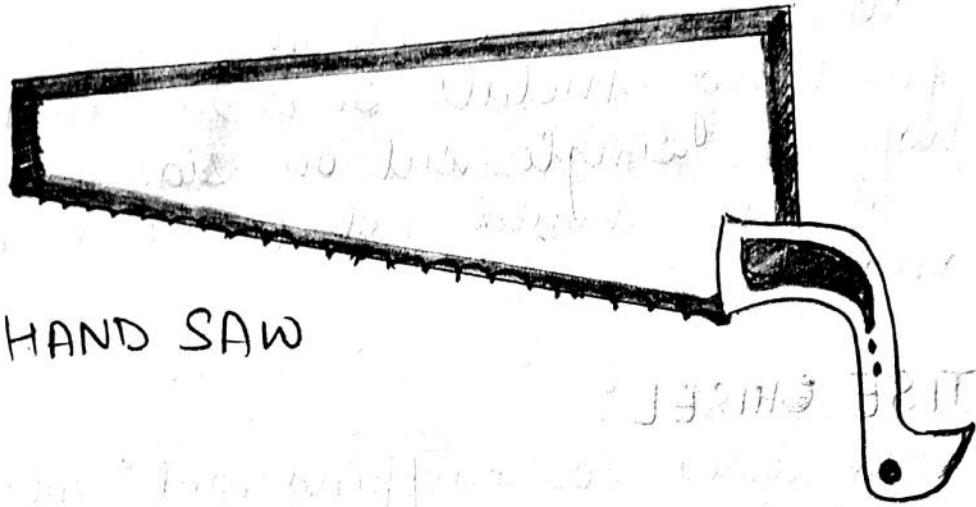
These are used for 'chopping out' joints. They are useful for cutting mortise joints as they are strong enough to withdraw heavy blows with a mallet.

#### 9. FIRMER CHISEL :

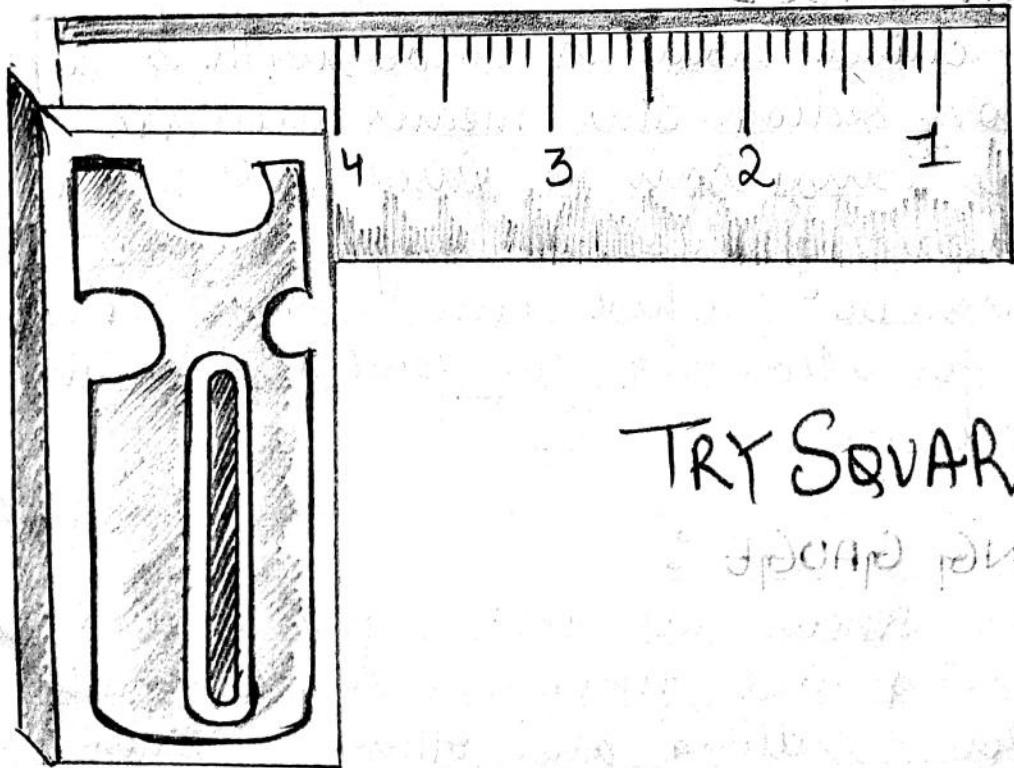
Firmer chisel have a blade with a rectangular cross-section. This means they are stronger and can be used for heavier work. A pairing chisel is longer thinner chisel which can be pushed into longer joints. It is used for cleaning the joint and make it accurate fit.

#### 10. MARKING GAUGE :

It is also known as scratch gauge, used for woodworking and metal working to mark out lines for cutting and other operation. The purpose of Gauge is to scribe a line.



