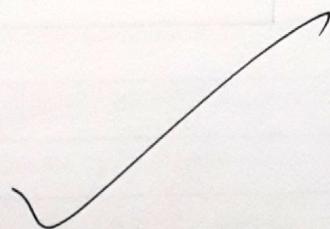


SINGLE V-BUTT JOINT

DETAILED JOB DIAGRAM

DETAILED WELD
MATERIALS



WELD PROFILE
CROSS SECTION

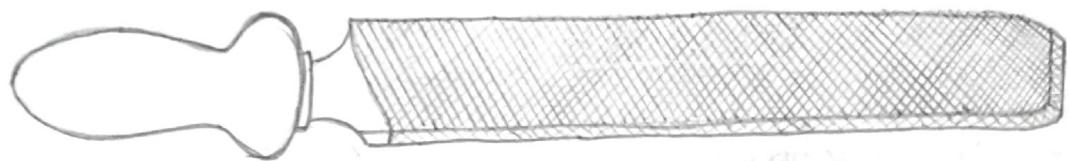
JOB NO. 1WELDING

- OBJECT:- To prepare a single V-butt joint by arc welding and study of gas welding process.
- TOOLS AND EQUIPMENTS USED:- 12" rough double cut file, 4" try square, 5" parallel jaw bench vice, welding machine, screen, tongs, chipping hammer and steel wire brush.
- BRIEF THEORY/PRINCIPLE:-
Welding is a process of joining similar metals by application of heat with or without application of pressure and addition of filler material the result is a continuity of homogenous materials of the characteristics of two parts which are being joined together. Welding depends on one or more of major facts:

- (i) Melting point
- (ii) Thermal expansion
- (iii) Thermal conductivity
- (iv) Surface conduction
- (v) Change in micro-structure.

Undesirable in micro-structure with respect to weldability, they may be corrected by proper shielding atmosphere, proper fluxing material, proper filler metal, proper welding procedure and

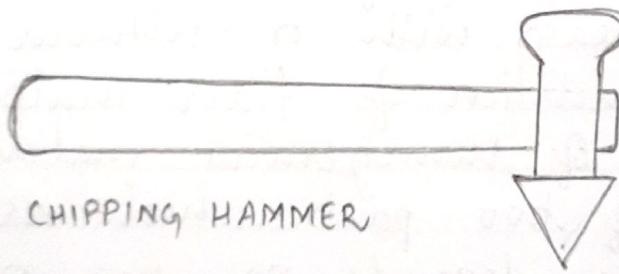
Teacher's Signature :



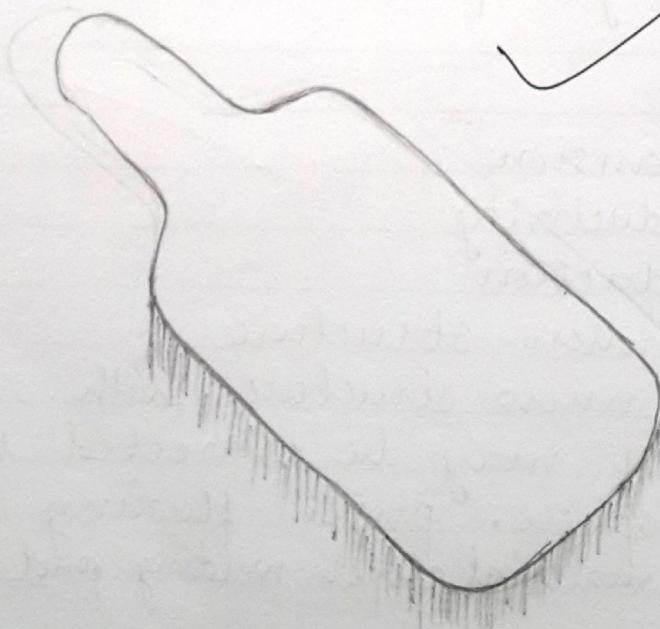
12" DOUBLE ROUGH FILE (FLAT)



TONGS



CHIPPING HAMMER



STEEL WIRE BRUSH

Same case by proper heat treatment of the metal before deposit.

→ OPERATIONS PERFORMED:-

(i) Filing :- Filing is done on the job material to remove the corrosion, to set them together and to make them uniform. It is done by fixing the mild steel bars on 5" parallel jaw bench vice. A cut of angle 45° from one side is made on both the bars and the straightness is checked using try square.

(ii) Single V-lutt joint by arc welding :-

Arc welding is most extensively employed method of joining metal parts whose source of heat is an electric arc, the arc column is generated between an anode which is positive and table which is earthed and acts as cathode.

When these end conductors of an electric current circuit are brought together and separated for a small distance (2-4 mm) such the current continues to flow, through a path of inside particle (gaseous mode) called plasma an electric arc is made (formed). Heat is generated as the ion strike on the cathode, here electrical energy is being converted into heat energy the temperature of arc being 6000-7000°C, the temperature of electrodes depends upon the type of

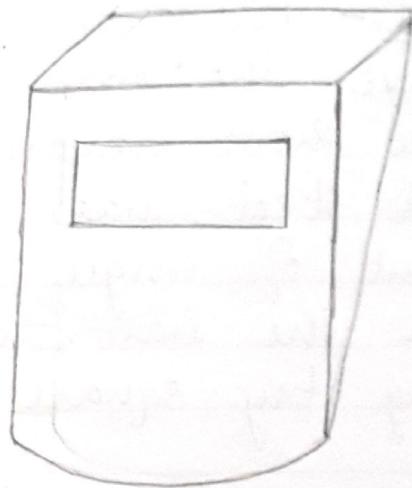
Teacher's Signature : _____



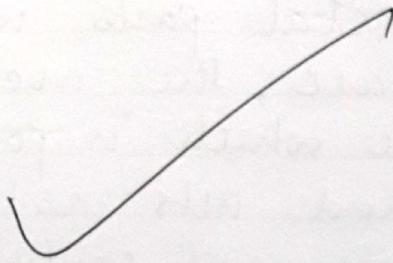
ELECTRODE
HOLDER



ELECTRODE



SCREEN



electrode between which it is stuck, the heat of arc raises the temperature of the parent metal which is melted forming a molten metal. The deposit metal serves to fill and bond the joint or to fuse and build up the parent metal surface, the two-third of the heat is developed near the positive pole while remaining one-third of heat is developed near the pole which is negative.

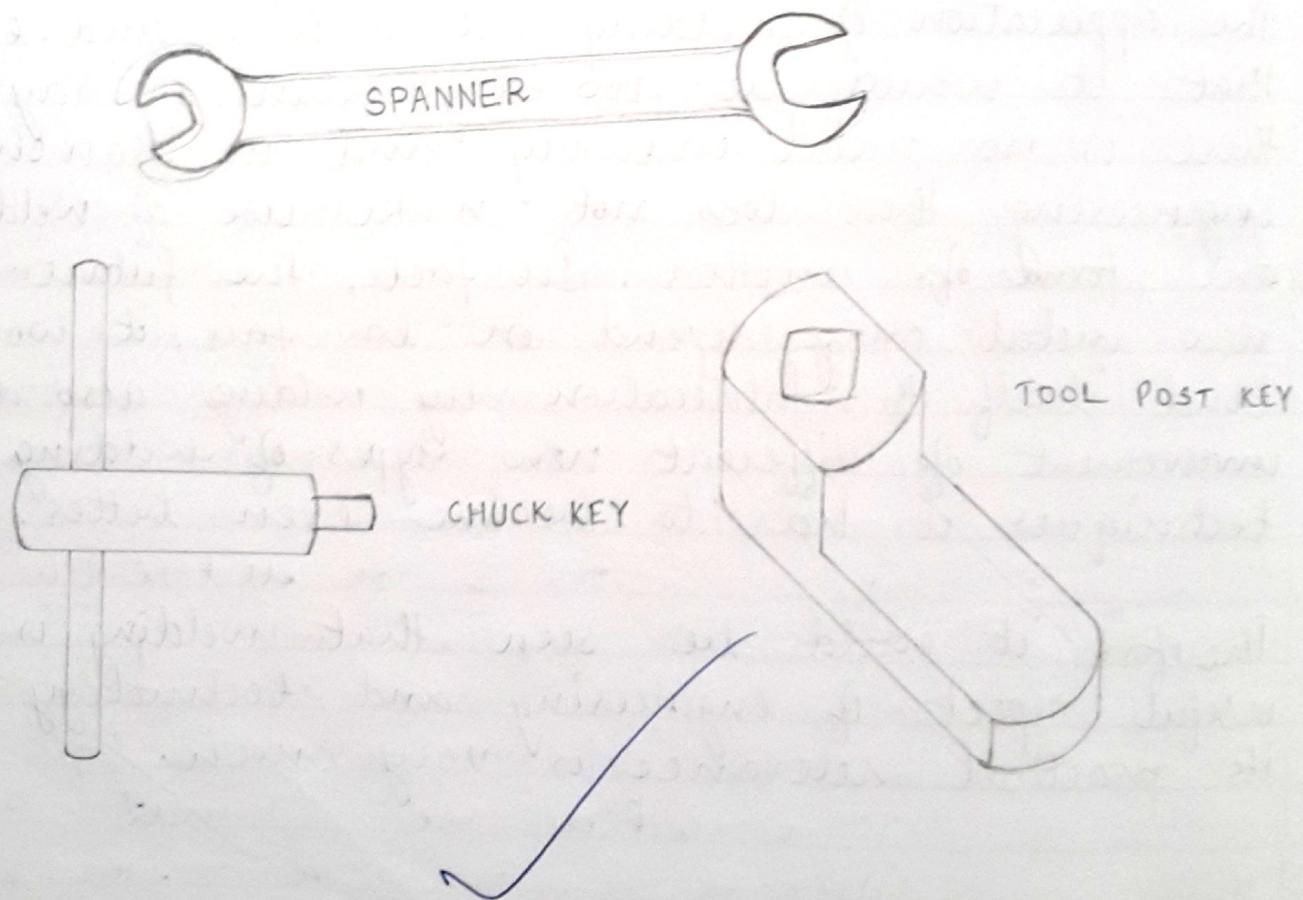
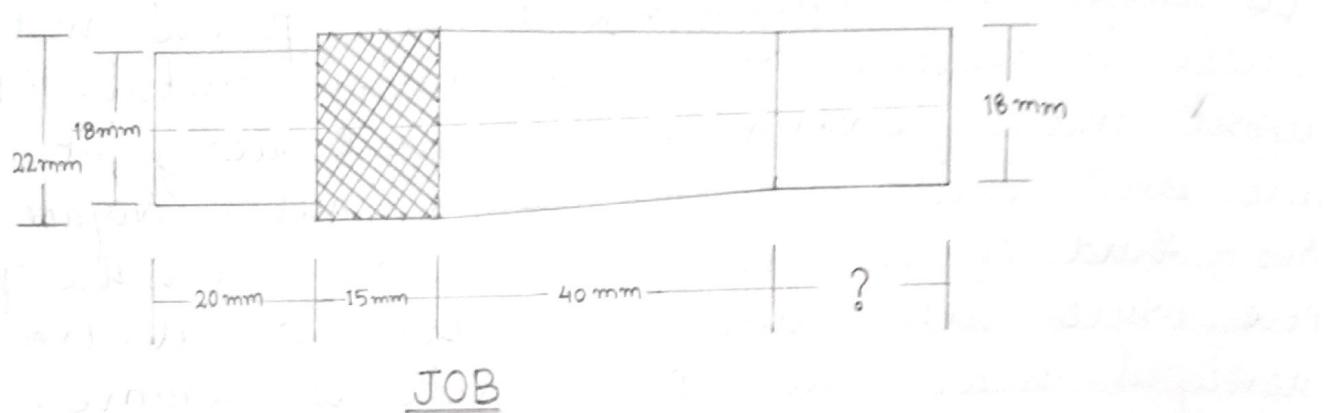
→ PRACTICAL RELEVANCE :-

