

Common for All Branches)

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Syllabus of Practicals / Jobs Performed

S.NO.	PRACTICAL / JOB	DATE	PAGE	REMARKS
1.	To study different types of machine tools used in a machine shop	29/5/21	1-5	
2.	To prepare a job on the lathe involving facing, outside turning, step turning, taper turning, radius making and parting off.	5/6/21	6-8	
3.	To study various types of tools used in carpentry and to prepare simple types of wooden joints.	12/6/21	9-13	
4.	To prepare a lap 'T' joint	19/6/21	14-15	
5.	To study various types of materials used in electrical shop.	26/6/21	16-19	
6.	To study various types of materials used in sheet metal shop.	3/7/21	20-21	
7.	To study different types of fitting and making tools used in a fitting shop.	10/7/21	22-24	
8.	To study the CNC machine, CNC control panel, setting up the cutting tool to the correct length, CNC lathe, and CNC programming.	17/7/21	25-28	

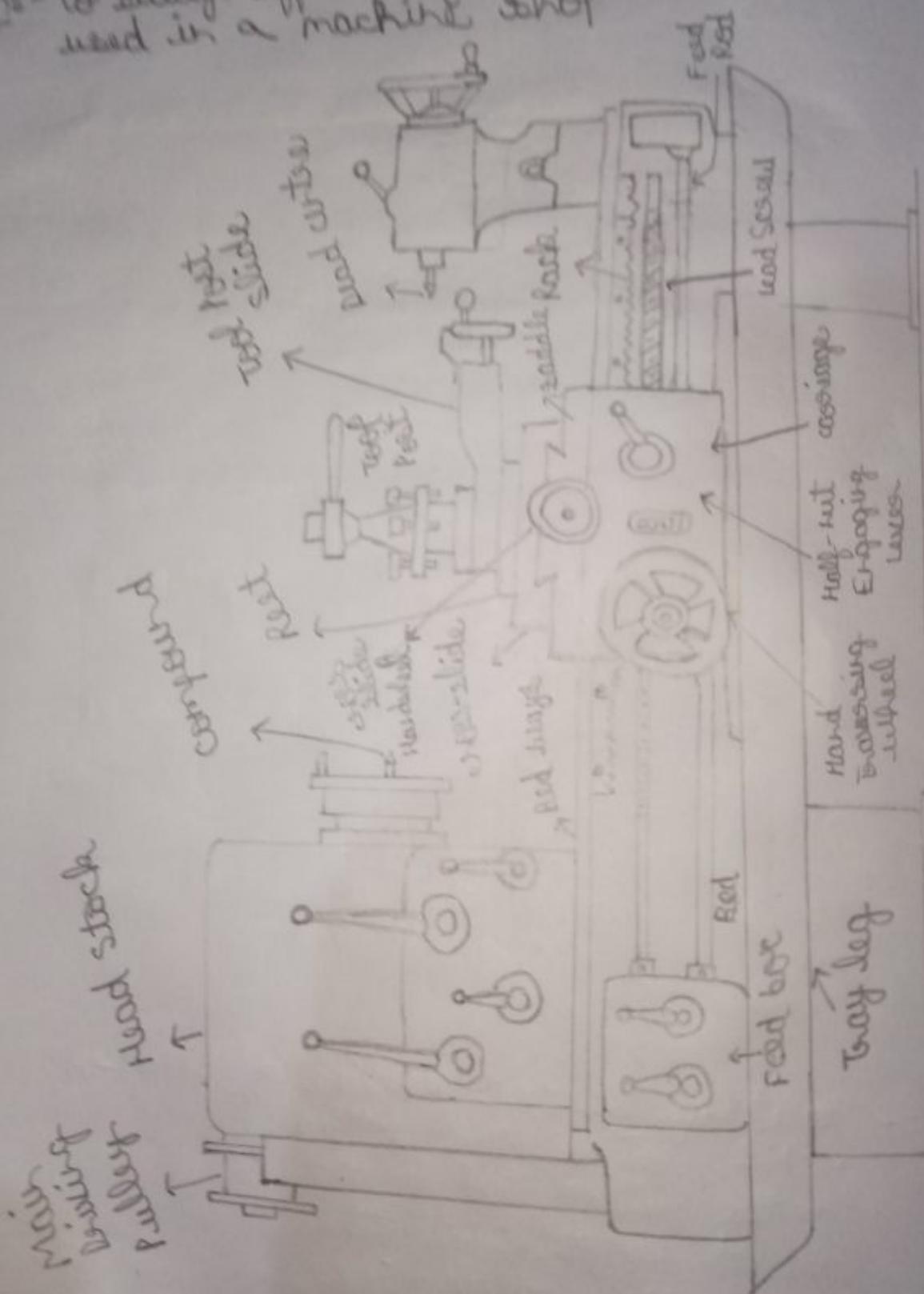
Particulars of Practicals / Jobs Performed

S.No.	PRACTICAL / JOB	DATE	PAGE	REMARKS
9.	To study various types of tools used in welding shop.	22/7/21	29-32	
10.	To perform step turning operation on CNC machine.	27/7/21	33-34	
11.	To study various types of following tools used in a foundry shop.	28/7/21	35-37	

Lathes Machine

Aim - To study different types of machine tools used in a machine shop

Practical - 1



Practical - 1

Aim:- To study different types of machine tools used in a machine shop.

Introduction :- A machine tool is a device which performs the function of material removal with the help of tools. The purpose of machine tool is to save time, cost of production and get better output which cannot be obtained with hand tools.

The various types of machine tools commonly used in the workshop are ⇒

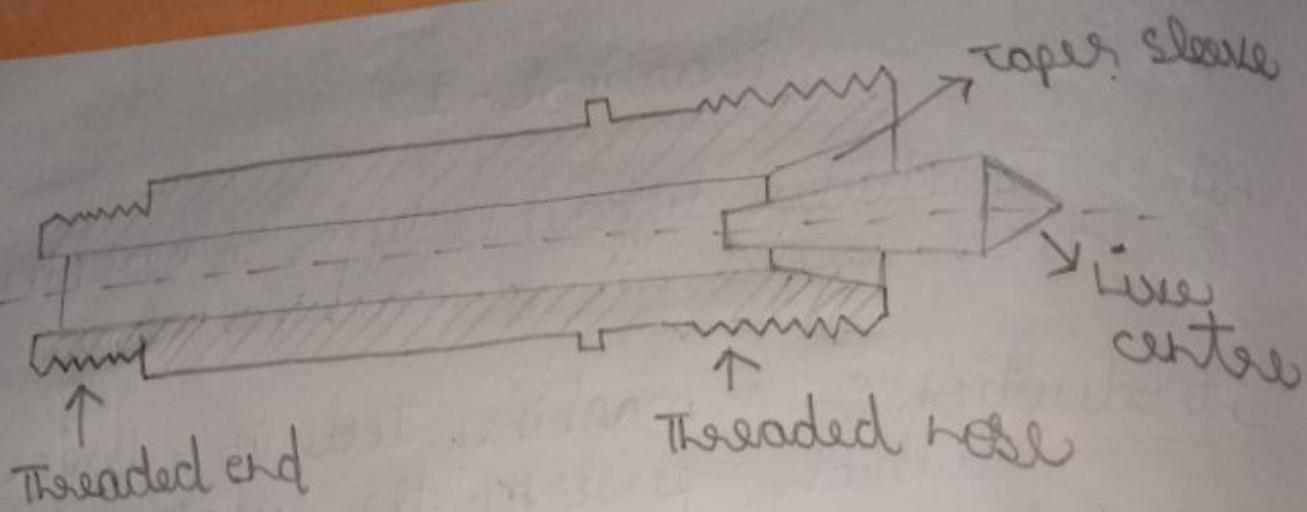
- a. Lathe b. Sharpeners c. Planer
- d. Drilling machine e. Grinding machine
- f. Milling machine

Lathe ⇒

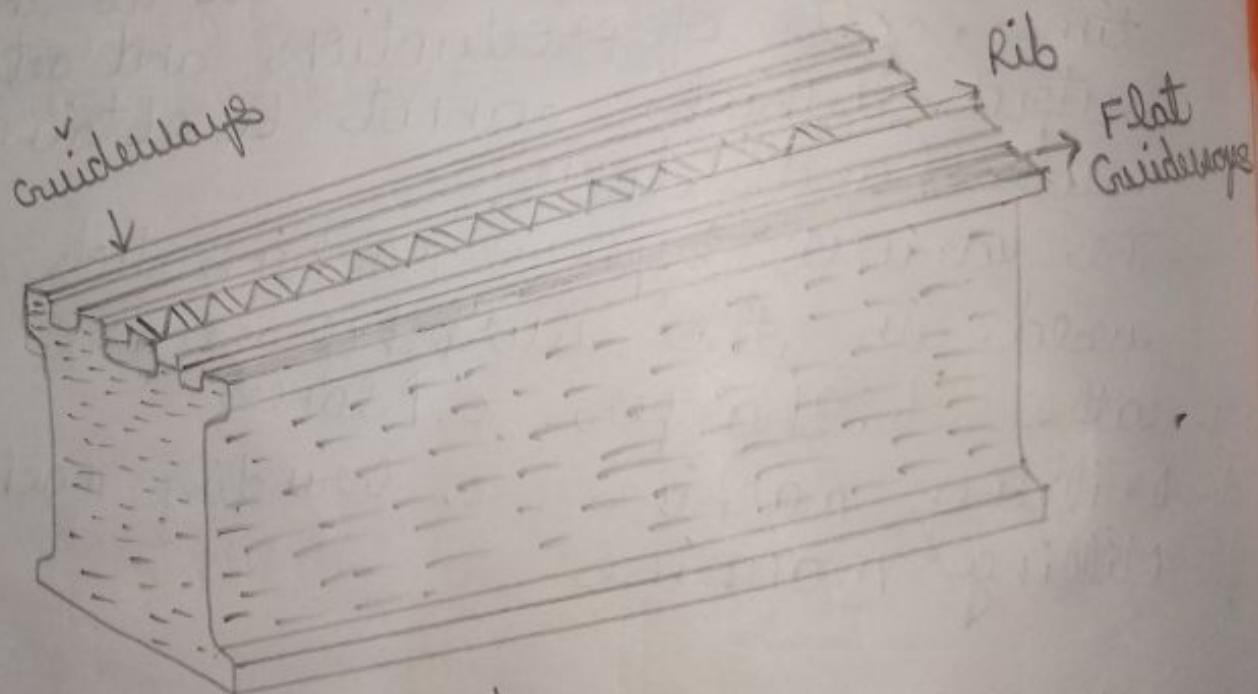
A lathe, probably one of the earliest machine tools, is one of the most versatile and widely used machine tool, so it is also known as a mother machine tool.