HAND SAW



TRY SQUARE

## 1. HAND SAW :

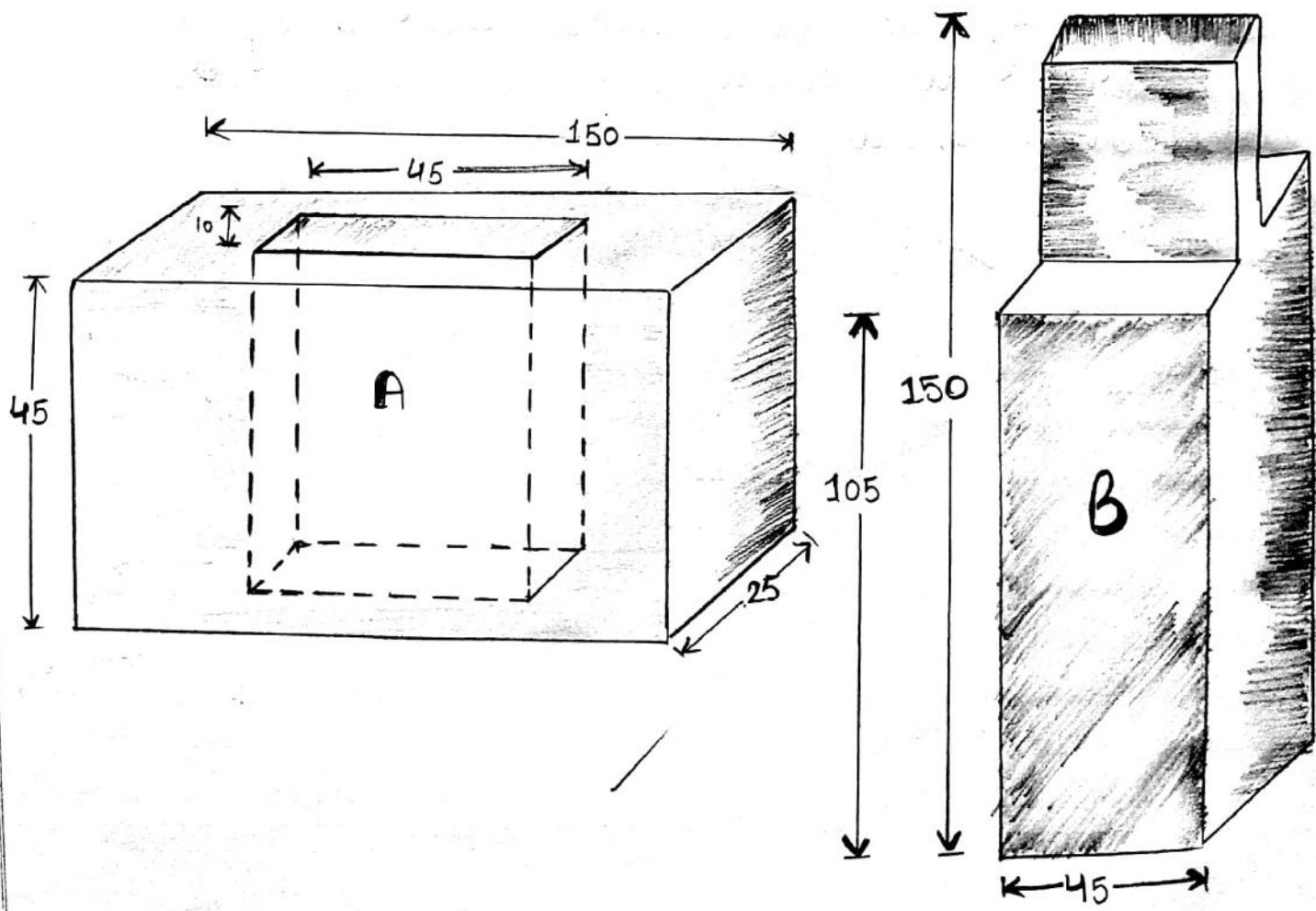
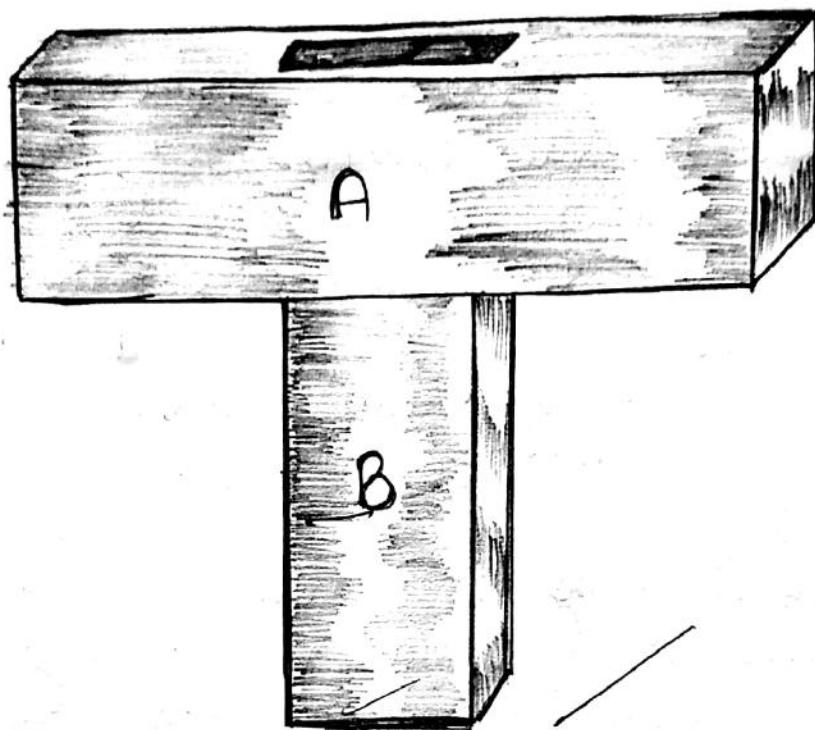
In carpentry, hand saw are used to cut pieces of wood into different shapes. They usually separate by honing a series of sharp points of some substance that is harder than the wood being cut at. It has 8 to 14 teeth per inch of the saw.

## 2. TRY SQUARE :

It is woodworking or a metalworking tool used for marking and measuring a piece of wood. The square refers to the tools primary used for marking. The accuracy of a rt. angle and to try a surface is to check if it is straight or correspondence to an adjoining surface.

Teacher's Signature : \_\_\_\_\_

Aim: To design mortise and tenon joint.



## Job Performed

AIM: To design mortise and tenon joint

MATERIAL REQUIRED: Soft wood, kail wood.

TOOLS REQD. :

Iron jack plane, hand saw, tenon saw, mortise chisel, firmer chisel, try square, scale, mortise gauge.

MEASUREMENTS: Initial size:  $305 \times 50 \times 35$  mm

Complete size:  $300 \times 45 \times 25$  mm

### PROCEDURE :

1. Smooth the given planes wood to the cross-section of  $45 \times 25$  mm.
2. Cut the given piece of wood in two equal parts.
3. Mark with the help of marking gauge the portion to be removed from pieces A.
4. Chisel out the marked portion leaving allowance for furnishing.
5. Mark lines with the help of marking gauge of required thickness on piece B.
6. Remove the unwanted material from piece B.
7. Finish the chisel surface.
8. Assemble the two parts.

Ques  
Date \_\_\_\_\_  
b) \_\_\_\_\_  
Teacher's Signature : \_\_\_\_\_

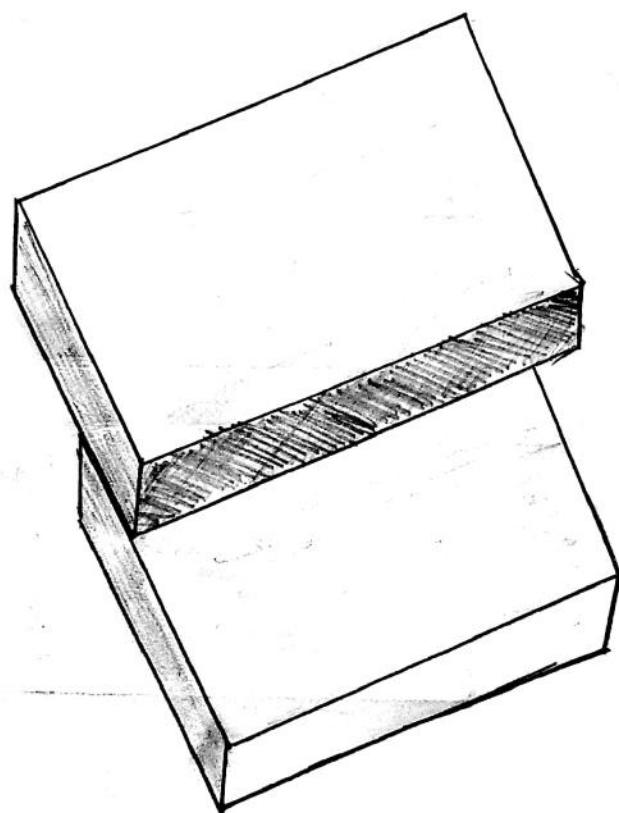
weldings

Shop...

## SAFETY PRECAUTIONS

1. Always wear apron in the workshop.
2. Use goggles, gloves while working
3. Never weld with bare eyes.
4. To avoid exposure to skin use personal protective devices.
5. Keep clothing free from oil and grease.
6. Do not touch any wire/cable and don't allow them to lie horizontally around the work piece to avoid damage in work.

Teacher's Signature :



LAP JOINT

# INTRODUCTION

Welding is a process of joining two similar metals, dissimilar metals or more than two by fusion or with help of heat and pressure. Welding has various applications in automobile, ships, bridges, railway tracks, machines, furniture, Gates etc.