The application of welding are so wide and extensive that it would be no exaggeration to say that there is no metal industry and no branch of engineering that does not make use of welding in one form or another. In fact, the future of any new metal may depend on how fair, it would tend itself to fabrication by welding also due to involvement of different new types of welding techniques it has to become even better.

Therefore it could be seen that welding is a very useful aspect of engineering and technology and its practical relevance is very much.

July 3/11/16

Teacher's Signature : _____



JOB NO. 2 (TURNING)

→ OBJECT:- To perform facing, simple turning, taper turning and knurling operation on lathe machine.

→ TOOLS AND EQUIPMENTS:-

Mild steel rod, lathe machine, spanner, outside spring calliper, single point V-shape cutting tool, chuck key, tool post key, knurling tool, high speed cutting tool.

→ THEORY:-

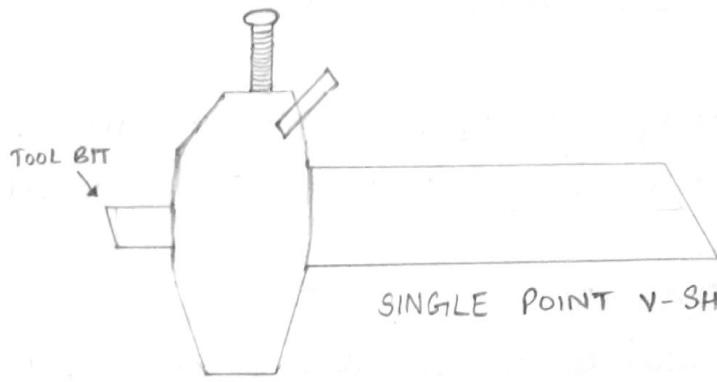
The main function of a lathe is to remove metal from a piece of work to give it the required shape and size.

This is accomplished by holding the work securely and rigidly on the machine and then turning it against cutting tool which will remove metal from the work in the form of chips. To cut the material properly the tool should be harder than the material of the work piece.

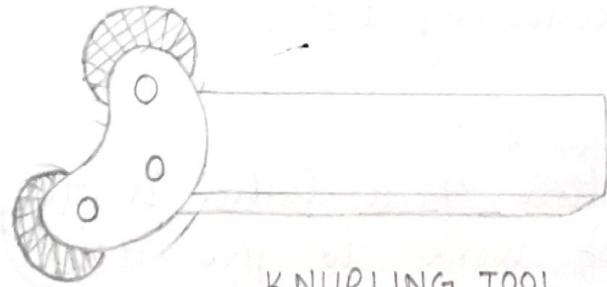
→ OPERATIONS:-

i) FACING:- Facing is the operation of machinery the ends of a piece of work to produce a flat surface square with the axis. This is also used to cut the work to the required length. This operation involves feeding the tool perpendicular to the axis of rotation of the work piece.

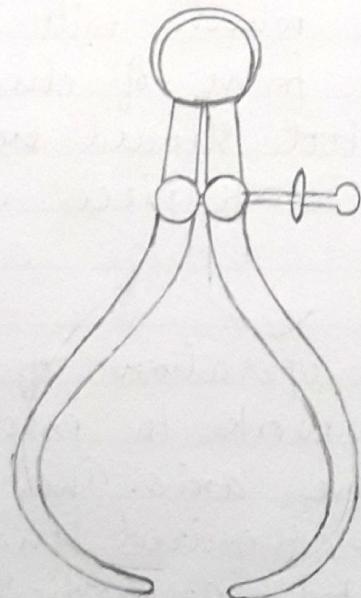
Teacher's Signature : _____



SINGLE POINT V-SHAPE CUTTING TOOL



KNURLING TOOL



OUTSIDE SPRING CALLIPER

2) TURNING:- Turning in a lathe is to remove excess material from the work piece to produce a cone shaped or a cylindrical surface.

(i) Simple Turning:-

It produces a cylindrical surface by removing excess metal from the work piece. The tool is fed parallel to the lathe axis.

(ii) Taper Turning:-

In a lathe, taper turning means to produce a conical surface by gradual reduction in diameter from a cylindrical work piece

→ CALCULATION:- By compound ress method -

$$\theta = \tan^{-1} \left(\frac{(D-d)}{2l} \right)$$

$$= \tan^{-1} \left(\frac{22-18}{2 \times 40} \right) = \tan^{-1} \left(\frac{4}{80} \right) = \tan^{-1} \left(\frac{1}{20} \right)$$

$$= 2.86^\circ \approx 3^\circ$$

3) KNURLING:- It is a process of embossing a diamond shape pattern on the surface of a work piece, provides gripping surface on a work piece to prevent it from slipping when operated by hand.

→ PRACTICAL RELEVANCE:-

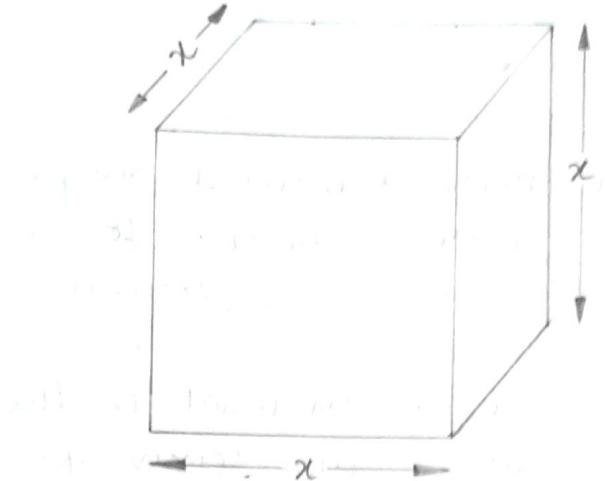
Turning is the process of producing required shape by machine tool of different types of iron. It is simple to use and can produce cylindrical and conical shape.

This process smoothes the texture of material of the work piece and improve the shape by removing rust and extra material from the job piece.

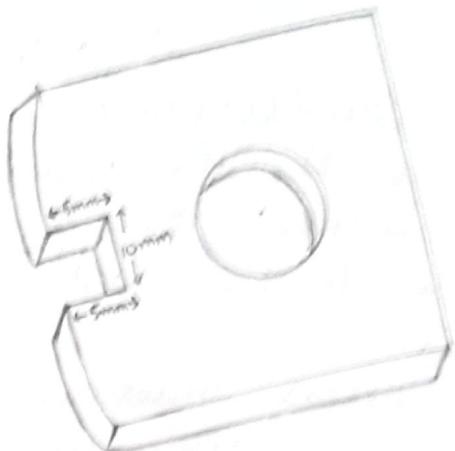
It has great practical relevance in industry also.