The job is to maintain stationary and rotated in the lathe chuck, a cutting

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Head Stock



Bed

tool is advanced which is stationary against the rotating job. cutting tool material is harder than the workpiece. some of the common operations performed on a lathe are facing, turning, drilling, etc.

Principal parts of Lathe

1. Bed =>

It is the base of the foundation of the lathe.

It is a heavily rigged and single machine piece casting made to support parts of the lathe.

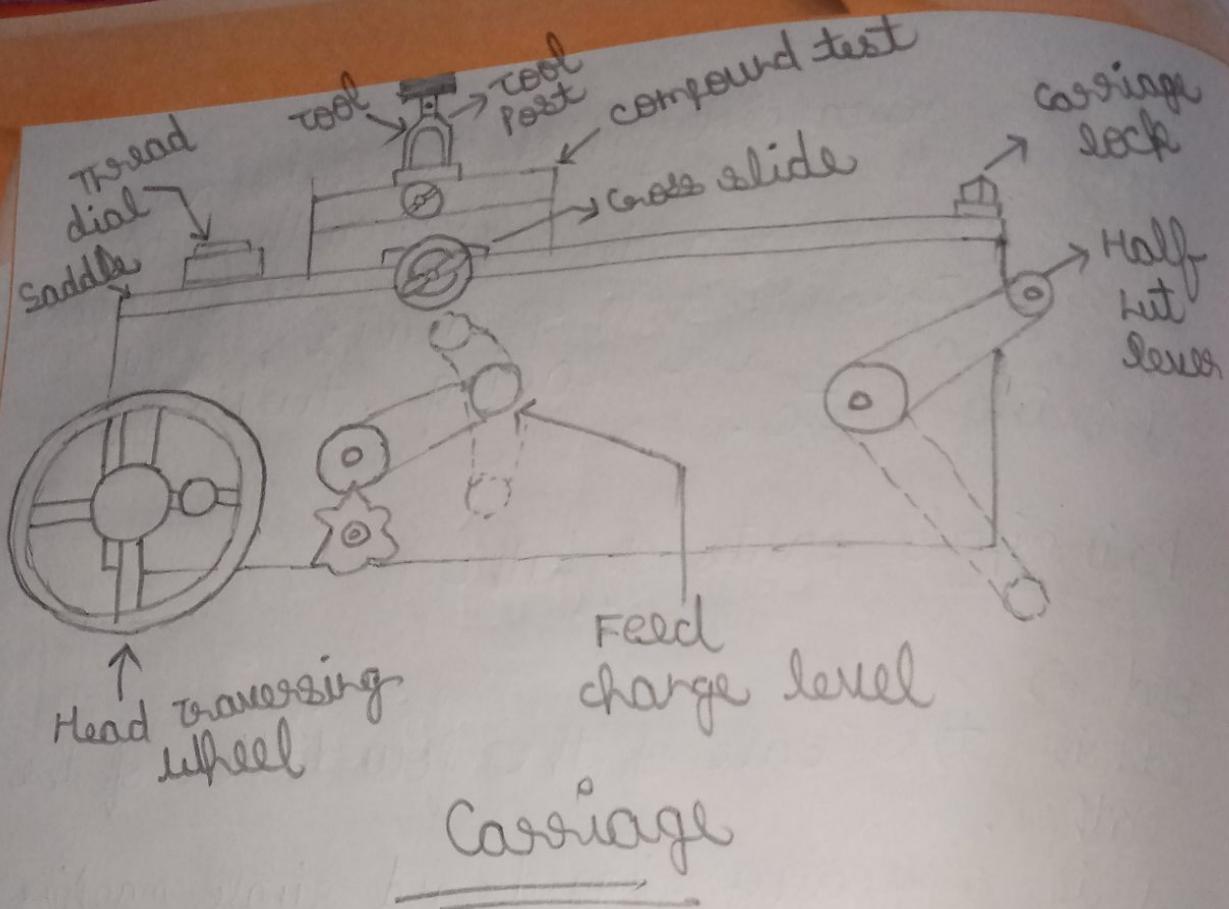
On the top of the bed there are two sets of guide ways. ~~Outer~~^{outer} ways and inner ways. outer ways is for the carriage and inner way for the tailstock.

The guide ways are of two types - wide flat guide ways and inverted V guide ways.

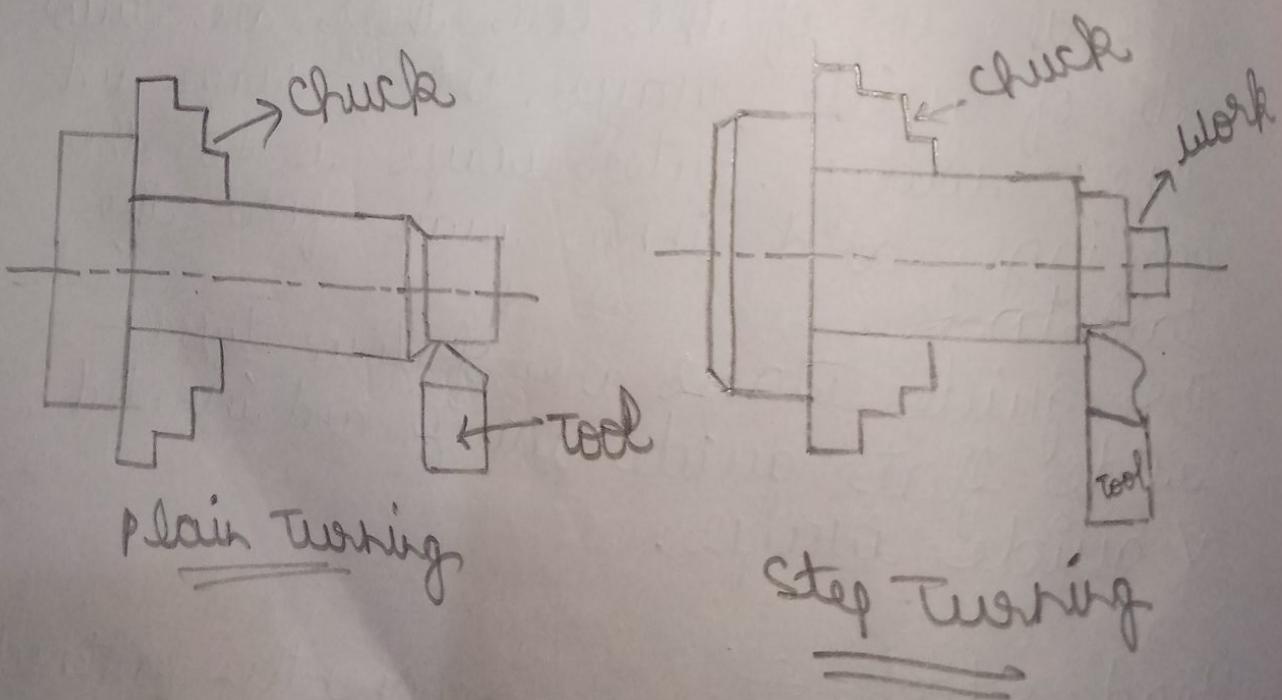
2. Head stock =>

The head stock is permanently fastened

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3.



4.

(i)

(ii)

on the inner ways at the left side of the bed.

A live centre and sleeve, a face plate or a chuck can be fitted to the spindle nose to hold and drive the work.

3. Tail stock \Rightarrow

It is situated at the right hand end of the bed and is mounted on the inner guide ways.

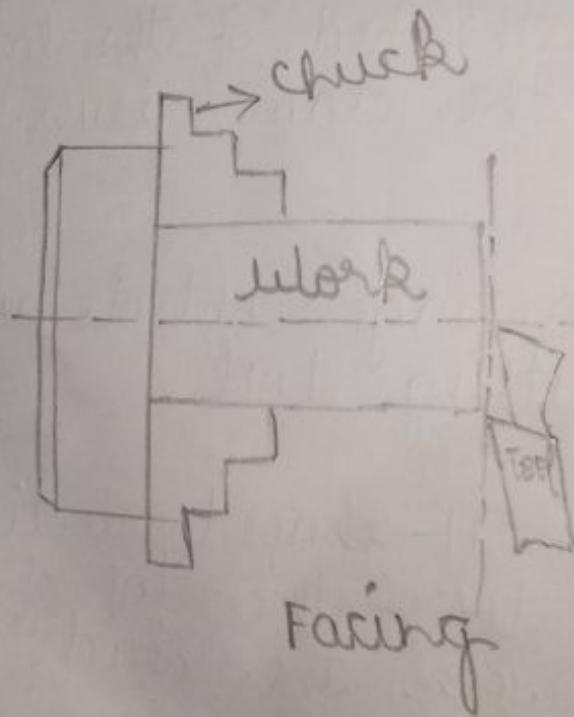
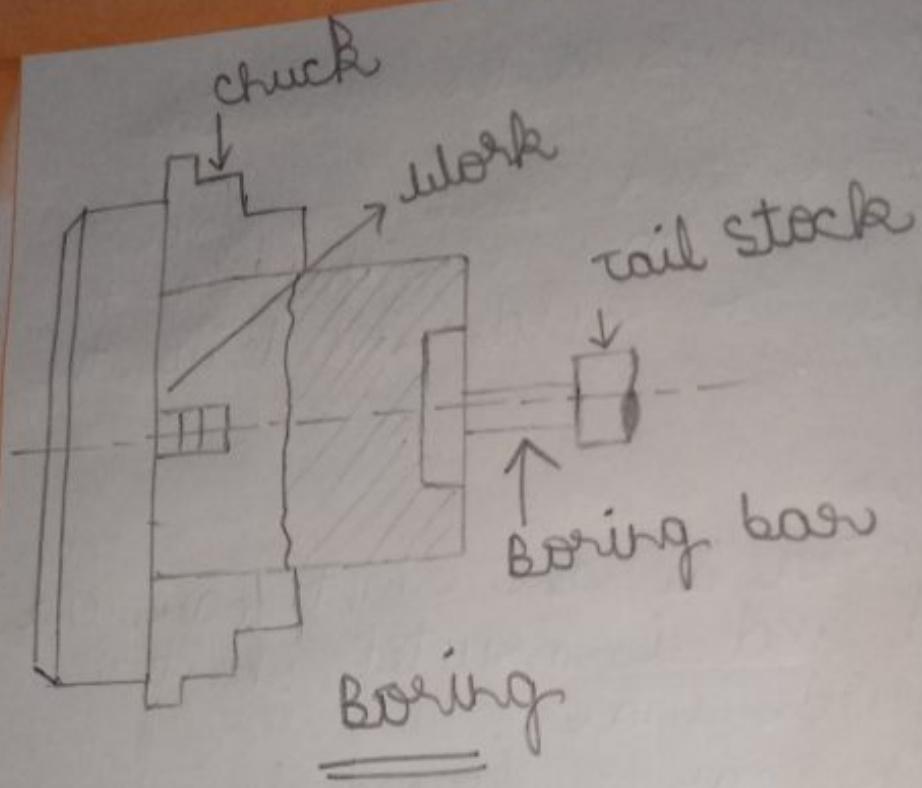
Tail stock can be locked in any position along the bed of the lathe by tightening the clamp lever or nut.