## TYPES OF WELDING :

- (A) 1. Electric Arc Welding
- 2. AC Arc Welding
- 3. DC Arc Welding
- 4. MIG (Metal Inert Gas) Welding
- 5. TIG (Tungsten Inert Gas) Welding.

## (B) Gas Welding

- 1. LPG/
- 2. Oxyhydrogen
- 3. Oxyacetylene.

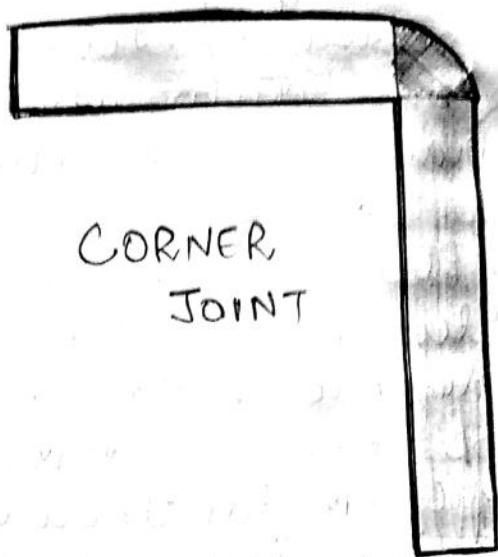
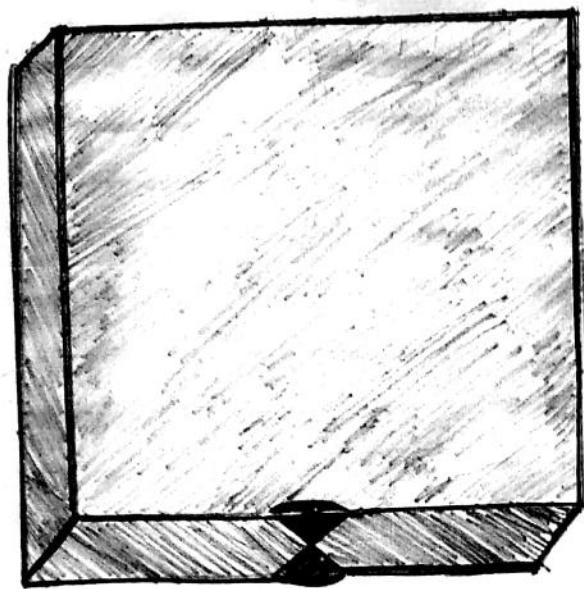
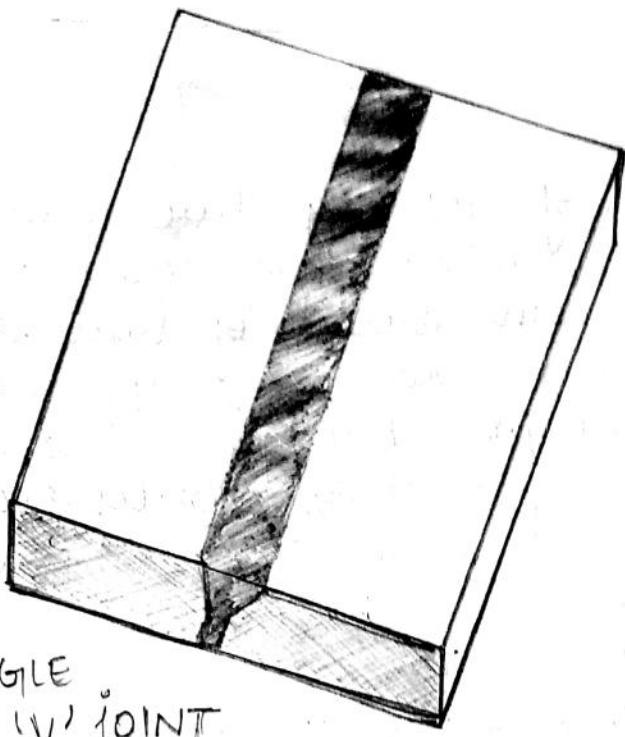
## (C) Resistance Welding

- 1. Spot Welding
- 2. Seam Welding

## JOINTS PREPARED IN WELDING SHOP

- 1. Butt joint:
  - a) Simple butt joint

Teacher's Signature : \_\_\_\_\_



Scanned by CamScanner

- b) Single 'V' butt joint  
c) Double 'V' butt joint

2. Lap joint

- a) 'T' joint  
b) Corner joint  
c) Edge joint

**BUTT JOINT :**

The edges are cuddled in the same flame, 'V' or 'U' shape is given to the edge to make the joint stronger.

**LAP JOINT :**

Used to join two overlapped plates so that the corners of each plate join the surface of other.

**T-JOINT :**

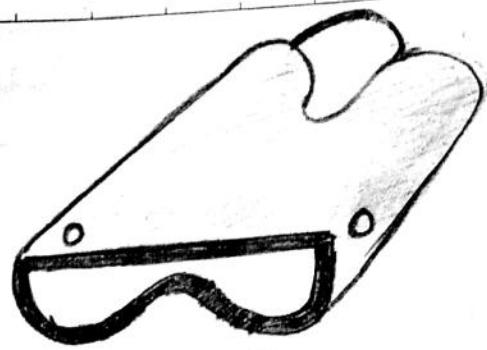
Two surfaces are cuddled at right angles. Angle between surface is  $90^\circ$ .

**CORNER JOINT :**

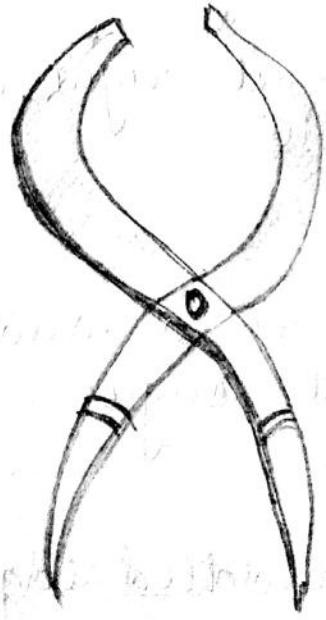
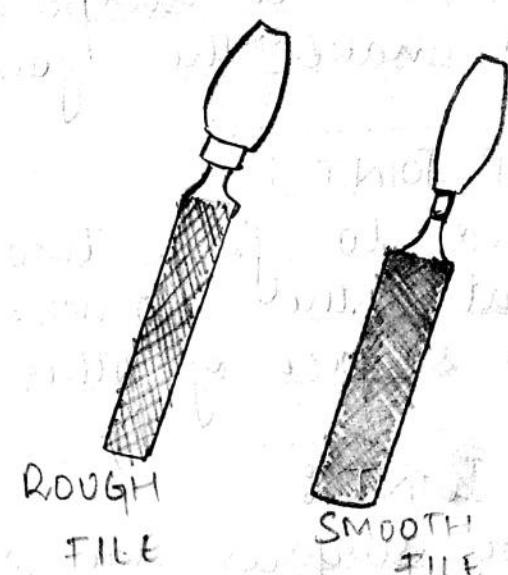
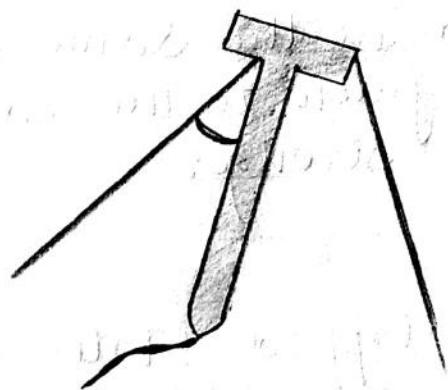
Edges of the shells are joined and their surfaces are kept at right angles.