~~July 27/11/15~~

Teacher's Signature : _____



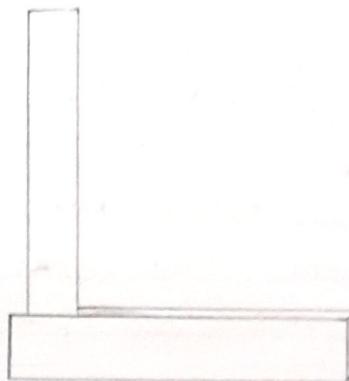
Cube shaped cast iron block jobe



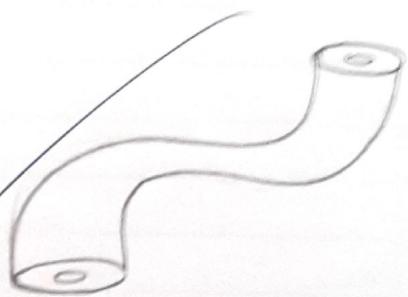
Slot cut in cast iron block jobe



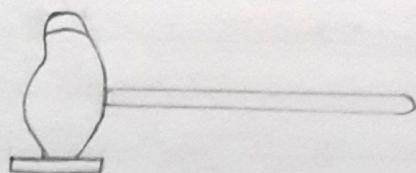
centre punch



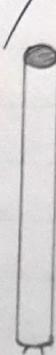
Try-square



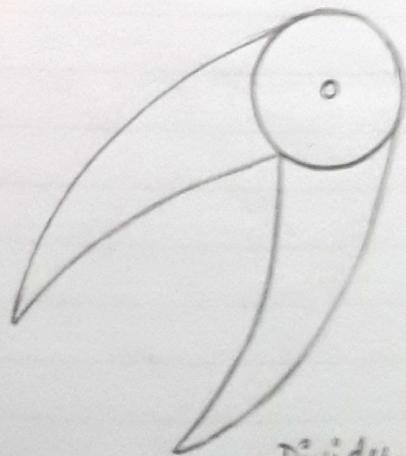
Ring spanner



Hammer



Number
punch



Divider

EXPERIMENT No. 3

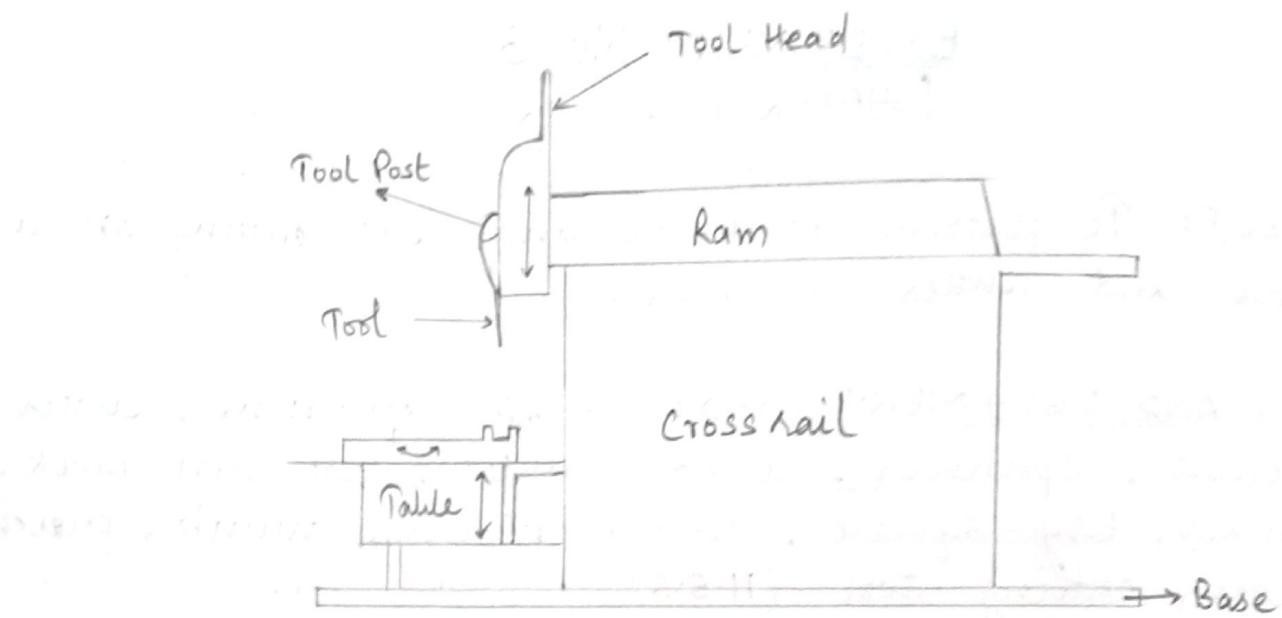
(SHAPER & SLOTTER)

- OBJECT:- To perform planning and slot cutting on a shaper and slotted machine.
- TOOLS AND EQUIPMENT USED:- Shaper machine, slotted machine, spanner, using spanner, cast iron block, hammer, try-square, centre punch, number punch, divider, cutting tool (H.S.S)
- JOB MATERIAL:- cast iron cube, cast iron block.
- BRIEF THEORY:-

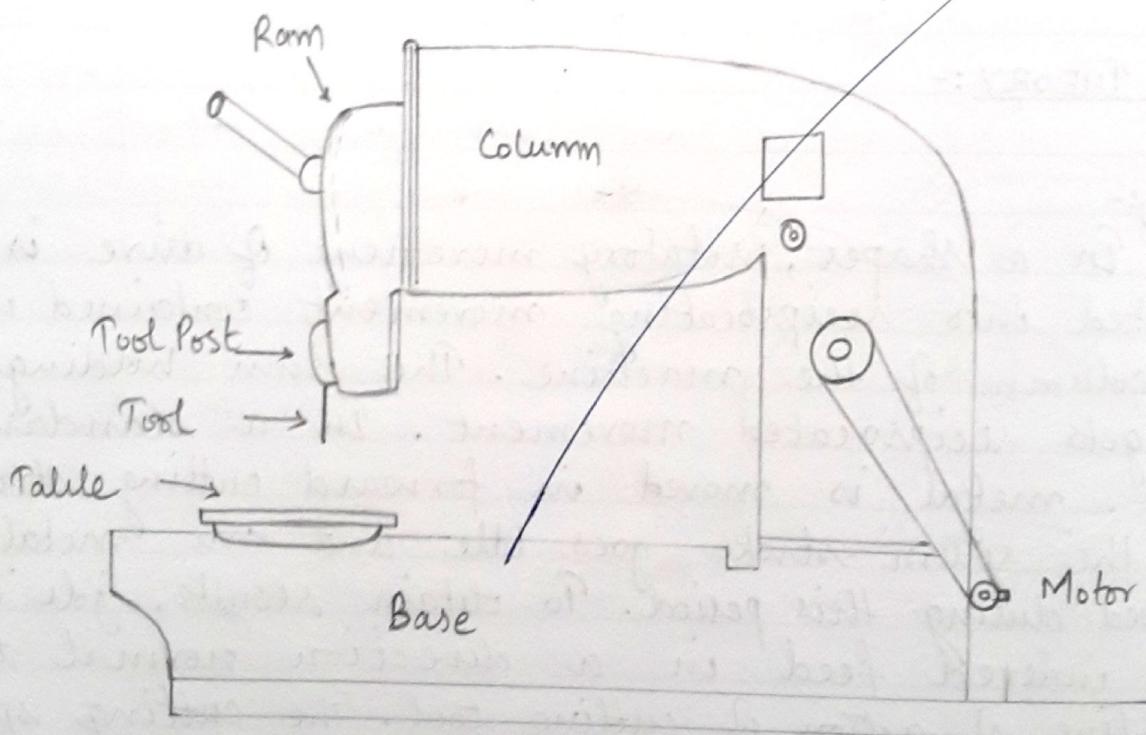
Shaper :-

In a shaper, rotatory movement of drive is converted into reciprocating movement contained within the column of the machine. The ram holding the tool gets reciprocated movement. In a standard shaper, metal is moved in forward cutting stroke while the return stroke goes idle and no metal is removed during this period. To obtain results, job is given indexed feed in a direction normal to the line of action of cutting tool. The cutting speed depends on type of material and machine condition, during return stroke, ram is allowed to move at a faster rate to reduce the idle time.

Teacher's Signature :



Main parts of a shaper



Main Parts of Slotter

Slotter:-

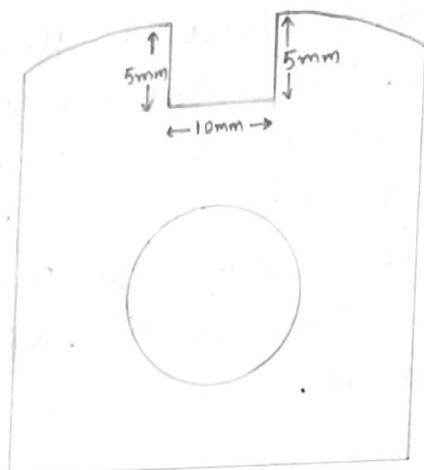
Slotting machine operates almost on same principle as that of shaper. The ram holding the tool reciprocates in vertical direction. A vertical shaper and slotter are almost same and the only difference being in case of vertical shaper, the ram holding the tool also reciprocates at an angle to horizontal.

→ OPERATIONS PERFORMED:-

PLANNING:- The job is properly held on the table and a planning tool is set in tool post with minimum overhang. The table is raised till there is a clearance between tool and work piece. The length of position of stroke are then adjusted. Proper speed of cutting and feed system is adjusted. Depth of cut is adjusted by rotating the feed screw of the tool head. Feed is adjusted about half the width of the cutting edge of tool so that each cut will overlap the last cutting giving a smooth surface finish. Both roughing and finishing cuts are performed to complete the job.

SLOT CUTTING:- The external and internal flat surface may be generated on a work piece easily on a slotting machine. The work to be machined is supported. The work is then properly clamped on table and length of stroke is adjusted. The table is

Teacher's Signature : _____



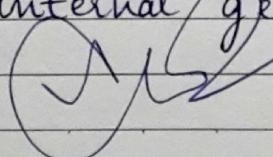
SLOT CUTTING JOB

clamped to prevent any unnecessary movement. The cross feed is supplied at the beginning of each cutting stroke. A surface perpendicular to the first machined surface may be completed by rotating the table 90° and adjusting the position of saddle and crosslide, making circular surfaces, the work is placed centrally on the rotatory table and clamps are to be held on the work securely on table. The tool is set radially on the work and necessary adjustments are made. The saddle is clamped in its position and machine is started.

PRATICAL RELEVANCE:

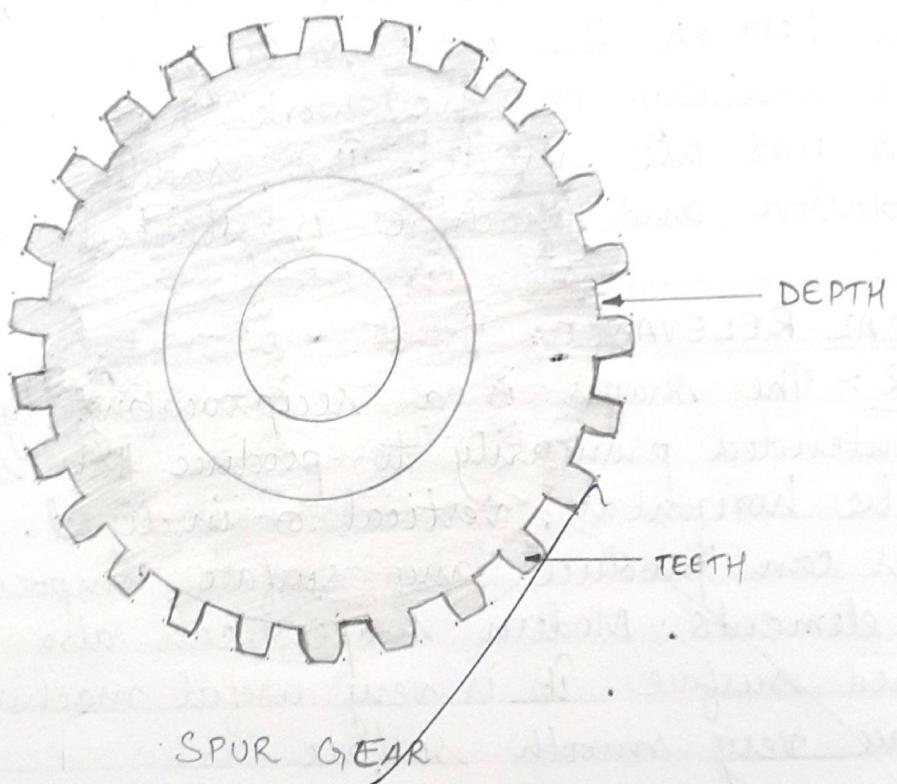
SHAPER:- The shaper is a reciprocating type of machine tool intended primarily to produce flat surfaces. These may be horizontal, vertical or inclined. In general, shaper can produce any surface composed of straight line elements. Modern shapers can also generate curved surface. It is very useful machine tool to produce very smooth surface.