4. Carriage \Rightarrow The carriage controls and supports the cutting tool.

i) Saddle \Rightarrow It is an H-shaped casting mounted on the top of the top of the lathe ways between the head stock and tail stock.

ii) Cross slide \Rightarrow It is mounted on the saddle. It provides the cross movement to the cutting tool. It supports the compound

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rest.

- iii) compound rest \Rightarrow It is mounted on the top of the cross-slide and is used to support.
- iv) tool post \Rightarrow It is mounted above the compound rest. It clamps the cutting tool or cutting tool holder in a desired position.
- v) Apron \Rightarrow It is fastened to the saddle and contain the feeding mechanism.

Lathe Operations

1. centering \Rightarrow If the chuck is three jaw type, this centering is not required because it is a self centered chuck. But for four jaw, centering is needed.
2. Facing \Rightarrow Facing is the operation of machining the ends of a piece of work to produce the flat surface.
3. Plain Turning \Rightarrow It is an operation removing excess amount of material from the surface. The operation is done to reduce the diameter of

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the work piece.

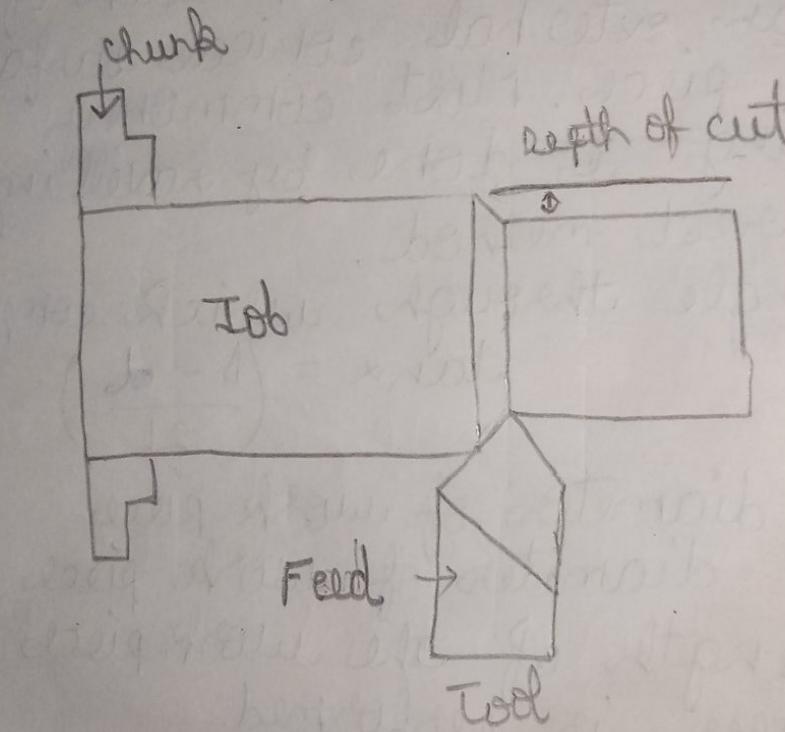
4. Step turning \Rightarrow It is an operation of producing various types of different diameters in the work piece.
 5. Taper turning \Rightarrow It is an operation of producing an external conical surface on a work piece. Most commonly taper turning is done by travelling compound rest method.
 α is the angle through which compound rest is $\tan \alpha = \left(\frac{D - d}{2L} \right)$
- D = Larger diameter of work piece
 d = smaller diameter of work piece
 L = Axial length of the work piece
 on which taper is performed
 $\text{Taper } (\alpha) = \left(\frac{D - d}{2L} \right)$

6. Boring \Rightarrow It is an operation of enlarging hole already made in a work piece. In this operation, boring tool is held on the tool post.

Practical - 2

Aim:- To prepare a job on the lathe involving facing, outside turning, step turning, taper turning, radius making and parting off.

Tools Used :- Lathe machine, parking tool, vernier callipers and spanners, etc



Practical -2

Aim :- To prepare a job on the lathe involving facing, outside turning, step turning, taper turning, radius making and parting off.

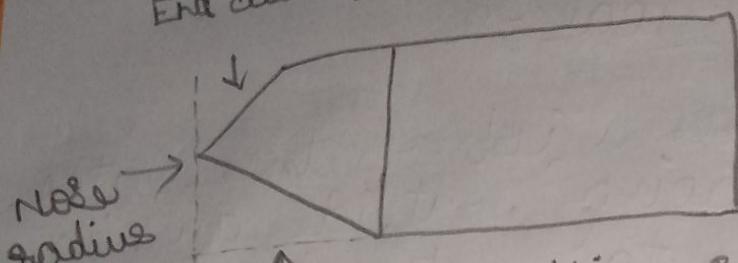
Tools used :- Lathe, mauls, parting tool, vernier caliper and spanners, etc.

Theory :-

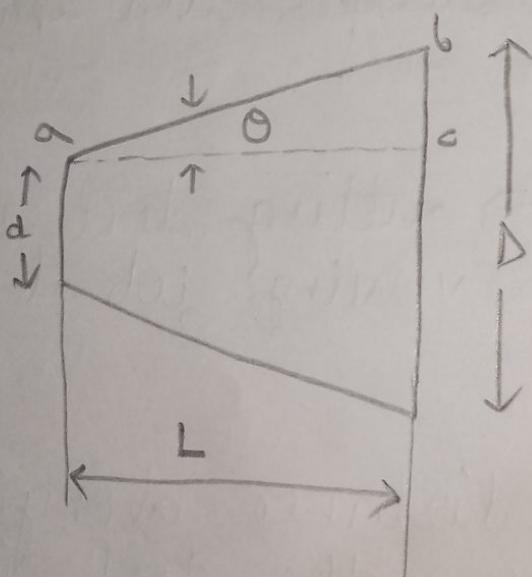
1. Turning operation \Rightarrow cutting tool slowly moves over the revolving job at a high speed.
2. Feed \Rightarrow It is a distance along the bed, traversed by the tool in one revolution of the work. It depends upon the depth of cut and finishing.
3. Speed \Rightarrow Speed at which the job is revolving is expressed as rpm. Linear cutting speed is more for softer materials and less for the harder materials.

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End cutting edge tool



↑ slide cutting edge sample



4. Depth of cut \Rightarrow The depth of cut is the perpendicular distance measured from the machined surface to the uncut surface of work piece.

Procedure

1. Fix the M.S. rod in a three jaw chuck, in such a way so that the job projects about 90 mm from the face of chuck.
2. Fix single point cutting tool of HSS material in the tool post of lathe machine.
3. Select proper job for 32 mm diameter mild steel rod and for HSS tool, it should be around 400 rpm.
4. For facing operation, material is removed from the end of the rod. Tool tip is penetrated about 0.5 mm into the centre of the job and is slowly moved towards circumference.

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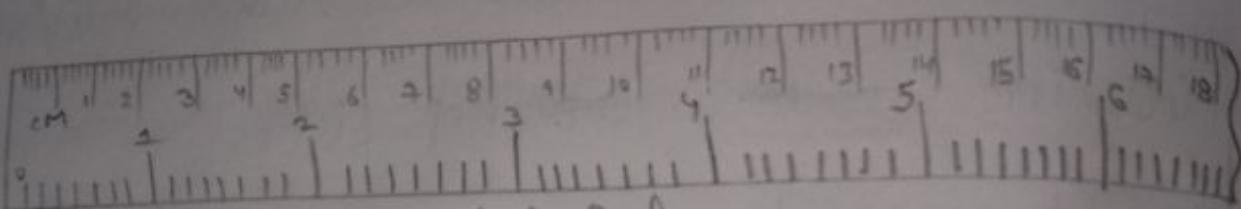
5. For outside turning, tool is set at the right angle to the job. The tool is moved along length of bed.
6. For taper turning, the required angle is worked out as $\tan \theta = (\phi - d) / 2L$

Material :- M.S. round piece

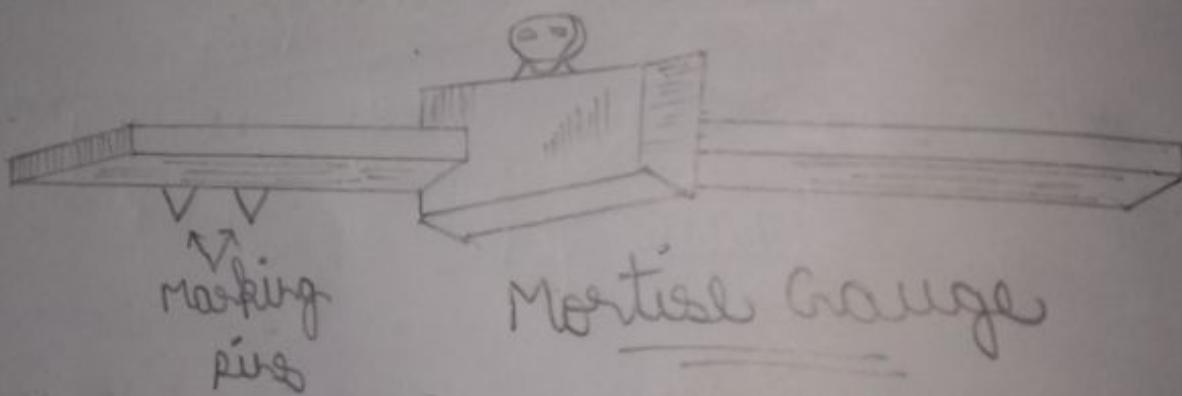
Result :- Job made and self inspected as per drawing.