**EDGE joint :**

Two parallel plates are cuddled edge to edge.



GOGGLES



TONG

## TOOLS USED IN WELDING :-

1. Files -

Rough files and smooth file is used to make metal plate smooth from all sides.

2. Goggles -

To protect eyes from heat & harmful rays and sparks.

3. Electric Holders -

Used to hold electrodes

4. Trysquare -

Used to check perpendicularity of metal oxide

5. Steel foot Rule - To measure the dimension of metal

6. Bench vice -

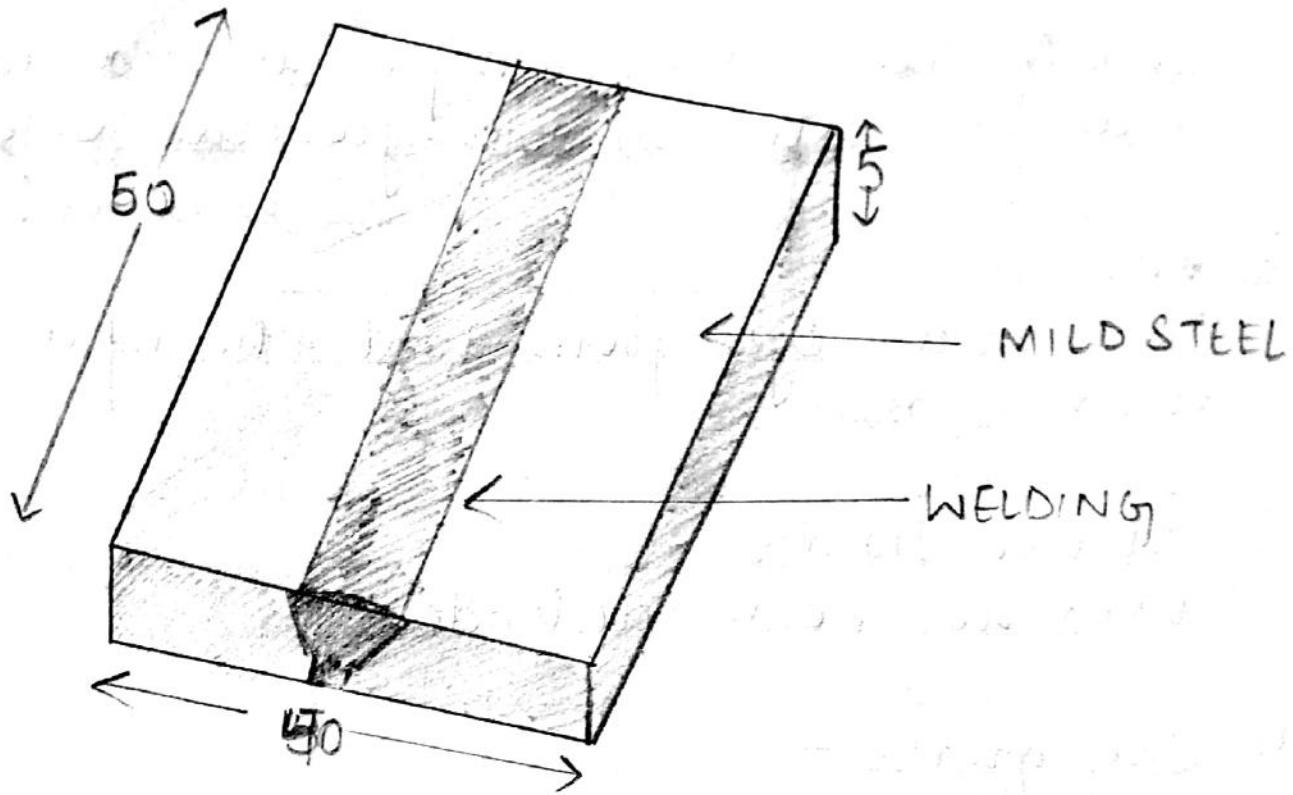
Used to tighten and grip the metal at a particular position to help with fitting and cutting.

7. Chipping Hammer -

Used to clean the chips and smooth the metal joints.

Brought to you by <https://KalExamHai.GitHub.io>

Aim: To prepare a V-Butt Joint by welding



## NOTE :

All dimensions

## SINGLE V' BOTT JOINT.

Expt. No. / Name :

Page No. 42  
Date 20/4/17

## Job Performed

AIM : To prepare V-joint arc welding

### TOOLS REQUIRED:

Electrode, Electrode holder, glove, chipping hammer, tongs, welding screen and goggles, apron, steel foot Rule, try square, wire brush, file.

### MATERIAL REQUIRED:

Mild steel plate, size (40 x 50 x 5) mm

### PROCEDURE

1. Hold the given piece in bench vice.
2. File the plate to make it of reqd. dimensions.
3. Join the two plates as shown.
4. Start the welding job to join the two pieces in the given way.
5. Remove the slag using chopper and hammer.
6. Clean the joint with wire brush and let it cool.

### PRECAUTIONS:

1. Do not touch any wire and do not allow them to lie horizontally around the workpiece to avoid damage on work.
2. Always wear eye protection.

Teacher's Signature

Ajay  
20/4/17

# SHEET METAL SHOP...

## SAFETY PRECAUTIONS

1. Hold the chisel in such a manner that the hammer blow may not miss the chisel to injure your hand.
2. Hammer with the loose hand should not be used it may cause hand injury.
3. Never middle the fingers in between the snip, while shearing.
4. Never manipulate tools or work piece during shearing and banding operations and machine.
5. Burns on cut piece are sharp, handle carefully such pieces.
6. Do not brush away the chips with your hand.
7. Hot working pieces should be clearly indicated same sign otherwise they may cause hand burns.
8. Place the scrap in the scrap box.