SLOTTER:- It is used for cutting grooves, key ways and slot of various shapes, for making regular and irregular surfaces, both internal and external, for handling large and awkward piece, for cutting external and internal gears.



Teacher's Signature : _____

JOB DIAGRAM



JOB NO. 4 (MILLING)

- OBJECT :- To carry out gear cutting by simple indexing.
- TOOLS AND EQUIPMENTS USED :- 12 D.P. cutter No. 4 (H.S.S.), vernier calliper, double ended spanner, chuck key, screw driver, mendorill, column and knee type milling machine.
- THEORY :- Milling is the process in which a milling machine that removes metal at the work is fed against a rotating multipoint cutter. The milling cutter rotates at a high speed and it removes metal at a very fast rate with the help of multiple cutting edges. The rotatory speed of the cutting tool and the feed rate of the workpiece depends upon the type of material being machined.

Formula used is,

$$D = \frac{N+2}{D_p}$$

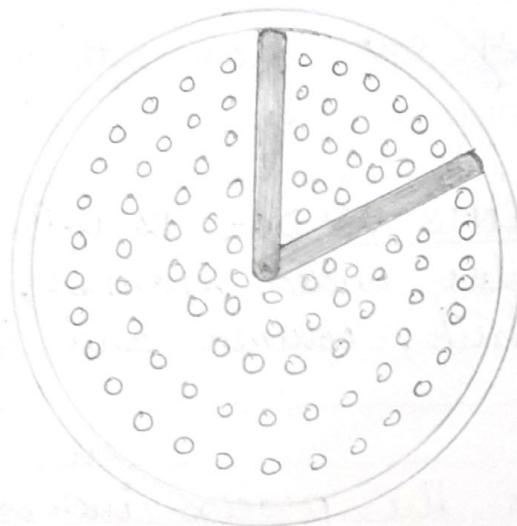
where, N = No. of teeth

D_p = Diameter of pitch

D = Depth

In cutting of gear, equal spacing of teeth on the gear is performed by indexing which is accomplished by dividing head.

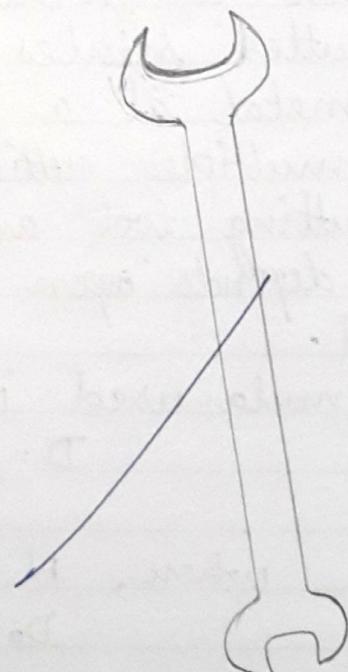
Teacher's Signature :



SECTOR ARM.



SCREW DRIVER



DOUBLED ENDED
SPANNER

→ OPERATIONS PERFORMED:-

(i) Measurement of diameter :-

For measuring diameter of the disc to be formed, we use vernier callipers. Using vernier calliper scale we find out the diameter of spur gear.

Diameter of spur = 3" (inches)

(ii) Cutting of Teeth :-

For the calculation of no. of teeth to be cut, we use the following formula:

$$\text{O.D (outside diameter)} = \frac{n+2}{\text{D.P}}$$

where, D.P = diameter of pitch of teeth

(iii) CALCULATION :-

$$\begin{aligned} n+2 &= \text{O.D} \times \text{D.P} \\ \Rightarrow 3 \times 12 &= n+2 \Rightarrow n+2 = 36 \\ n &= 34 \end{aligned}$$

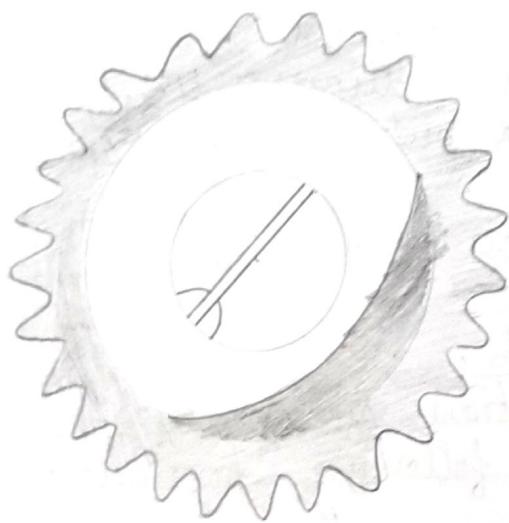
∴ No. of teeth to be cut = 34

(iv) CRANK RATIO :-

For calculating crank ratio, we use the following formula -

$$\text{Crank Ratio} = 40/N$$

Teacher's Signature : _____



GEAR CUTTER



where, N = No. of teeth

$$C.R = \frac{40}{34} = \frac{20}{17} = 1. \frac{3}{17}$$

(v) Gear cutting :-

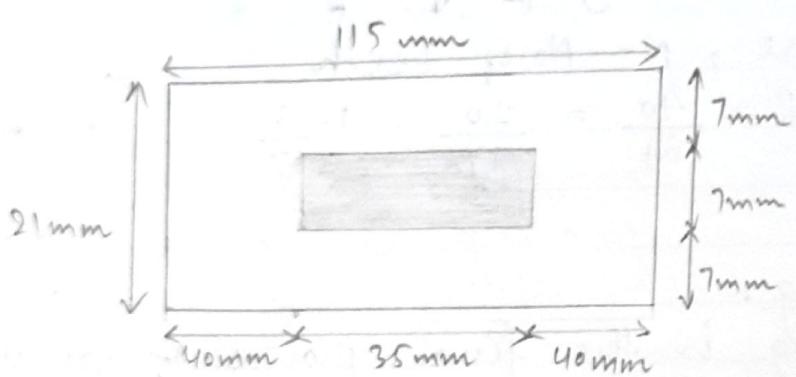
Gear cutting is the final process of forming the spur gear by operating the milling machine. The gear is being inserted into the machine. Now the cutter is being introduced and the cutting of gear is being started.

→ PRACTICAL RELEVANCE :-

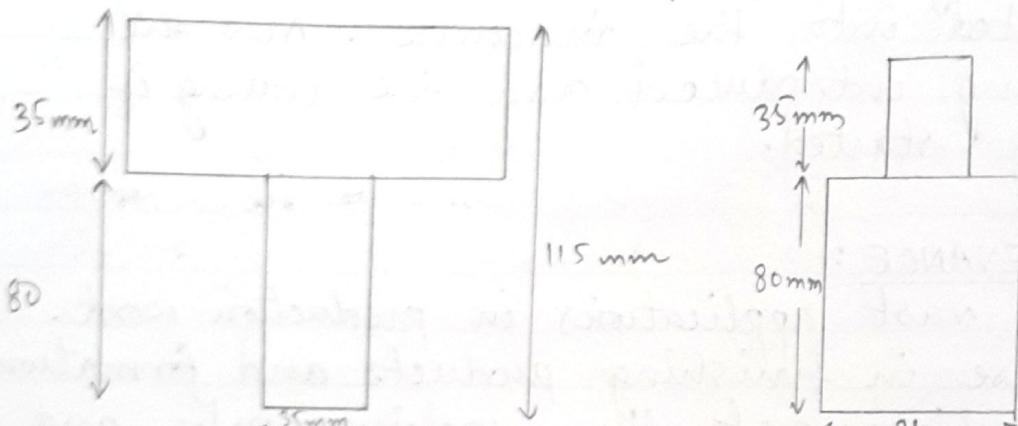
Milling finds vast applications in production work. This finds use in finishing products and formation of various machine parts by machine only and can be produced very precisely and at a very fast rate. Therefore, milling has very wide aspects in daily life and is one of the main process of engineering.

Sl

Teacher's Signature : _____

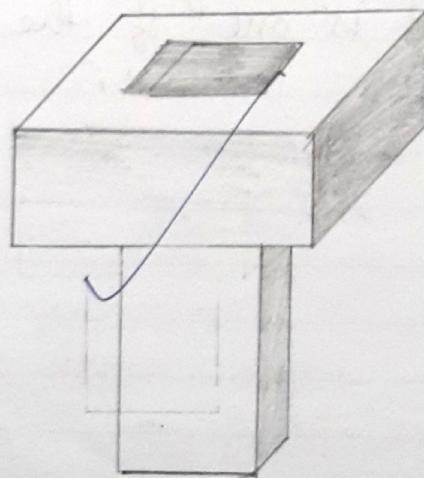


PLAN



ELEVATION

SIDE VIEW



3-D VIEW OF JOB

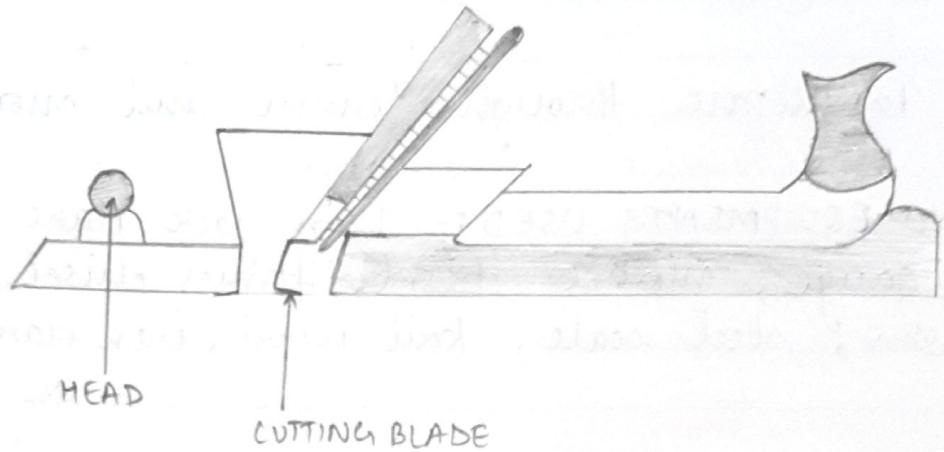
JOB NO. 5
(CARPENTRY)

- OBJECT:- To prepare through tenon and mortise joint
- TOOLS AND EQUIPMENTS USED:- Iron jack Plane, try square, marking gauge, mortise chisel, firmer chisel, mallet, tenon saw, steel scale, kail wood, bar clamp (clench vice)
- THEORY:- Wood obtained from tree is the chief product of forest which has been universally acceptable as raw material for manufacturing wooden products and appliances. The useful work on wood is being generally carried out in a most common shop known as carpentry shop. Carpentry usually deals with any class of work related to wood or timber.
- OPERATIONS PERFORMED:- For preparing a tenon and mortise joint various operations are performed over piece of wood -

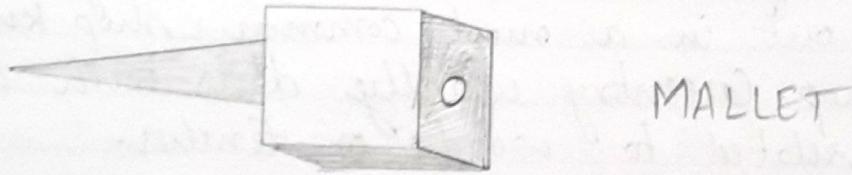
(i) Planing:-

Planing is a process in which the piece of wood is planed or levelled by a special tool known as iron jack plane. This tool is equipped with a cutting blade for smoothing and removing wood as shavings. Iron jack plane is ideal for obtaining a smooth and flat surface. This plane has an iron body and a stainless steel blade.