Practical - 3

Aim :- To study various types of tools used in carpentry and to prepare simple type of wooden joints.

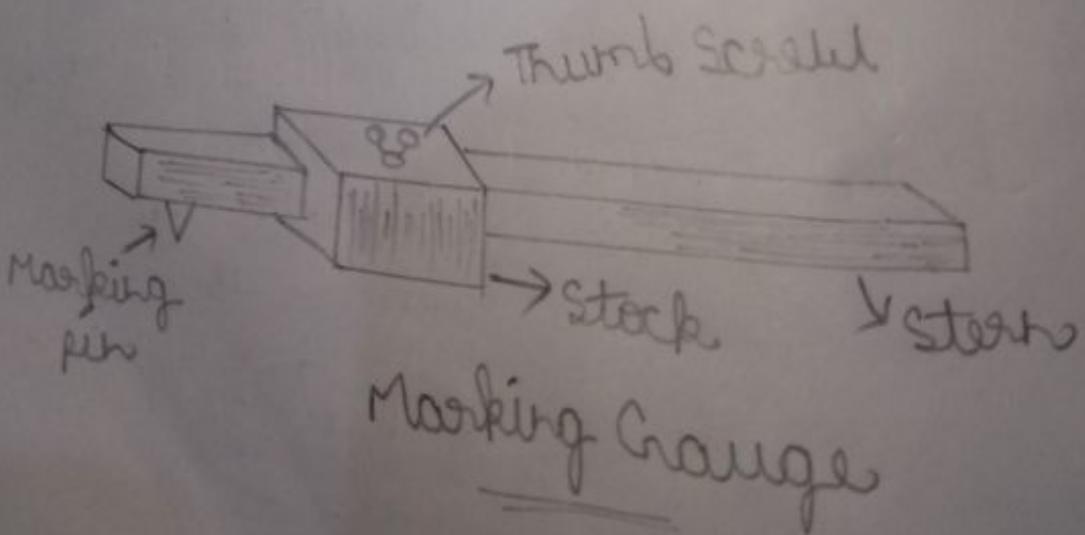


Steel Rule



Marking
pin

Mortise Gauge



Marking
pin

Thumb Scriber

Stock

Stern

Marking Gauge

Practical - 3

Aim :- To study various types of tools used in carpentry and to prepare simple types of wooden joints.

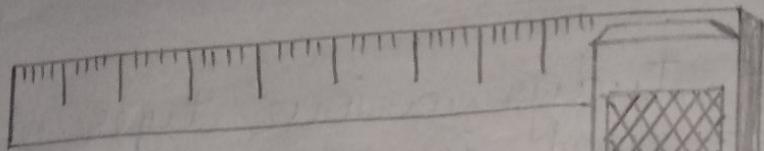
various types of tools used in carpentry are

1. measuring tools
2. Marking tools
3. cutting tools
4. Planing tools
5. drilling and boring tools
6. striking tools
7. Sharpening tools
8. Holding devices.

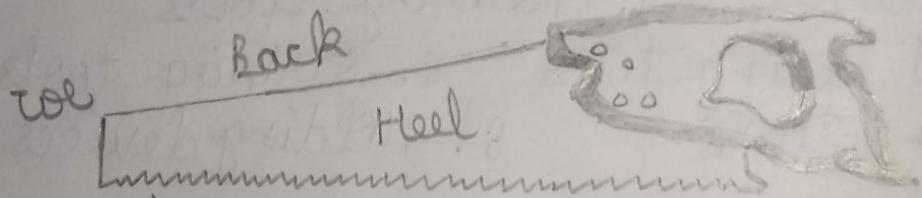
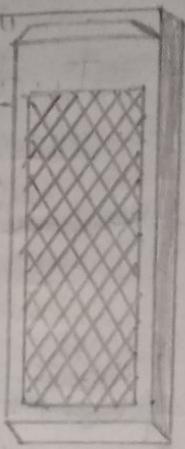
Introduction :- Carpentry may be defined as the process of making wooden components. It starts from a marketable form of wood and ends with a finished product. It deals with the building work, furniture, cabinet making, etc.

Measuring tools
Steel Rule \Rightarrow It is made up of stainless steel and is marked with centimeter scale and inch scale.

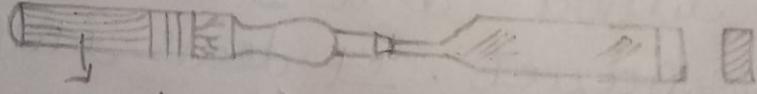
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Try Square



Blade Toe Heel Handle



Round toe Firmer chisel

Marking Tools

Mortise Gauge \Rightarrow It is used to draw two parallel lines. Its working is similar to marking gauge but it has two pins instead of one in marking gauge. In some mortise gauges, one pin is fixed while other is movable.

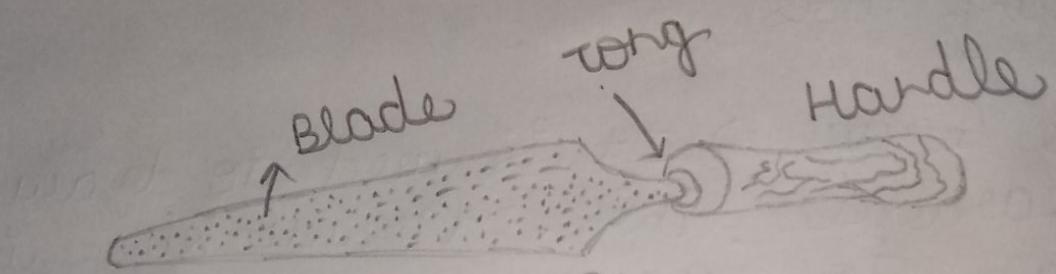
Marking Gauge \Rightarrow It is used to scribe the line parallel to and at a desired distance from a finished face or edge. Stock is the movable portion and can be adjusted at any position on the stem with the help of the thumb screw.

Try square \Rightarrow It is used to draw parallel lines at the right angles or to check the true ness of the planned surface.

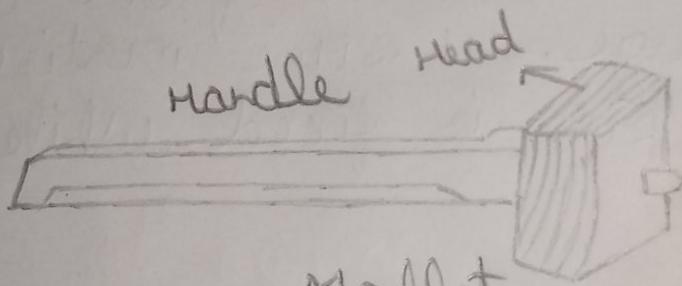
Cutting Tools

A. Saws \Rightarrow A saw consist of a thin spring steel blade with a wooden

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RASP



Mallet

11

No. _____

Dated _____

Handle. The front of the saw is called toe.

1. Rip Saw \Rightarrow It is a hand saw measuring 30 cm to 75 cm long (length of blade). The width of the blade is about ~~100~~ 120 mm to 150 mm near the handle and 60 mm to 70 mm at the toe.

Cross cut saw \Rightarrow This saw is provided with two handles, one at each end. It is used for cutting heavy timber logs, two persons are employed on cross cut saw.

2. Chisel \Rightarrow It is a flat thick piece of tool steel, where one edge is ground to form a cutting edge and the other is provided with a wooden handle.

Firmer chisel \Rightarrow It is a medium duty tool used for the general work. It carries a wide blade. It is used for taking wider cuts and banishing flat surfaces.

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Mortise Chisel \Rightarrow It is used for taking heavy removals of material. It cuts so more material possible by this chisel.

Wooden Jack Plane \Rightarrow The main cutting part is known as blade or iron cutter is fitted in the stock such a way that it remains at angle of 45° with the sole.

Iron Jack Plane \Rightarrow It gives better surface finish and is more durable than the wooden jack plane. Its use is similar to the wooden jack plane.

Rasp \Rightarrow It is also known as rasp file. It is a finishing tool used to make the wood surface smooth, remove sharp edge etc. Sharp cutting teeth is provided on the surface.