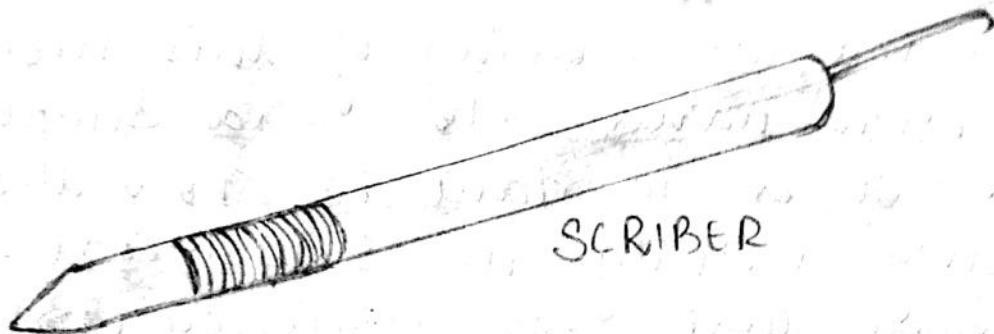
Teacher's Signature \_\_\_\_\_

# Introduction

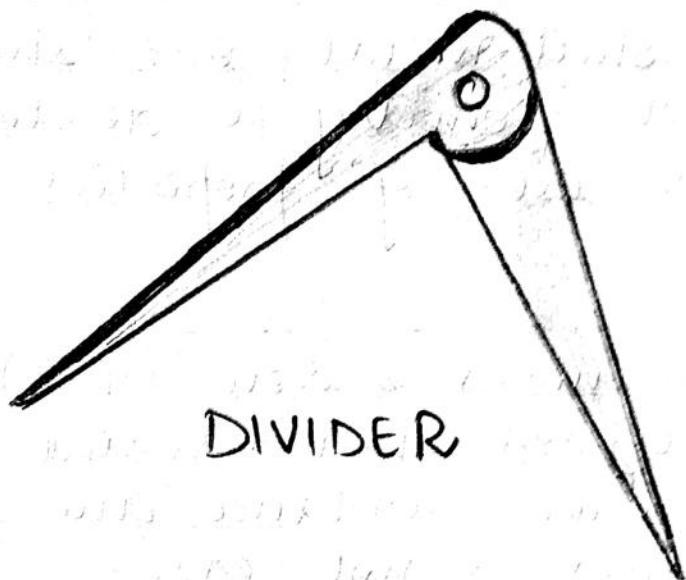
It is regarded as working of this metallic sheet with hand tools and simple machines. It is important to know that for efficiency working in sheet metal, one should know that for efficiency working in sheet metal, one should know about project Geometry i.e. development of surfaces and the proj properties of metal.

## Widely Used Sheets:

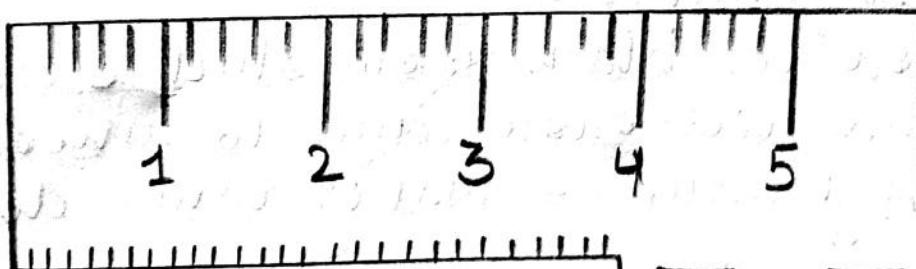
1. Galvanised iron (I) sheet :-  
It is soft sheet created with Zinc, has corrosion resistance due to Zn coating, welding is not easy.
2. Mild Steel Sheet :-  
It is known as black iron sheet susceptible to rust and corrosion due to uncoating. Used in fabrication, water tanks etc.
3. Aluminum Sheet :-  
These sheets have silvery appearance. They are light weight and can be easily bent and crushed.



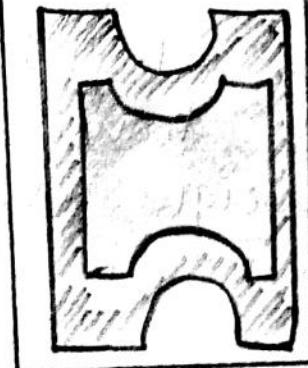
SCRIBER



DIVIDER



TRY SQUARE



## TOOLS USED IN SHEET METAL :-

### 1. Scriber :

It is steel wire of 200mm length with one end sharp and hardened to make lines on metallic sheets.

### 2. DIVIDER :

It is used to scribe arcs and circles on the metallic sheets.

### 3. Try-Square :

It is used as marking tools. It can draw lines at right angles.

### 4. STEEL SQUARE :

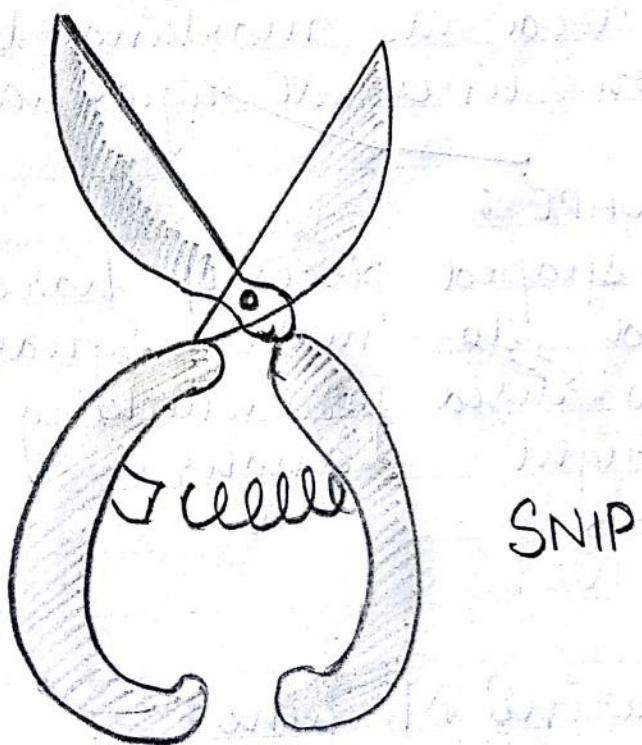
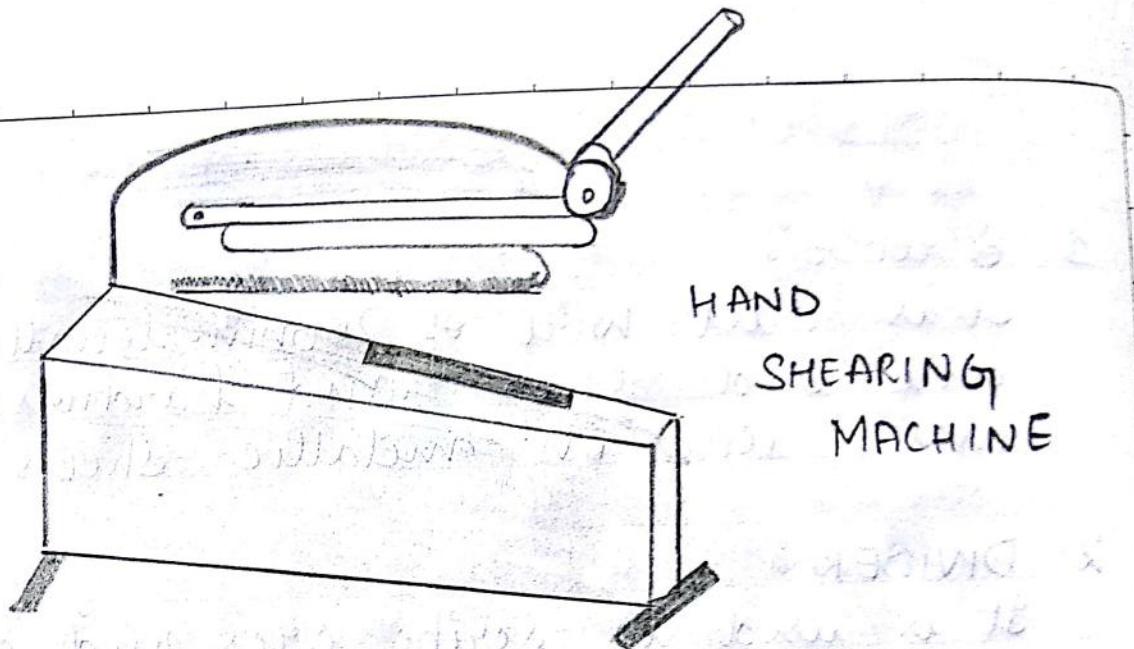
It is a L shaped piece of hardened steel. It is used to make square corners. It is also used for checking and making right angles.