Teacher's Signature :

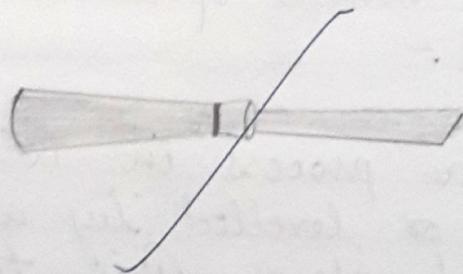


IRON JACK PLANE



MALLET

MORTISE CHISEL



which is ideal for cutting.

(ii) Marking:-

In the process of marking we use two tools known as try square and other as marking gauge. Try square is generally used for measuring and checking of squareness in the wood, also perpendicularity, dimensions, testing of finish of planned surfaces and drawing parallel and perpendicular lines.

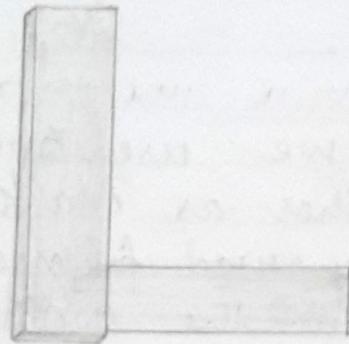
(iii) Chiselling:-

In this process of chiselling, a tool chisel is used for cutting. It is a strong sharp edged cutting tool with a sharp bevel edge at one end. They are used to shape a fit parts as required in joint making. The mortise chisel is designed for heavy work used as a lever for removing chips.

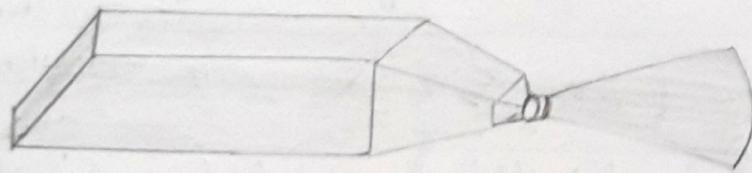
(iv) Tennon and Mortising:-

In tennon and mortising the wood piece is cut into two parts. One is tennoned which means the wood pieces are edged to fit in a hole and one is mortised in which the wood piece is hollowed from the centre with the markings and same size as of the tennoned piece so that they both fit accurately.

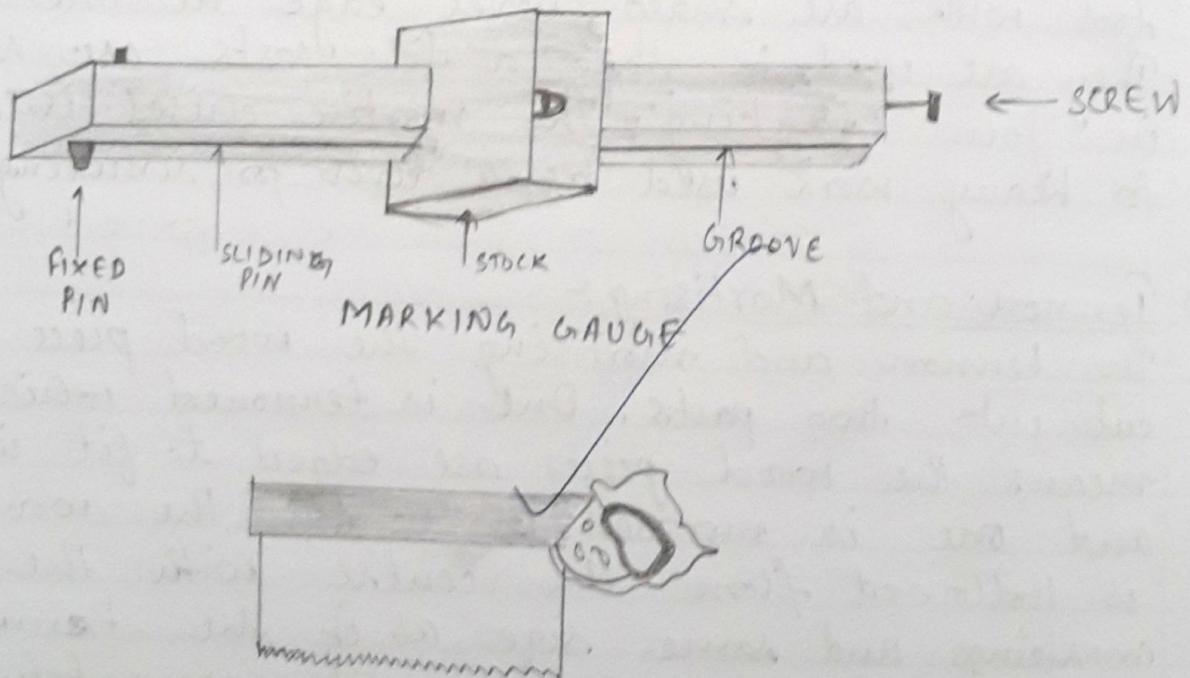
Teacher's Signature : _____



TRY SQUARE



FIRMER, CHISER



TENON OR BACK SAW

(v) Saw cutting:-

Saws are wood cutting tools having handles and a thin steel blade with small sharp teeth along the edge. They are utilised to cut a wood to different sizes and shapes used for making the wooden joints that hold parts together.

(vi) Fitting:-

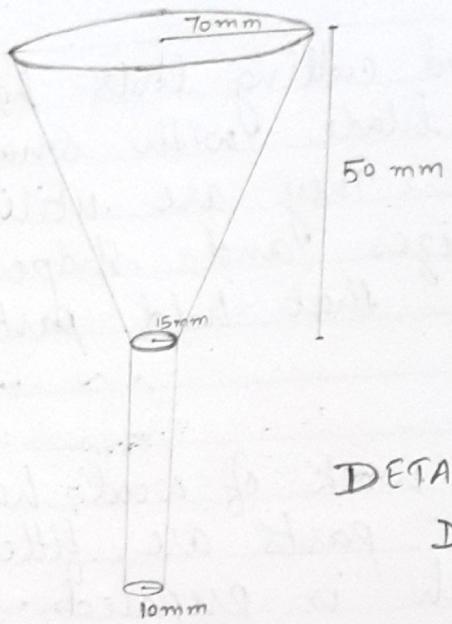
Now all the work of wood has been made and now both the parts are fitted together to get a joint which is prepared through tenon and mortising.

→ PRACTICAL RELEVANCE:-

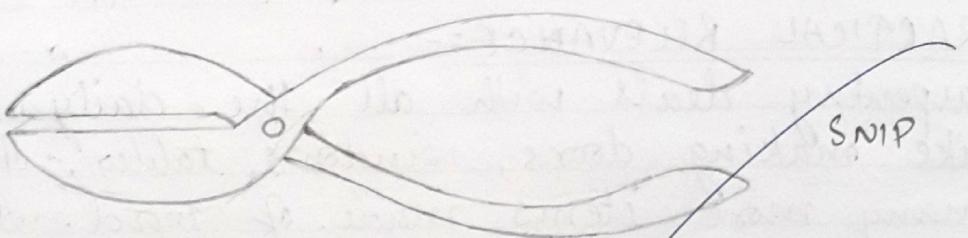
Carpentry deals with all the daily household work like making doors, windows, tables, chairs and many more items made of wood. It deals with one of the chief main product of forest, i.e., wood by shaping it into desired shapes. Thus Carpentry plays a crucial role in our life and is a great aspect of engineering.

Sl

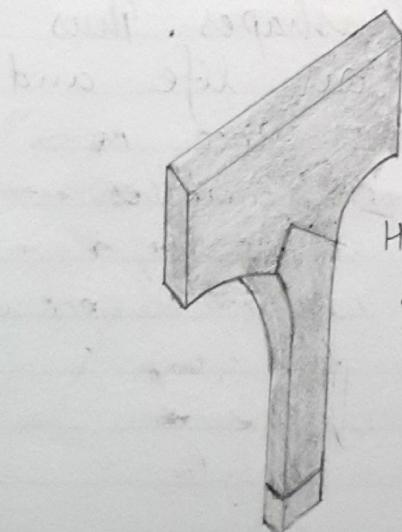
Teacher's Signature : _____



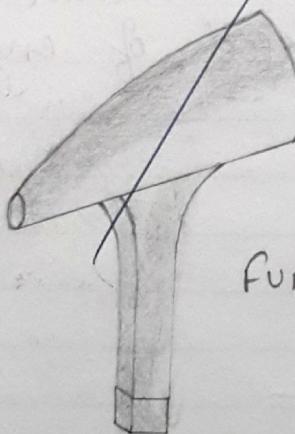
DETAILED JOB
DIAGRAM



SNIP



HATCHET
STAKE



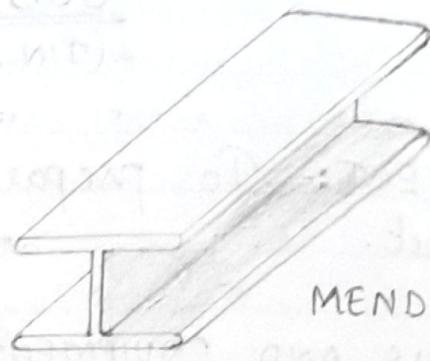
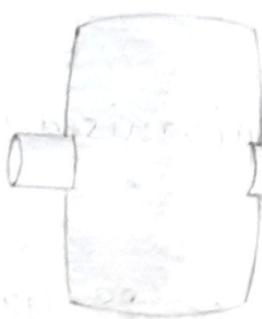
FUNNEL STAKE

JOB NO. 6
(TIN SMITHY)

- OBJECT:- To prepare a funnel of galvanised iron sheet.
- TOOLS AND EQUIPMENTS USED:- GI sheet of 28 Gauge, Ammonium chloride (NH_4Cl), Hydrochloric acid (HCl), solder, try square, spring divider, mallet (wooden hammer), snip scissors, mendlill, scriber, soldering iron, groving stake, hatchet stake.
- THEORY:-
Tin smithy is a manufacturing process used to make out or manufacture useful items using tin sheets. Sheet metal is generally metals used in sheet works are black iron, galvanised iron, stainless steel, copper, brass, zinc, aluminium, tin plate and lead. Various operations that are performed in tin smithy are laying out, bending, shaping, jointing, folding, soldering and assembling are performed on the sheet metal using hand tools and machines to make a product of desired shape and size and carving out a polished surface.