Hammer
Claw Hammer \Rightarrow It is used for striking as well as for pulling the nail from the wood. The claw face

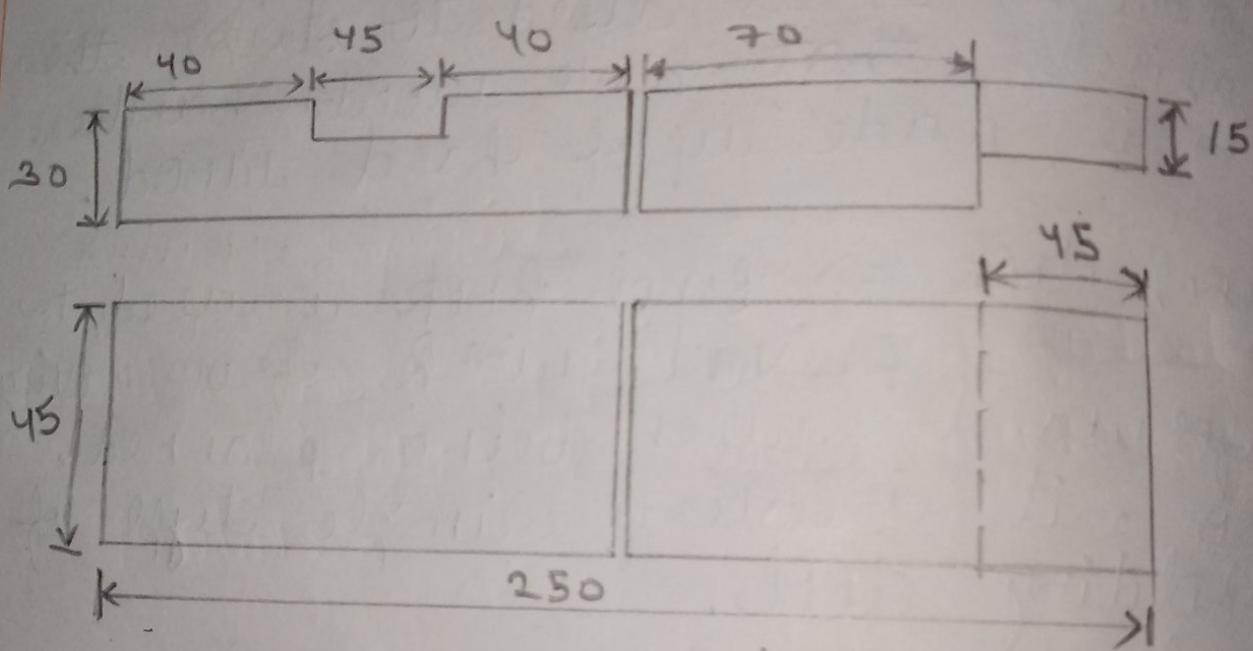
is used for pulling out the nails
and the head face is used to
drive the nails.

Mallet \Rightarrow It is used to strike the
chisels that have wooden handles.
It is made up of hard wood.

Bench Hook \Rightarrow Bench hook is used to
prevent work from moving
forward when being planed.
So, it is very simple type of
holding tool.

Practical - 4

Aim :- To prepare a lap 'T' joint



T-lap Joint

Practical - 4

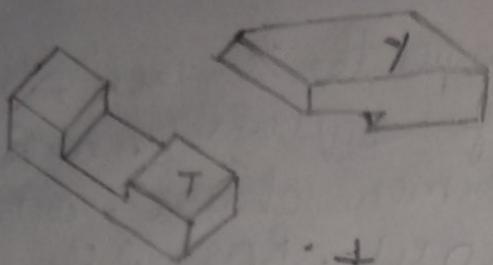
Aim :- To prepare a lap 'T' joint

Material Used :- Carpenter's vice, jack plane, try-square, marking gauge, 25 mm firmer chisel, cross cut saw, rip saw, rasp file, mallet, claw hammer, wood.

Procedure :-

1. The given reaper is checked to ensure its correct size.
2. The reaper is firmly in the carpenter's vice and two adjacent planes are planed by the jack plane and the two faces are checked for squareness with the try-square.
3. Marking gauge is set and lines are drawn at 30° and 45° mm, to mark the thickness and width model respectively.
4. The mating dimensions of the parts x

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T-lap joint

Result :- The T-lap joint is thus formed by
following the above sequence of
operations.

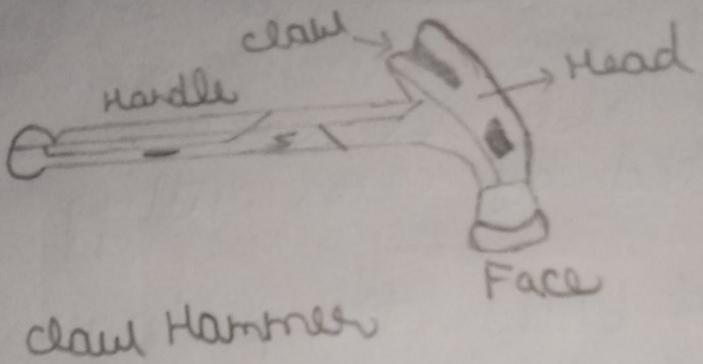
and Y are then marked using scale and marking gauge.

5. Using the rip saw, the portions to be removed are cut in both the pieces and also the parts X and Y are separated by cross cutting.
6. The ends of both the parts are chiseled to the exact lengths.
7. A fine finishing is given to the parts using rasp file.
8. The parts are fitted to obtain a slightly tight joint.

Result :- The T-jig joint is thus formed by following the above sequence of operations.

Practical-5

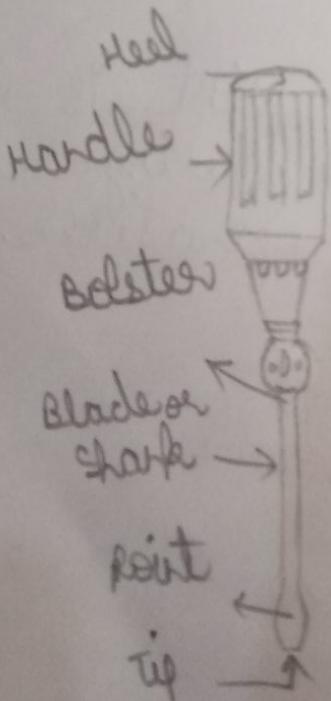
Aim:- To study various types of materials used in electrical shop.



claw Hammer



wire gauge



Practical - 5

Aim :- To study various types of materials used in electrical shop.

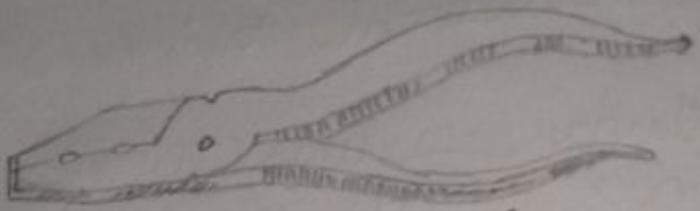
Types of electrical wires

1. Lead Sheathed wires \Rightarrow The lead sheathed wires are covered from outside with lead or lead alloy. These wires are used in snowfall areas.
2. Weather proof wires \Rightarrow The insulation of such wires is very high because they are generally used for outdoor or underground work.
3. P.V.C. wires \Rightarrow These are covered with an insulation of Polyvinyl chloride. These are used for neat wiring and conduct wiring.

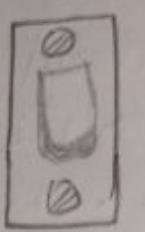
Electrical tools

1. Claw Hammer \Rightarrow Hammers are used for striking nails and punches for

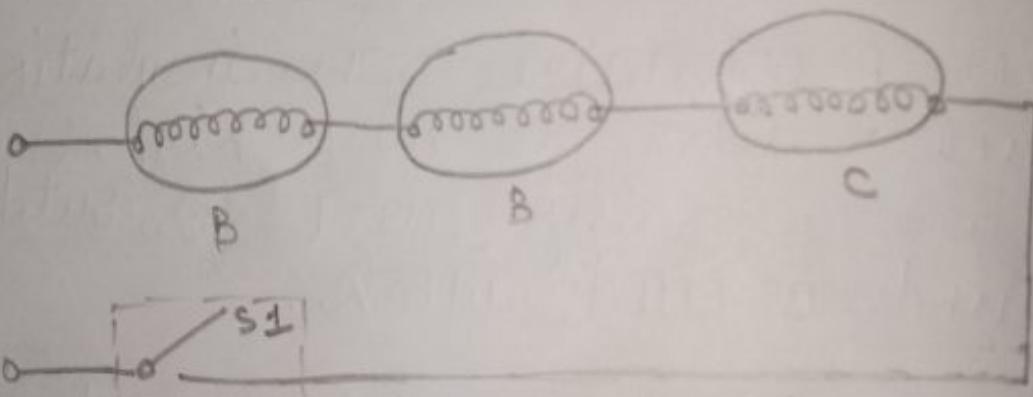
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Flat Nose Plier



Electric switch



Series circuit

giving the force to the component for proper fitting.

2. Wire gauge \Rightarrow wire gauge is used to check the size of electrical wires. It consists of steel disc having slots and holes in the circumference. The diameter of all the holes are different. The size of the wire is checked by simply inserting the wire into the slot.
3. Pliers \Rightarrow Pliers is used to perform the following functions \Rightarrow
 - (i) cutting of wires
 - (ii) twisting pairs of wires
 - (iii) loosening or tightening of nuts.
 - (iv) Holding purposes
 - (v) Removing the intersection of wires.Flat pliers has two jaws. It is used for holding, tightening or loosening of nuts.
4. Hacksaw \Rightarrow The hand hacksaw is used to cut the pipe, wooden board, batten or strips.

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5. Screw drivers \Rightarrow A screw driver has a plastic handle, semi round feel, tip and blade of tempered steel and chrome plate and number of screw drivers in different sizes and shapes are required.
6. Electric switch \Rightarrow This is a device that makes and breaks or changes the course of electric circuit. It consists of two or more contacts mounted on an insulating structure and arranged such that they may be moved into and out of contact with each other by a suitable operating mechanism.

Wiring Methods

A circuit is a path along with the electric current flows from the negative side of the power source to the positive side. There are three types of electrical circuit that are used for connecting wires or controls to

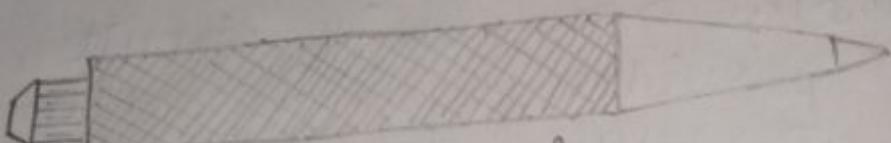
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the power source viz. series circuit, parallel circuit and combination of two.