## CUTTING TOOLS :

### Hand Shearing Machine :

(i) It is steel wire of 2nm. It is universal shearing machine. It is used for sheet cutting, flat shearing, around bar shearing etc.

Teacher's Signature \_\_\_\_\_



### Snip:

- (iii) It is used for cutting along straight line. It is used whose blades are straight. To cut sheets of greater thickness less shearing machine is used.

### Standard Wire Gauge:

- (iii) It is used to check the diameter of wire. It is made up of sheet size.

GAUGE	mm (thickness)
1	7.62
12	2.64
20	0.91
28	0.38
32	0.27

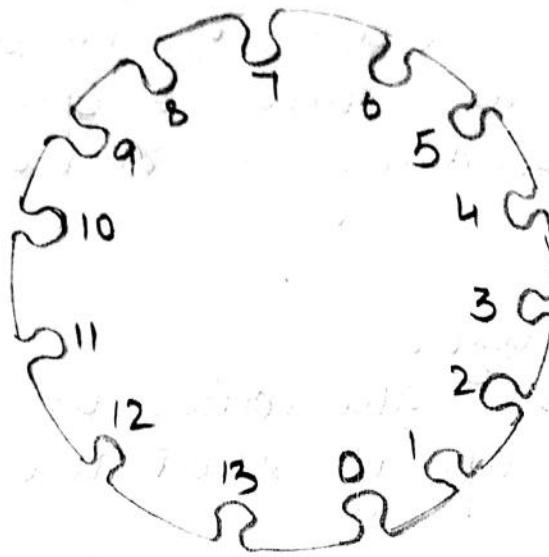
## STRIKING TOOLS

### 1. Mallet hammer -

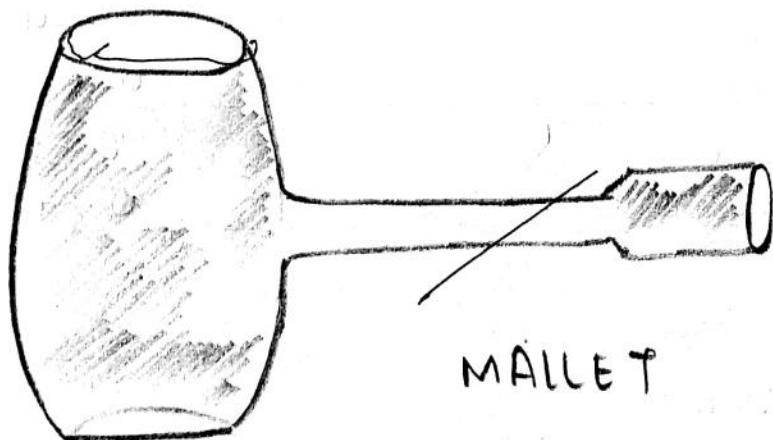
It is made of good hammer wood. Used to give light force, smoothing of sheet.

### 2. PLASTIC HAMMER -

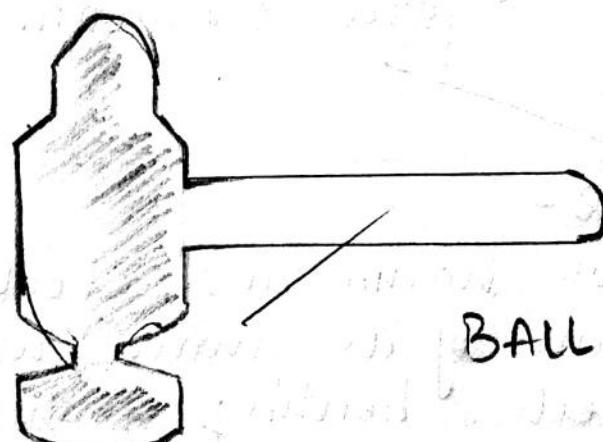
It is used for hammering sheets with low force. Some of its main uses are for striking of sheets, bending of sheets etc.



STANDARD WIRE GAUZE



MALLET



BALL PIN HAMMER

### 3. RUBBER HAMMER:

Made of Rubber. They are used when light force is required in equipment. As they do not leave marks and are less likely to dent the work piece.

### 4. BALL PEAN HAMMER:

It is a General purpose hammer. Its force is slightly curved and the head is round.

### ELENAI:-

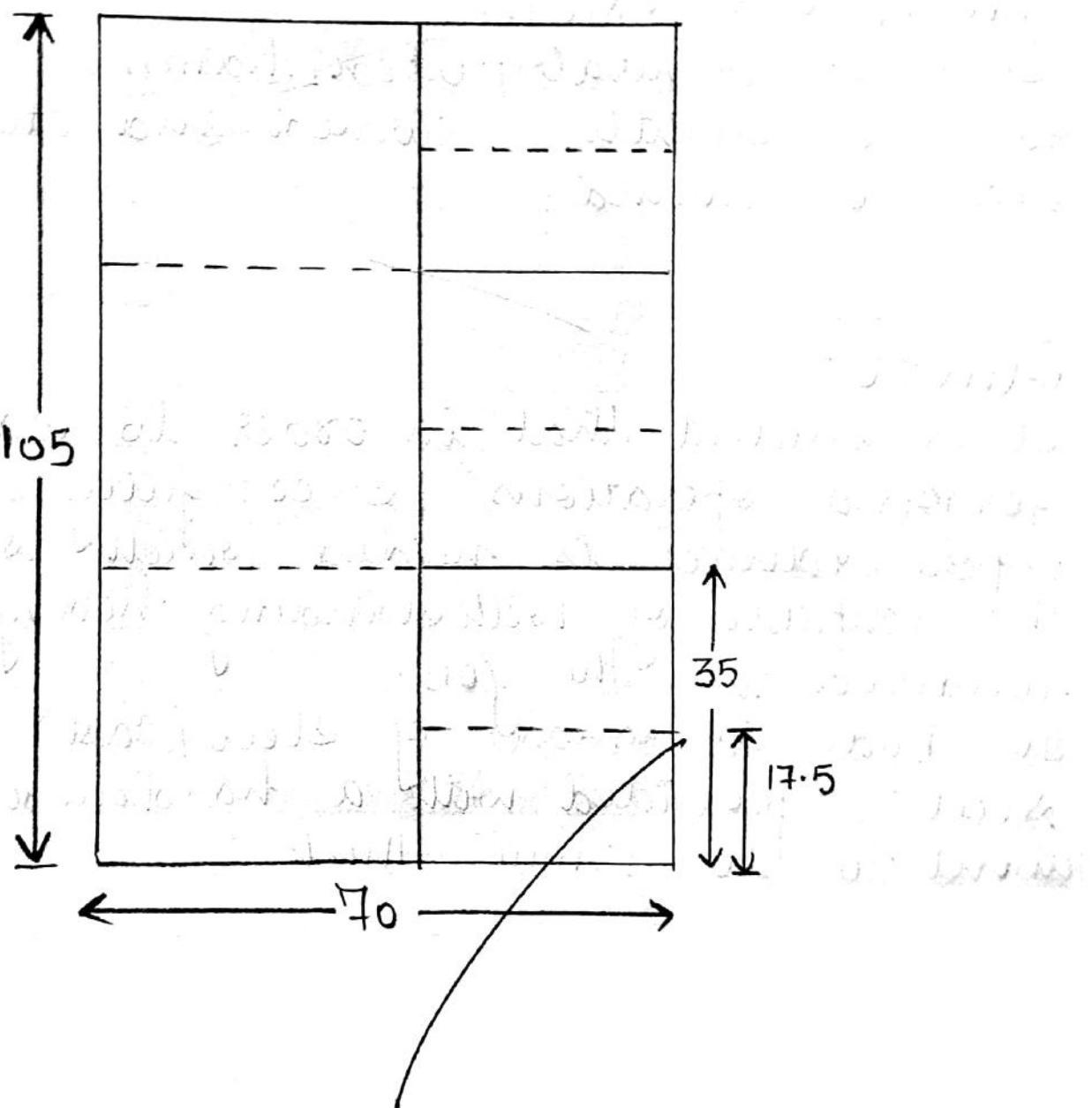
It is evident that in order to carry out forging operations successfully, a proper device is needed which should be capable of withstanding heavy rendered to the job.