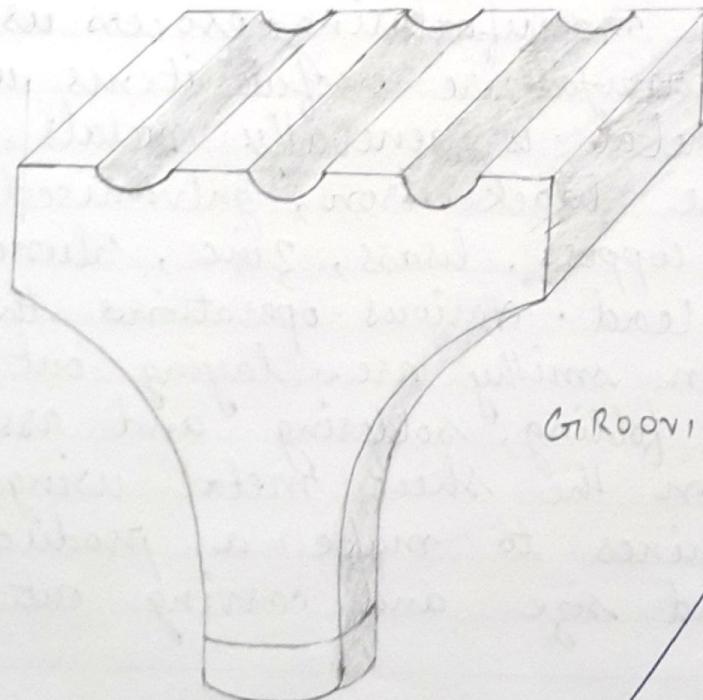
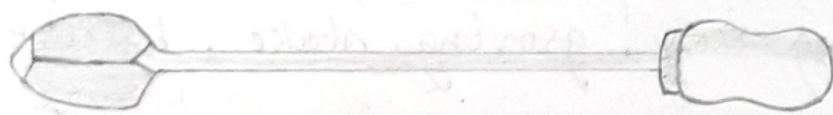
Teacher's Signature : _____

MALLET



MENDRILL

SOLDERING IRON

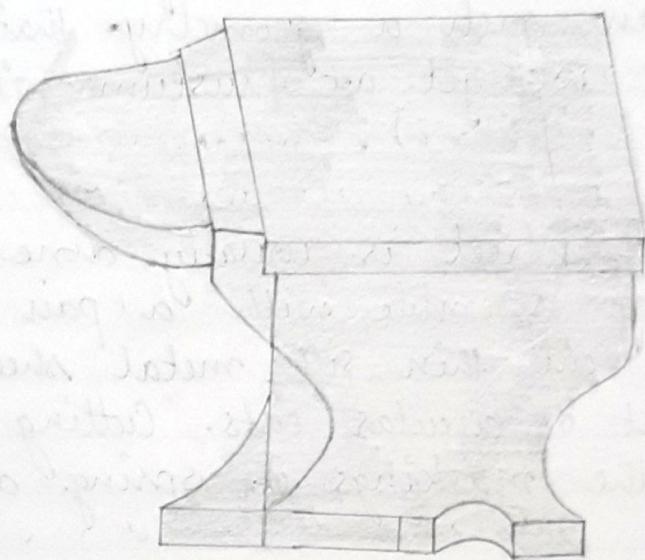


GROOVING STAKE

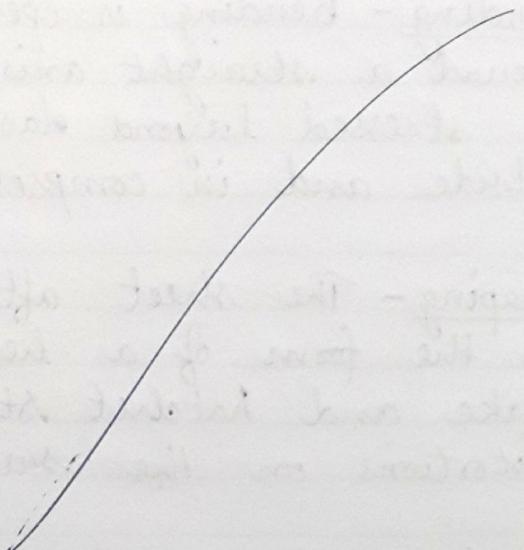
→ OPERATIONS PERFORMED:-

1. Laying out - It is the first process in which marking on GI sheet is done using a spring divider. Marking is done in such a geometry that after cutting the sheet we get a frustum with open ends.
2. Cutting - Cutting of sheet is usually done with the snip scissors. They resemble with a pair of scissors and are used to cut thin soft metal sheets. They can make straight or circular cuts. Cutting is usually carried out over the markings of spring divider.
3. Bending - Bending is operation of deforming a sheet around a straight axis. In bending all sheet material are stressed beyond elastic limit in tension on outside and in compression inside of the bend.
4. Shaping - The sheet after bending is given shape in the form of a beak using mallet, grooving stake and hatchet stake and is relieved of all distortions on the surface.
5. Folding - The sheet is folded so that it doesn't get opened easily if struck hard. It is done using mendril.

Teacher's Signature : _____



ANVIL



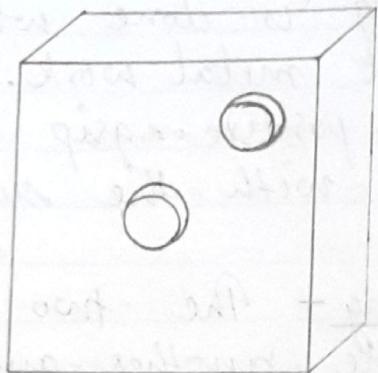
6. Jointing - Seam jointing is done which is a general joint in sheet metal work. It is locked so as to ensure a positive grip and also to make the joint flush with the surface.

7. Assembling and soldering - The two parts are being enforced into one another and are joined using a soldering process. Soldering is done by putting HCl over funnel joint part and the red hot smith heart is kept over NH_4Cl then on the funnel and the part is soldered.

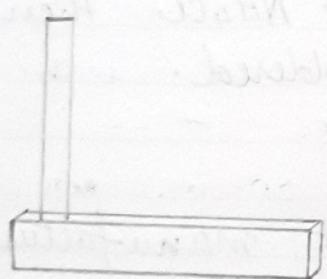
→ PRACTICAL RELEVANCE:-

Tin smithy is a very important manufacturing shop. Thus the applications of tin smithy are very wide and extensive as various items that we use in our daily lives are formed by tin smithy such as funnel, tin shades and tin articles.

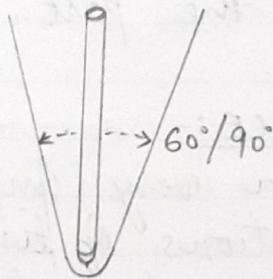
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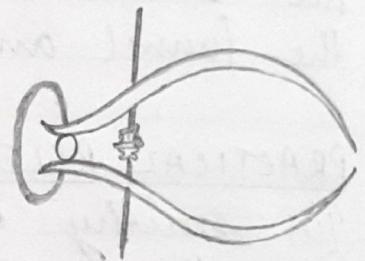
JOB DIAGRAM



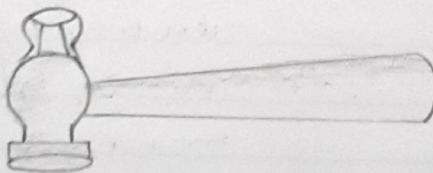
4" TRY SQUARE



CENTRE PUNCH



BALL PEEN HAMMER



JOB NO. 7 (FITTING)

→ OBJECT :- To perform fitting, drilling and tapping operations.

→ TOOLS AND EQUIPMENTS USED :-

Mild steel flat, 12" double cut flat file, 5" parallel jaws bench vice, 4" try square, 6" outside spring calliper, centre punch, ball peen hammer, surface plate, drilling machine, 10mm twist drill, 12mm tap with handle.

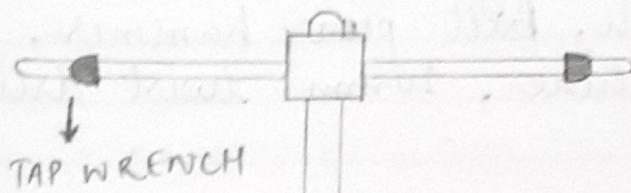
→ THEORY :-

The term fitting is the assembling of parts together and removing the metals to secure the necessary fit, and may or may not be carried out at the bench. This type of work requires the use of a large number of hand tools and other devices or equipments that involve a number of operations for accomplishing the work to the desired shape and size. Most of the semi-finished works can be accomplished with fairly good degree of accuracy in a reasonable time through various kinds of quick machining operations.

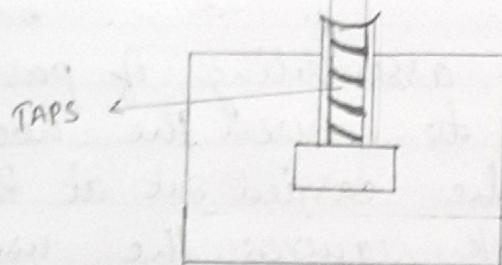
Teacher's Signature :



12" DOUBLE CUT FLAT FILE

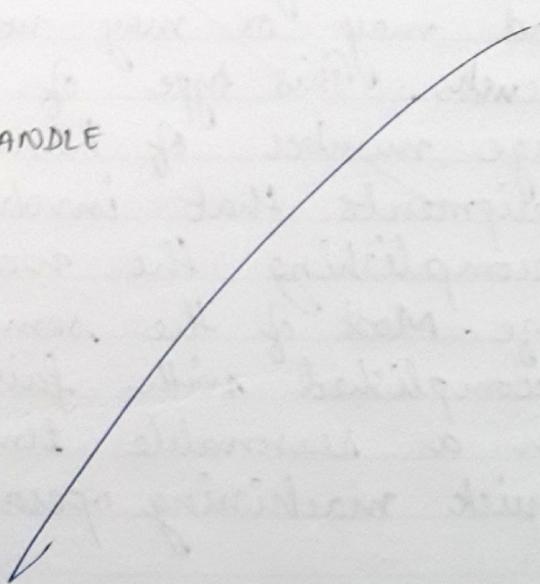


TAP WRENCH



12mm TAP WITH HANDLE

TOP
TOP
HOME



→ OPERATIONS PERFORMED:-

1. Filing :-

filing serves to remove the spots from the cuts and clean the face of the cuts and to finish the final shape of the work piece. A double cut flat file possesses two sets of two sets of teeth, the over cut teeth being cut at about 60° , and the upcut at 75° to 80° to the centre line. These flat files are generally used for filing flat surfaces in fitting shop.