- (i) Series circuit \Rightarrow The series circuit, provides a single, continuous path through which current flows.
- (ii) Parallel circuit \Rightarrow In parallel circuit, the device are connected side by side so that, current flows in a number of parallel paths.

Practical - 6

Aim :- To study various types of materials used
in sheet metal shop



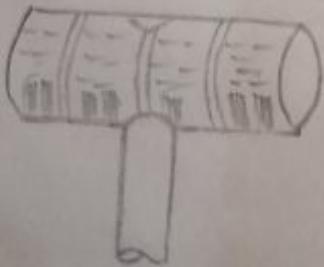
Solid Punch



Round cutting fisel



Straight Snip



Mallet

Practical - 6

Aim :- To study various types of materials used in sheet metal shop.

Introduction :- The sheet metal shop is important for every engineering concern. It deals with the working of metal sheets. The various operations performed in a sheet metal shop are cutting, shearing, bending etc.

Tools used in sheet metal work

1. Solid Punch \Rightarrow It is one piece rod-shaped tool made of metal designed to be struck by a hammer. They are typically used to drive objects such as pins or to form impressions on a work piece.
2. Chisel \Rightarrow It is flat thick piece of tool used, whose one edge is ground to form a cutting edge and the others

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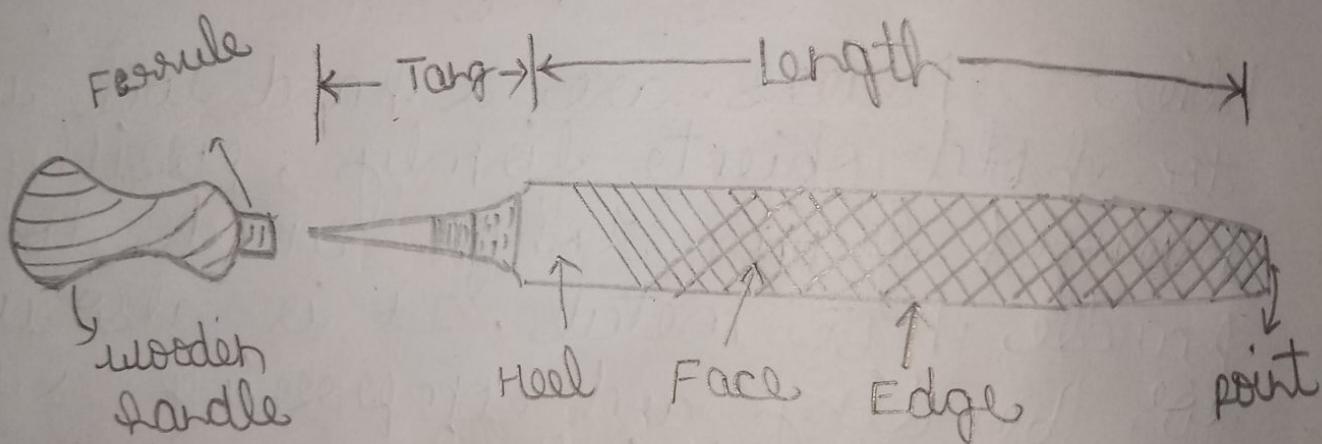
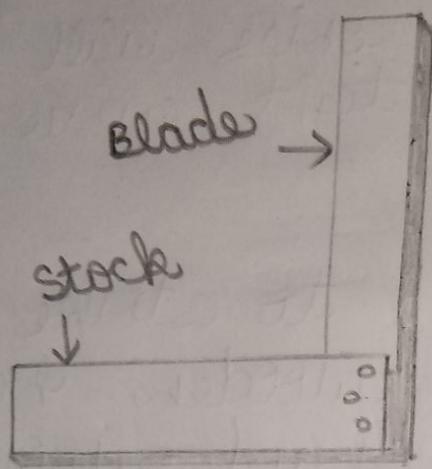
Pliers

is provided with a wooden handle.

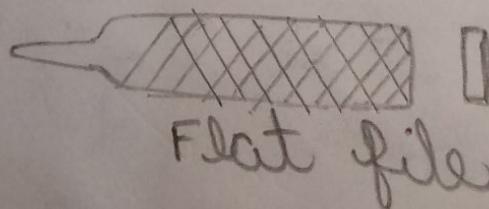
3. Straight Snip \Rightarrow straight cutting snips cut in a straight line and wide curves. Left cutting snips will cut straight and in a tight curve to the left.
4. Mallet \Rightarrow It is used to strike the chisel that have wooden handle. It is made up of hard wood.
5. Pliers \Rightarrow Pliers are a hand tool used to hold objects firmly, possibly developed from tongs used to handle hot metal. It is also used for bending and compressing a wide range of materials.

Practical -7

Aim :- To study different types of fitting and making tools used in a fitting shop.



Nomenclature of File



Practical - 2

Aim :- To study different types of fitting and making tools used in a fitting shop.

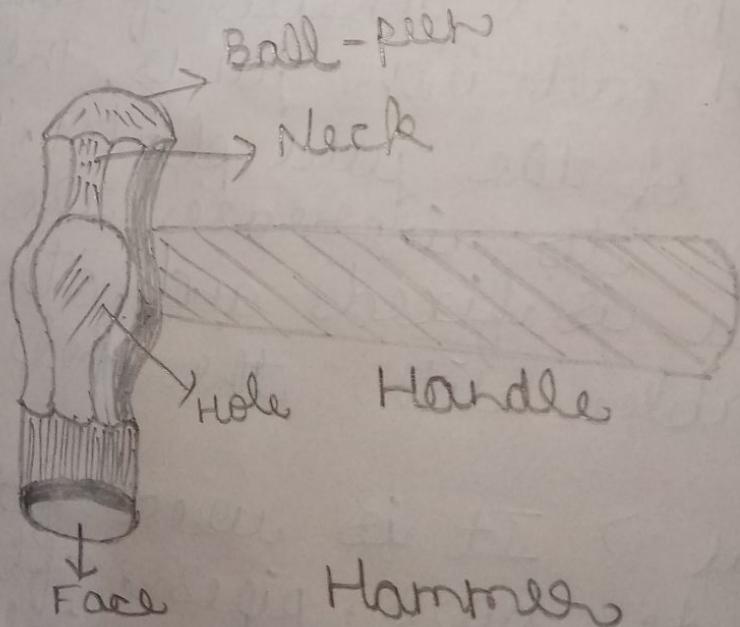
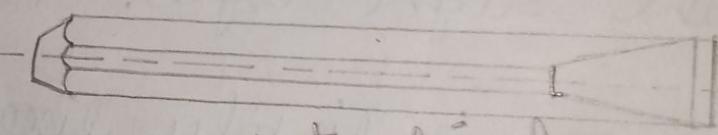
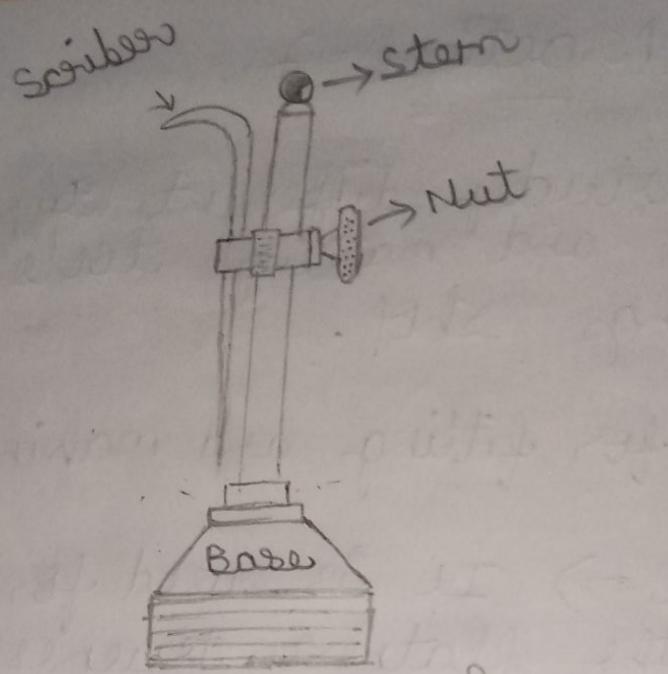
Tools used for fitting and making tools

Ttry Square \Rightarrow It is used for checking the flatness, true ness of surface. It consists of a blade which is made up of steel attached to the base at the right angle.

Bench Vice \Rightarrow It is firmly fixed to the bench with the help of nuts and bolts. It consist of cast iron body and cast iron jaws. The holding surface of the jaw plates is knurled in order to increase the gripping. One jaw is fixed and other jaw is movable with the help of handle.

Hack Saw \Rightarrow It is used for cutting rods, bars, pipes, flat etc. It consist of a frame which is made

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of mild steel. The blade is made up of high carbon steel or high speed steel.

Files \Rightarrow Files are multi point cutting tools. It is used to (prepare) remove the material by rubbing it on metal, files are available in a number of sizes, shapes and degree of coarseness.

Flat file \Rightarrow It is rectangular in cross section and is slightly tapered towards the point in both width and thickness and has double cut teeth. Both edges are cut.

Triangular File \Rightarrow Tapers towards the point and is usually single cut.

Surface Plate \Rightarrow It is used for testing the flatness, trueness of the surfaces. It is made up of cast iron and graphite

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while not in use.

Scriber \Rightarrow It consists of a cast iron base on the centre of which a steel rod is fixed vertically. Scriber is made up of high carbon steel and is hardened from the front edge. It is used for locating the centre of round bars or for making of lines.