Its body is made of Steel (cast), mild steel provided with a hardened to about 20 to 25mm thick.

## IM : Practice in Marking And Cutting

Cutting

All dimensions in mm.



## Job performed 1.

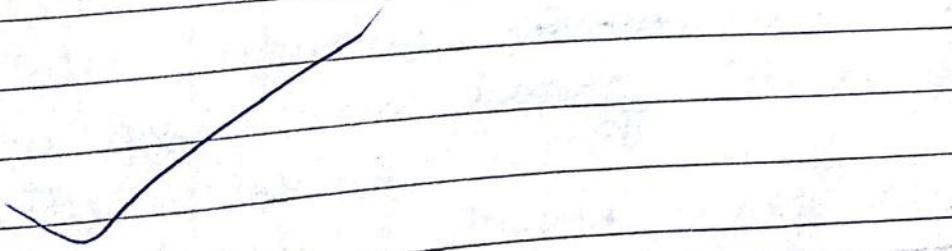
AIM : Practice in making measuring and cutting

TOOLS REQUIRED : Snip, steel foot Rule, square, sheet, mallet etc.

MATERIAL REQD. : Galvanised Iron (GI)  
Sheet of size 100m x 70mm.

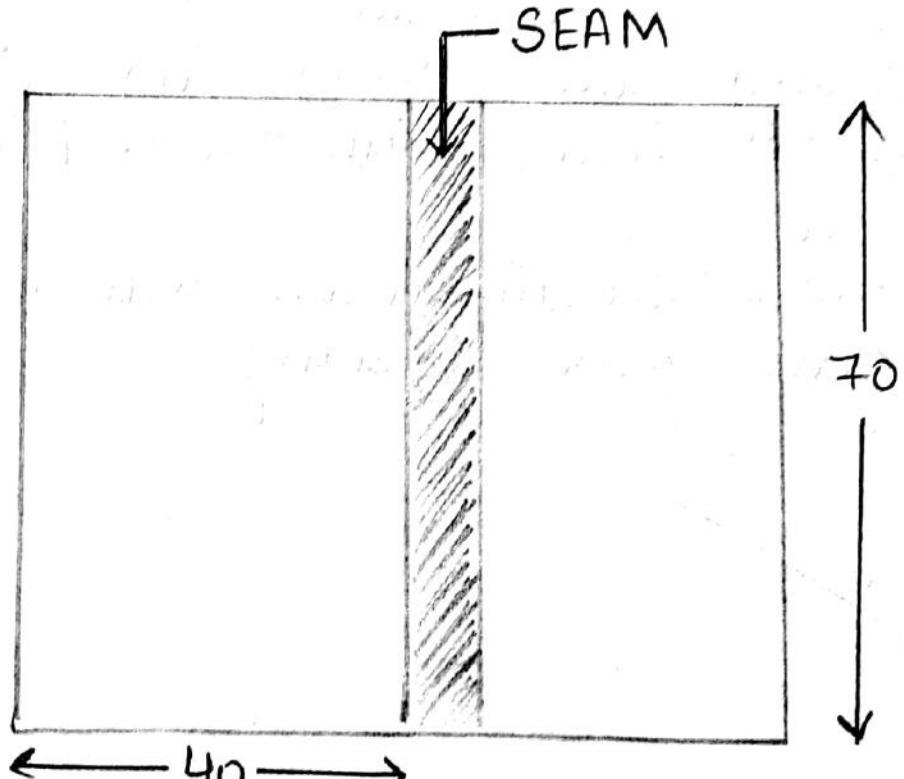
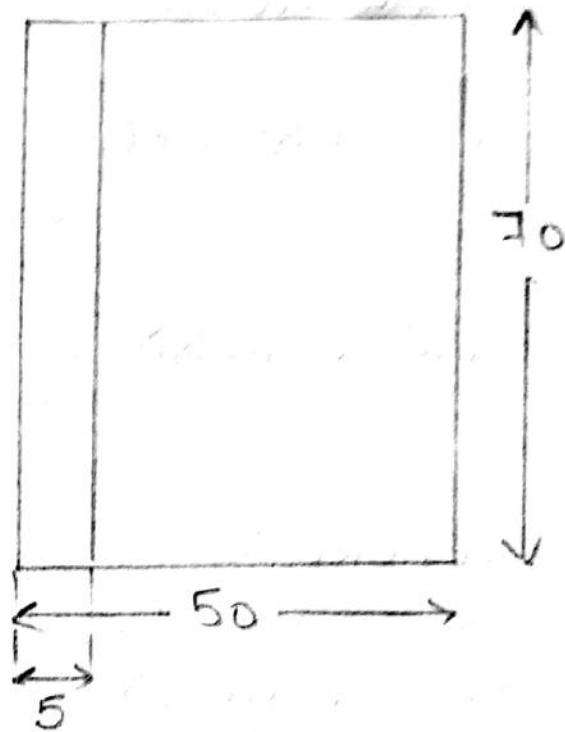
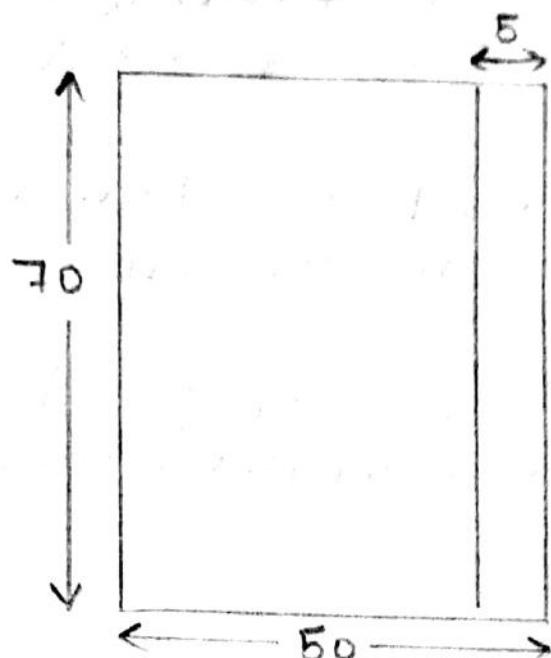
### PROCEDURE :

1. Study the drawing
2. Mark with the help of scriber one square as in figure.
3. Cut along the marking line (shown by dotted line) with the help of snip and file.
4. Check all the dimension with steel foot Rule and give good finishing.