2. Marking :- It consists of marking on the job a series of definite lines or position of these lines act as a guide to the fitter who will have to work on the job after it has been done or masked.

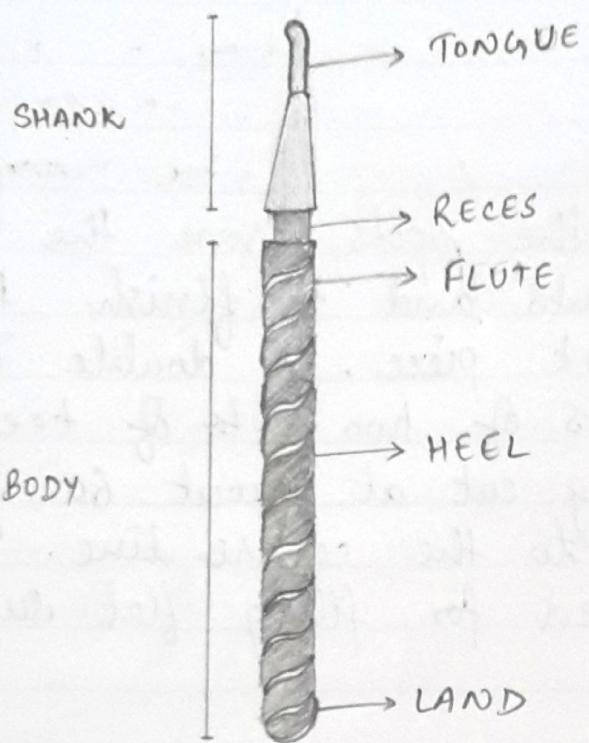
3. Punching:-

In punching we use a centre punch which is used for indentation marks. It is used to locate the centre of work piece for the purpose of drilling. The angle of centre punch is generally kept at 60° or 90° .

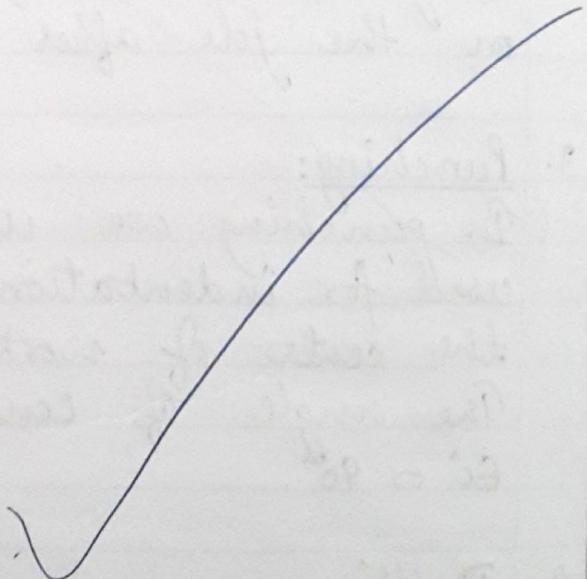
4. Drilling:-

Drill is a common tool widely used for making holes in a metal piece in fitting shop. It is generally held in chuck of pencil drilling machine.

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TWIST DRILL



for fast and accurate drilling works twist drills are commonly used. A general twist drill comprises the cutting angle of 118° and to obtain the correct diameter of the hole.

5. Tapping :-

Tapping is used for cutting or producing internal threads of either left or right hand kind in nuts or pre-drilled holes. Taps may be of many types such as hand taps, machine taps, pipe taps, solid taps, straight taps and bend shank taps. Hand taps are usually made in a set of three, i.e., taper tap, plug tap and bottoming tap.

→ PRACTICAL RELEVANCE :-

Even today with the use of automatic machines, bench works and fitting have important roles to play to complete and finish a job to the desired accuracy as various machining options still require various operations to be performed on them. Thus to finish a job by hand, fitting has great practical applications and is a great aspect of engineering.

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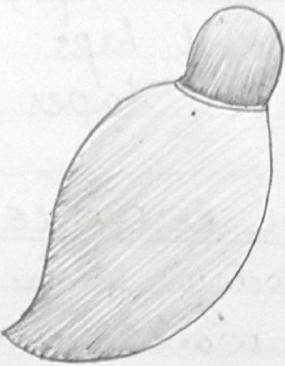
GATE CUTTER



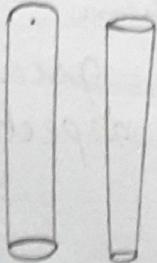
STRIKE OFF BAR



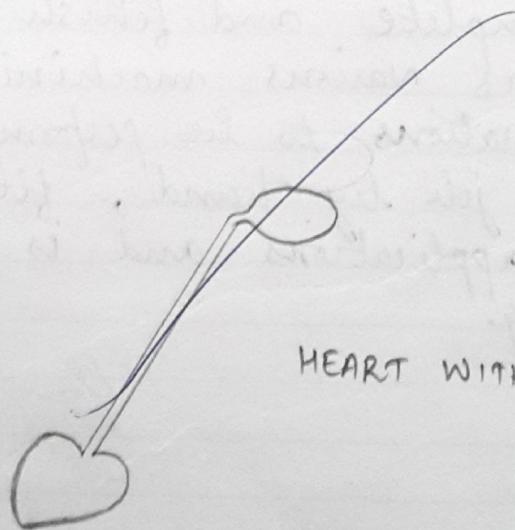
VENT WIRE



SWAB



SPRUE PINS

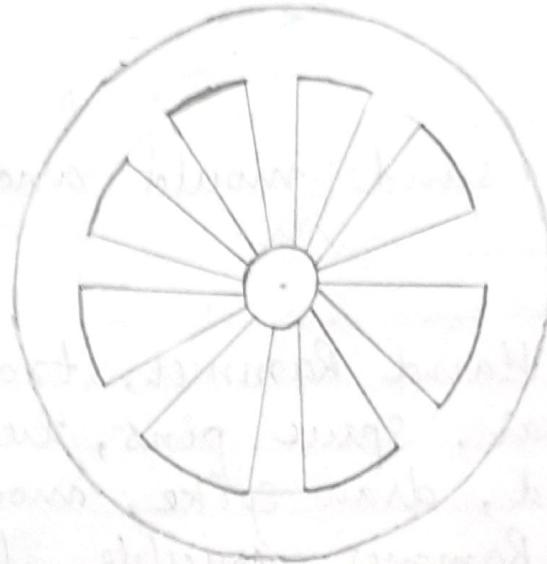


HEART WITH SPOON SLICK

JOB NO.8 (MOULDING)

- OBJECT:- Preparation of green sand mould and to perform casting process.
- TOOLS AND EQUIPMENTS USED:- Hand Hammer, trowel, click, lifter, strike off bar, sprue pins, hollow, snak, Gate cutter, Vent rod, draw spike, moulding block, Butt Hammer, Peen Hammer, crucible, ladle, Rapping plate.
- BRIEF THEORY:-
- (i) Rammer:- A hand rammer is a wooden tool used for packing or ramming the sand into the mould.
- (ii) Lifter:- It is made of thin section of steel, they are used to clean and finish the bottom of deep and narrow opening in mould.
- (iii) Trowel:- It is employed in order to smooth or slick over the damaged portion of the mould.
- (iv) Strike off bar:- Strike off bar is used to strike off excess sand on the cope for applying point to provide the level surface.
- (v) Snak:- They are used for moistening the sand around

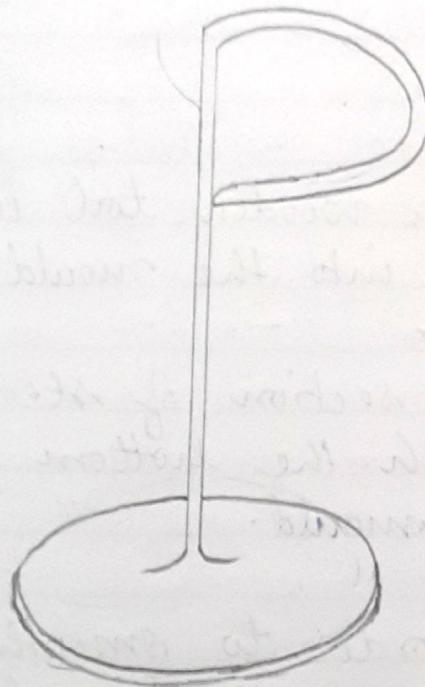
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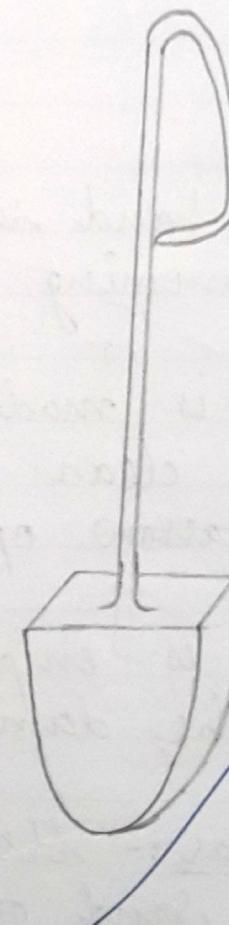
6.00 DOT

(WEDGES)

RAPPING PLATE



BUTT RAMMER



PEEN RAMMER

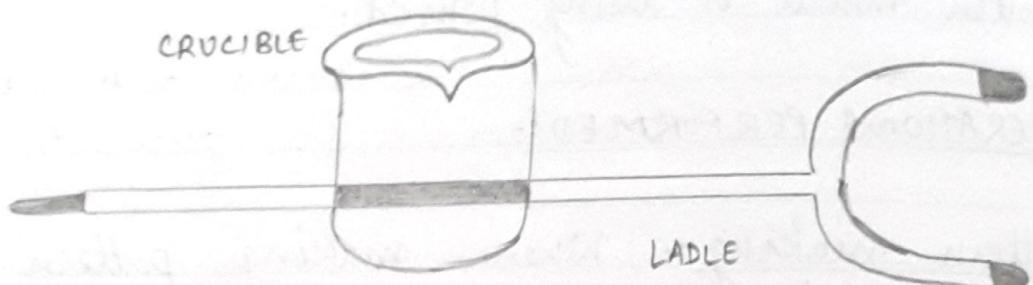
a pattern on for applying paint.