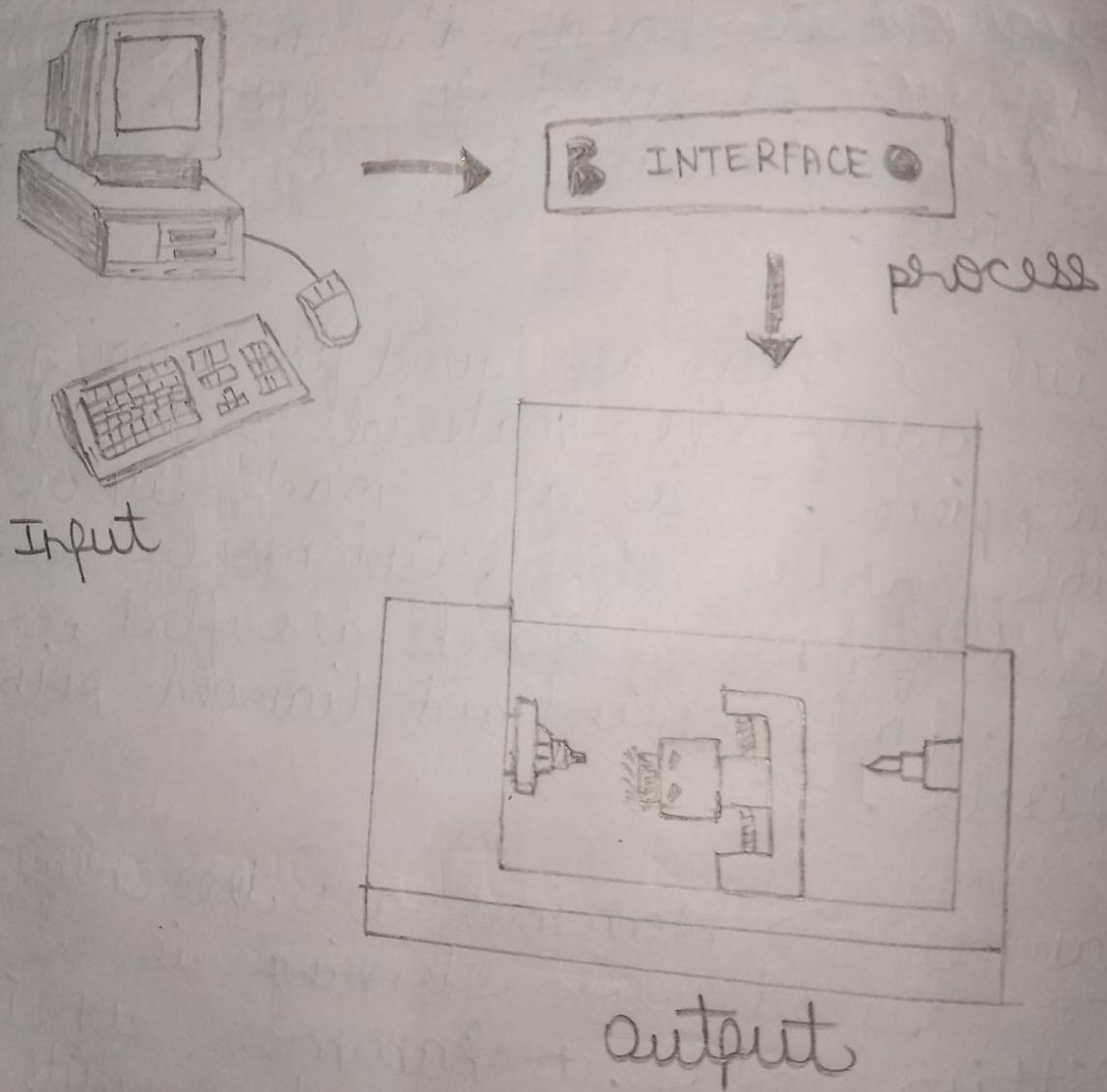
Chisel \Rightarrow These are used for chipping away the material from the workpiece. These are made up of high carbon steel. Commonly ~~ext~~ used forms of chisels are flat, cross cut, half round and diamond pointed chisels.

Hammer \Rightarrow Hammer are the only tools used for striking in a fitting shop. A hammer consist of a heavy iron body with a wooden from 0.25 * to 2 kg. The parts of the hammer are per, eye neck face and a handle.

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Practical - 8

Aim :- To study the CNC machine, CNC control panel, setting up the cutting tool to the correct length, CNC lathe, and CNC programming.



Practical -8

Introduction :- The design is loaded into the computer which is attached to the CNC machine. The computer changes the design into a special code that controls the way the CNC cuts and shapes the material. The material to be shaped is taped on to a block with double sided tape, this must be done carefully.

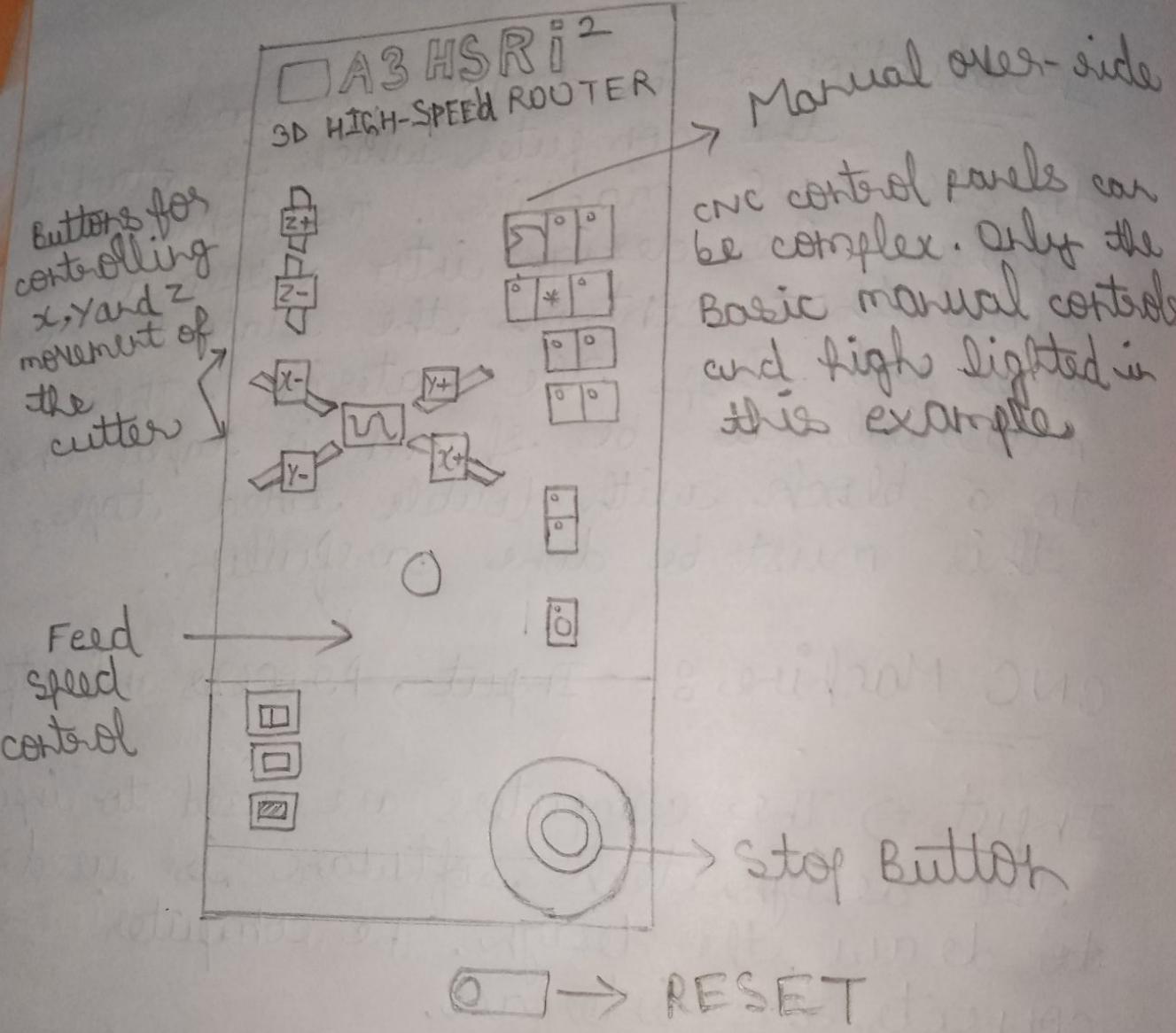
CNC Machine :- Input, Process and Output

Input \Rightarrow The computers are used to input the design. Tech software is used to draw the design. The computer connects the interface.

Process \Rightarrow The interface processes the signals from the computers to a form that the CNC machine can use. The interface is connected to the CNC machine.

Output \Rightarrow The signals from the interface

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Typical CNC control Panel

controls the movement of the cutting tool. The design is manufactured on the CNC machine.

CNC Control Panel \Rightarrow A CNC machine is normally controlled by a computer and software. However most CNC machines have a range of controls manual use when a CNC machine is used manually.

Reset Button \Rightarrow The most important control button is usually the reset button. When the CNC machine is turned on, the reset button is pressed by the machine operator.

Manual Control \Rightarrow The cutter can be controlled although this is rarely needed. The 'x' and 'y' buttons control the movement of cutter and 'z' button controls depth.

Stop Button \Rightarrow This helps to stop the machine very quickly.

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Speed and Feed \Rightarrow On some CNC machine, it is possible to manually vary the speed and feed of the cutter.

Working of CNC Lathe

- controlled by G and M codes
- Each number of code is assigned to a particular operation
- Typed in manually to CAD/CAM by machine operators.
- G and M codes are automatically generated by the computer software.