Teacher's Signature \_\_\_\_\_

Q1M : To prepare a Seam Joint.



NOTE : All dimension in 'mm'.

## Job Performed 2.

AIM : To prepare a seam joint.

TOOLS REQD : Steel straight snip, try square, plasti hammer, steel foot Rule.

MATERIAL REQD : Galvanised iron sheet of size  
(100 x 70) mm

### PROCEDURE :

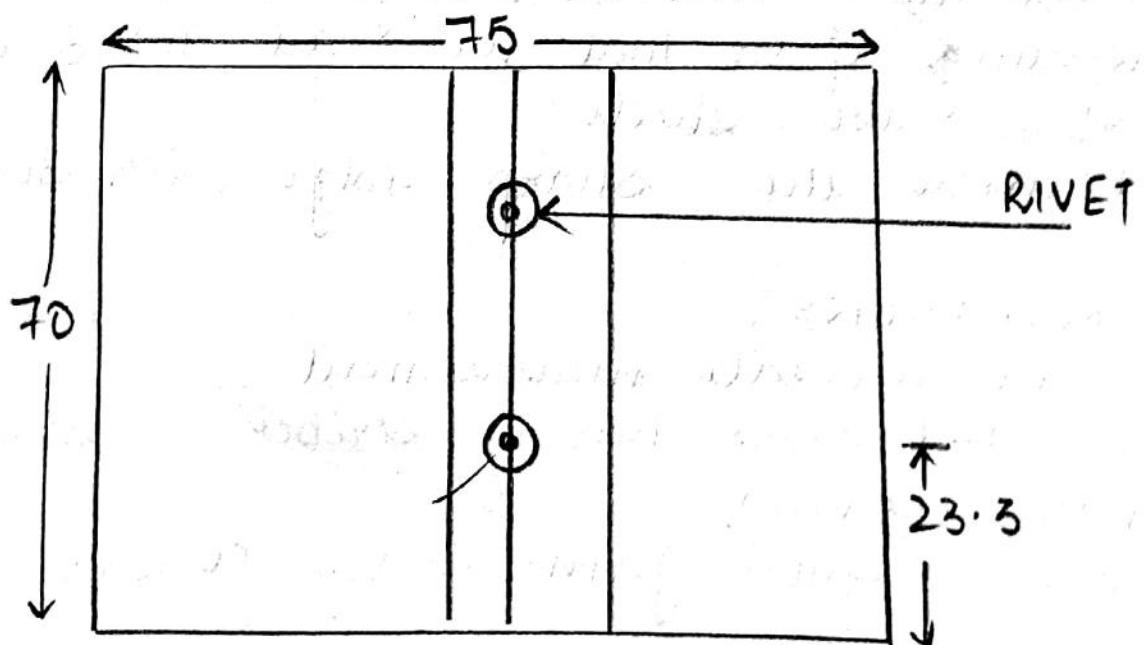
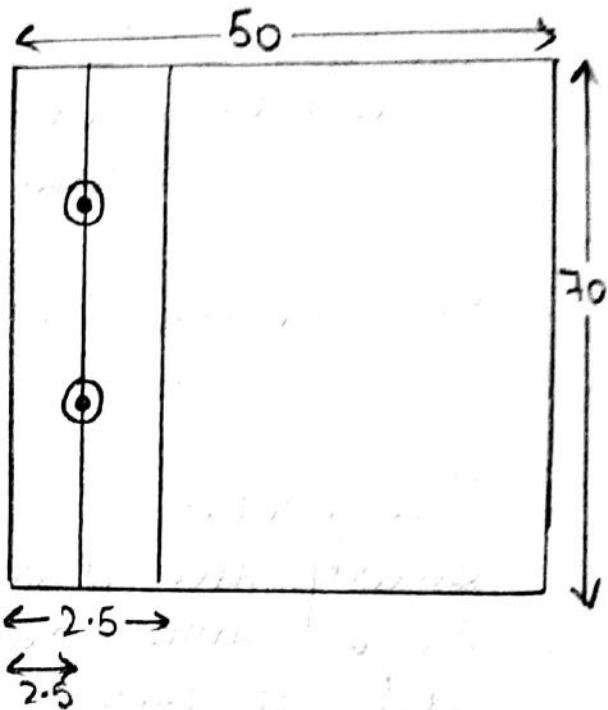
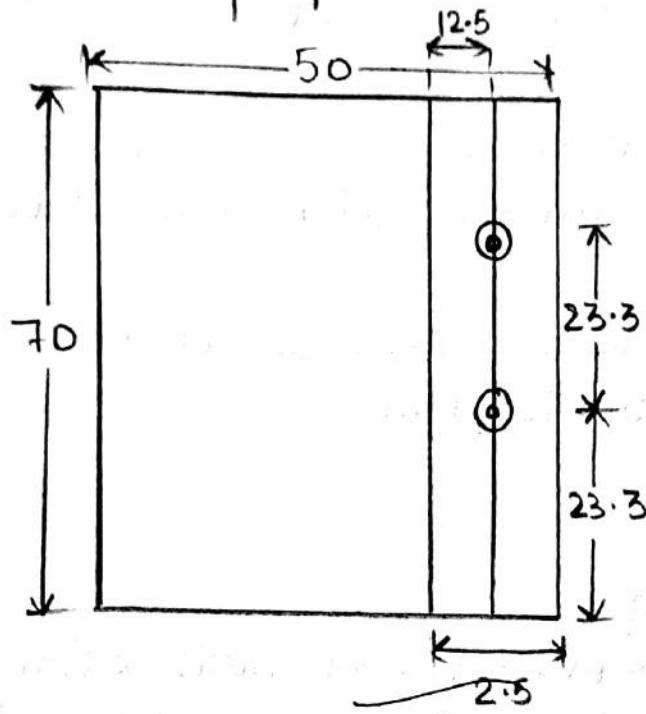
1. Study the drawing.
2. Mark 5mm from one edge on both side
3. Cut it with the help of snip, bend the sheet along the mark.
4. Mark the middle along the length and cutting if so that we get 70x50 size of two sheets.
5. Remove the sharp edge with snip.

### PRECAUTIONS :

1. Take accurate measurement.
2. Do not press hardly scriber on sheet with marking.
3. Be careful from sharp corners.

Teacher's Signature \_\_\_\_\_

AIM : To prepare a riveted joint



NOTE : All dimension  
in 'mm'.

job performed 3.

AIM : To prepare rivet Joint .

TOOLS REQD : Steel foot Rule, Snip, try square, scriber, plastic hammer.

MATERIAL REQD : Galvanised iron sheet of Size 100mm x 70mm .

PROCEDURE :-

1. Study the operations.
2. Mark this sheet into two equal size pieces
3. Mark the sheets acc. to figure with scriber and position them.
4. Cut the sheet with snip and hit with the help of mallet and rivet properly
5. join the two sheets
6. Remove the sharp edge with snip.

20/4/17