- (vi) Vent Rod :- A vent rod is used to make a series of small holes to permit gases to escape while the molten metal is being poured.

→ OPERATIONS PERFORMED:-

- (i) Pattern making :- When making pattern for arm'd wheels which have spokes radiating from the centre. The assembled arms are called spider. There are a no. of ways of fastening them together at the hub or centre.
- (ii) Moulding and core making :- The green sand is filled in the moulding box and with butt rammer and peen rammer it is fully filled. The strike off bar is used to remove the excess sand. The moulding pattern is fixed in the centre of the sand in moulding box and is again filled with sand. Then it is removed from top to give some space for casting with the help of gate cutter. Thus moulding is complete.
- (iii) Melting and Casting :- Die casting is the art of rapidly producing accurately dimensional parts by forcing molten metal under pressure into the split metal dies which resembles a permanent common

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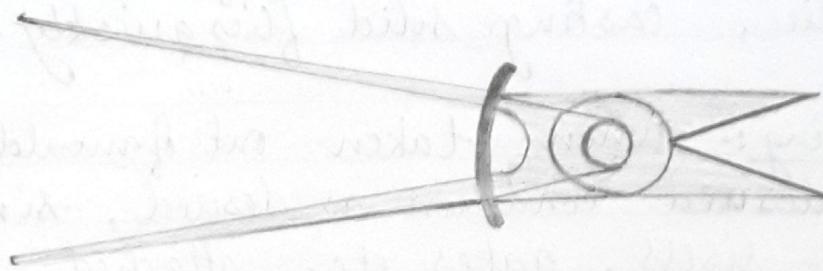
type of mould within a fraction of second the fluid alloy fills the entire die including all the minute details, because of this low temperature of die, casting solidifies quickly.

- (iv) Casting:- When taken out of mould they are not in the same condition as desired, since they have sprue risers, gates etc. attached to them. The operation of cutting of unwanted parts, cleaning and finishing is called fitting.
- (v) Testing and Inspection:- It is the art of checking the acceptability of the casting.

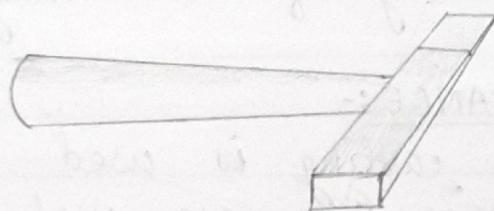
→ PRACTICAL RELEVANCE:-

Moulding and casting is used to prepare different types of structures. They are used in machines and other appliances. It is used to manufacture new designs and to create new machine parts. It is one of the most important operations of engineering and is very much practically relevant.

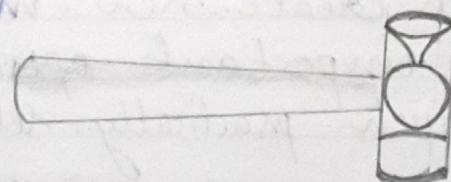
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FLAT TONGS.



SLEDGE HAMMER

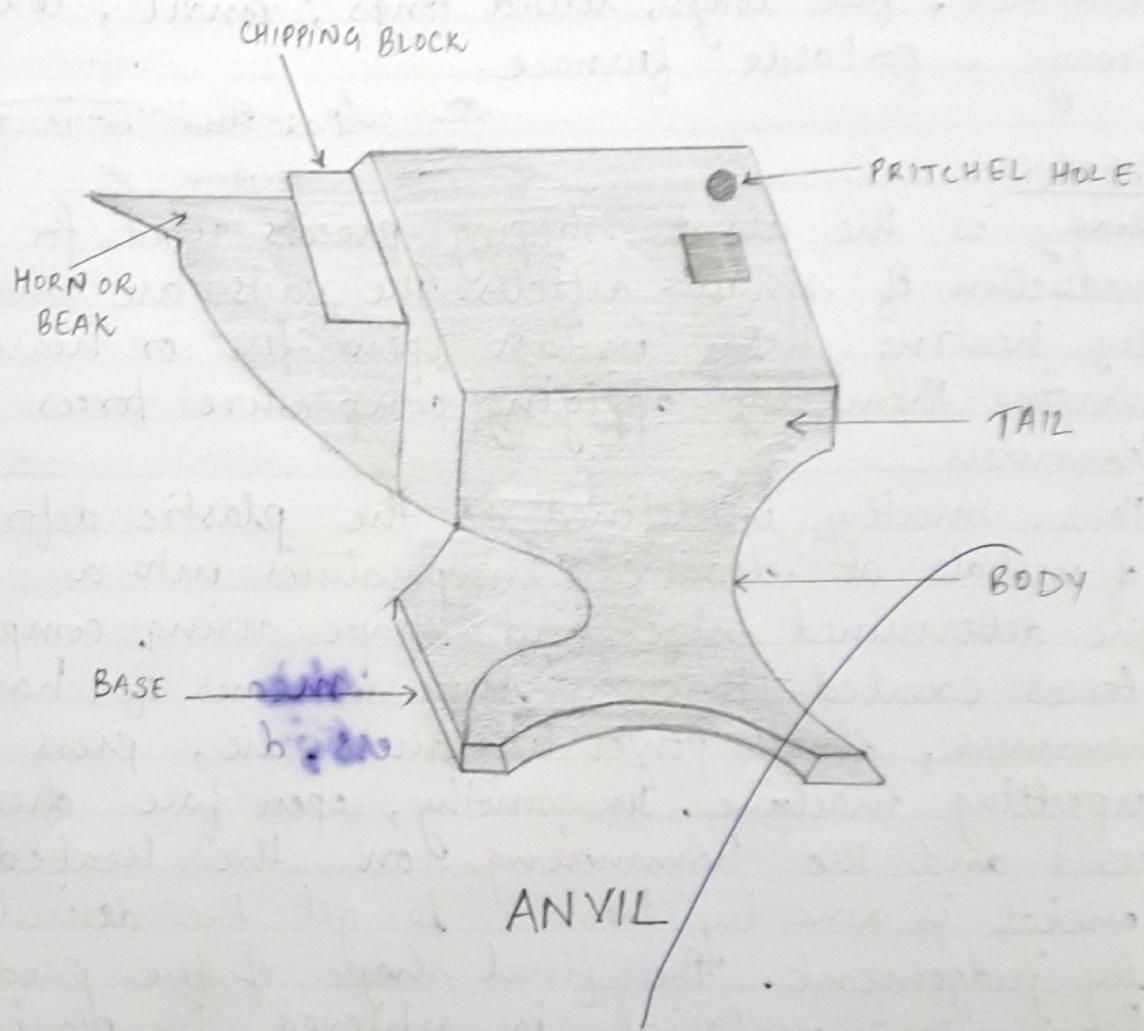
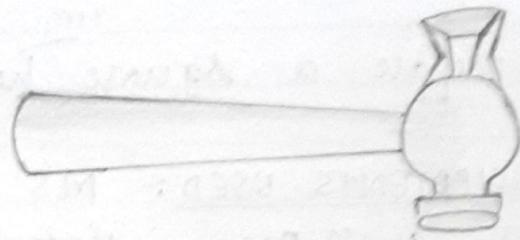


STRAIGHT PEEN HAMMER

JOB NO.9 (SMITHY)

- OBJECT:- To prepare a square headed bolt.
- TOOLS AND EQUIPMENTS USED:- MS rod (150mm), ball peen hammer, cross peen, sledge, straight peen hammer, flat tongs, round tongs, anvil, coke, swage, portable furnace.
- THEORY:-
Smithy is the oldest shaping process used for the production of small articles. The parts are shaped by heating them in an open fire or hearth and shaping them by applying compressive forces using hammers. Thus, smithy is defined as the plastic deformation of metals at elevated temperatures into a pre-determined size and shape using compressive forces exerted through some means of hand hammers, small power hammers, die, press or upsetting machine. In smithy, open face dies are used and the hammering on the heated metal is done by hand to get the desired shape by judgement. The final shape of the product from raw material is achieved by various operations performed on it.

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→ OPERATIONS PERFORMED :-

Various operations are performed in smithy which are as follows :-

(i) Heating :-

In this process, the M.S. rod is kept in the portable furnace where the burning coke is present with the help of tongs until the rod becomes red hot due to high temperature in the portable furnace.

(ii) Quenching :-

It is the process of rapidly cooling the rod which is red hot. This is usually implemented so as to reduce the temperature of the rod for a particular position by dipping it in water at a certain height and then used to perform.

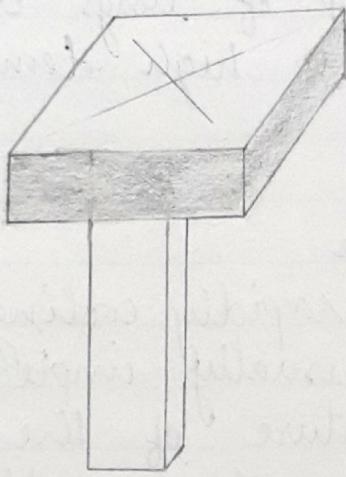
(iii) Upsetting :-

This process is also known as the jumping operation which is carried out to increase the thickness (or diameter) of a bar and to reduce its length. This process usually involves increasing the cross-sectional area by hammering.

(iv) Drawing Down :-

This process is usually done with the opposition of upsetting. It is used to reduce the thickness

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JOB DIAGRAM

of a bar and to increase its length. It may be carried out by working the metal over the horn, the anvil, then by hammering it over the face of the anvil.

(v) Hammering :-

It is the most basic process which involves the heating of the rod between the anvil on one side and various types of hammers used on the other side. Without this operation, one cannot perform drawing down and upsetting.

(vi) Swaging:-

It is usually performed with the help of swage block. It is mainly used for heading, bending, squaring, sizing and performing operations in smithy. It may be used either flat or edgewise in its stand.

→ PRACTICAL RELEVANCE :-

Smithy is one of the most ancient method. It was one of the milestones leading to manufacturing process with variety of huge applications. In daily life, this method can be used for giving the desired shapes to different pieces of metal like in the making of bolts, shaping of rods, make of metals, making of utensils of kitchen and many more. Thus smithy is one of the most basic and vast applying methods of common engineering.

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