Commonly Used Codes

- N - code \Rightarrow It is a program line number
e.g., N3 (sequence number)
- G - code \Rightarrow Preparatory function.
This code indicates that a given control function such as G01,

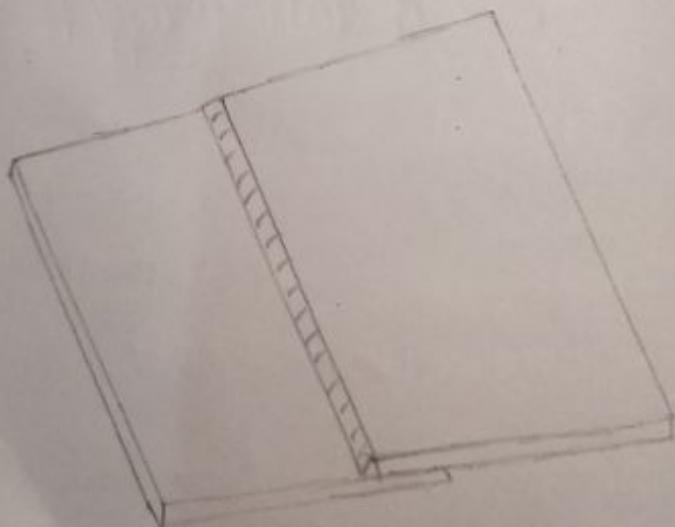
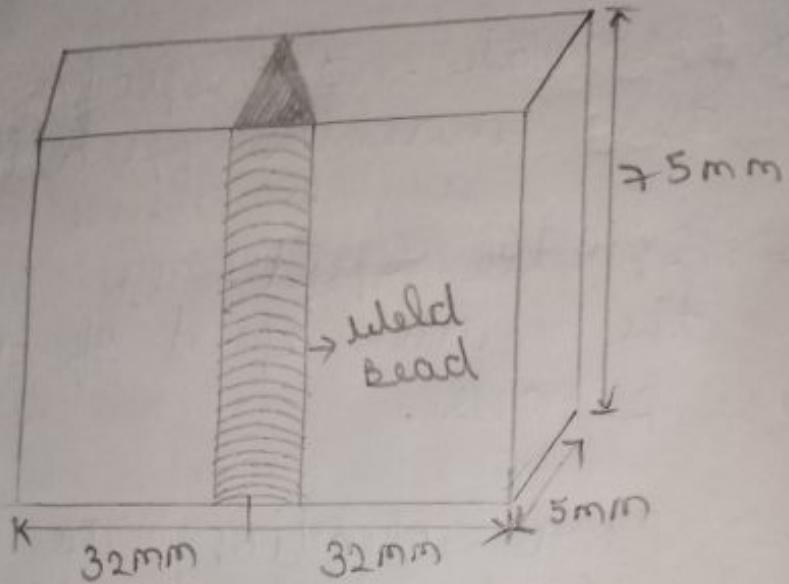
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linear interpolation is to be requested.

- x, y and 2 codes \Rightarrow coordinate, these give the coordinate positions of the tool.
- F-code \Rightarrow Feed rate. It specifies the feed in the machine operation.
- S-code \Rightarrow spindle Speed. The s code specifies the cutter speed of the machine process.
- T-code \Rightarrow Tool selection. The T code specifies which tool is to be used in a specific operation.

Practical - 9

Aim:- To study various types of tools used in welding shop.



Practical - 9

Introduction \Rightarrow Welding is a process of joining two similar or dissimilar metal by fusion with or without the application of pressure and with or without the use of filler metal. The fusion of metal takes place by means of heat. The heat may be obtained from electric arc, electric resistance, chemical energy reaction, friction or radiant energy.

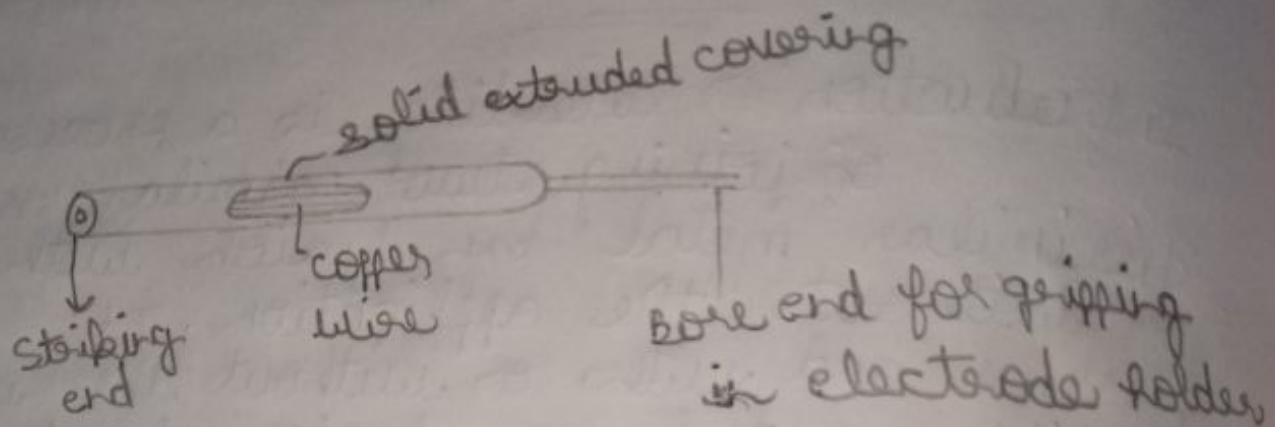
Types of welding joints

Lap joint \Rightarrow The lap joint is obtained by overlapping the plates and then welding the edges of the plates.

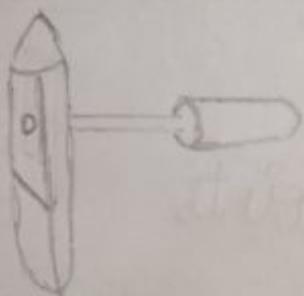
Butt joint \Rightarrow The butt joined is obtained by welding the ends or edges of the two plates which are approximately in the same plane.

Corner joint \Rightarrow The corner joint is

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Electrode Holder



chipping Hammer

obtained by joining the edges of two plates whose surfaces are at an angle of 90° to each other.

T-joint \Rightarrow It is obtained by joining two plates whose surfaces are approximately at right angles to each other.

Arc Welding Principle \Rightarrow

In the arc welding, arc is generated between the positive pole of D.C. called anode and negative pole of D.C. called cathode. When these two poles are brought together and separated for a small distance (1.5 to 3 mm). such that the current continues to flow through a path of ionized particles called plasma, an electric arc is found.

Equipment and eye protection guards

Goggles \Rightarrow Gas flames produce high intensity light and heat rays which are harmful to naked eye. To protect the eyes from these

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rays, goggles are used.

Hand gloves \Rightarrow leathers or asbestos

hand gloves are used to protect hands from UV and infrared rays, flying sparks and electric shock.

Welding Face screen \Rightarrow The job holder or operator, they should kept in mind that the workers working in close proximity must be protected from the hazards of the arc.

Apron \Rightarrow Apron made of heat resistant chrome leather, is used to protect the operators clothes from sparks.

Electrode Holder \Rightarrow It is used to hold the electrode. The electrode is held between the two jaws made of hard copper alloy.

Chipping Hammer \Rightarrow A chipping hammer is used for removing the slag formation on welds. One end of the

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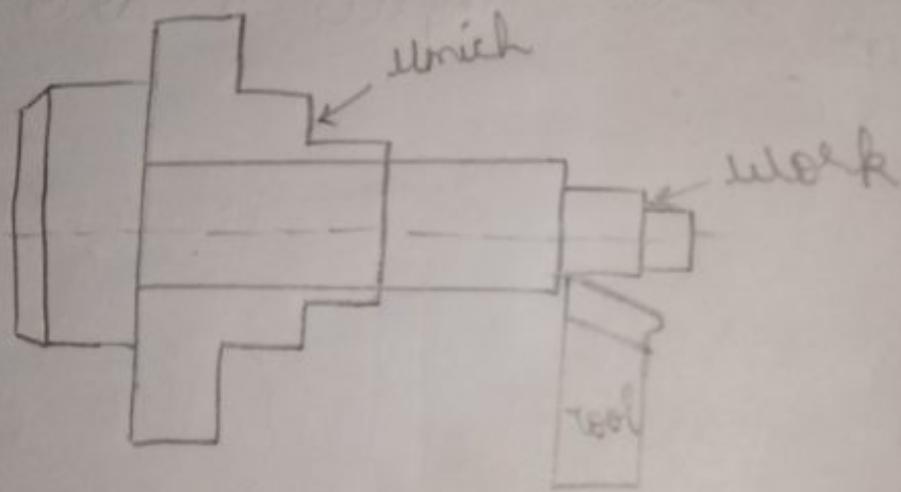
head is sharpened like a cold chisel and the others, to a blunt round point. It is generally made of steel.

Electrode \Rightarrow The electrodes are used for providing heat input in arc welding.

Practical - 10

Aim :- To perform step turning operation on CNC machine.

Materials Used :- CNC machine, work piece, lubricant



Practical - 10

Aim :- To perform step turning on CNC machine.

Materials used :- CNC machine, work piece, Lubricant.

Procedure

1. Hold the workpiece in the chuck.
2. Then check the machine if it is working properly or not.
3. Then set the programme of step - turning in CNC machine.

Step Turning =>

N5 G54;

N10 M42;

N15 G95 S300 M04;

N20 T01 D1 M8;

N25 G00 X30 Z0;

N30 G00 X40 Z0;

N35 CYCLE 95;

CYCLE 95 (step turn, 5

N40 G00 X200 Z200 M17;

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N45 M30;

Step turn: (Sub program)

N05 G01 X0 Z0 F0.2;

N10 G01 X0 Z-10 F0.2;

N15 G01 X20 Z-10;

N20 G01 X20 Z-30;

N25 G01 X30 Z-45;

N30 G01 X40 Z-45;

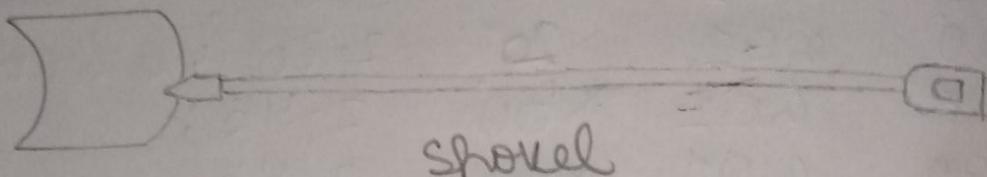
N35 G01 M17;

The step turning is done on workpiece

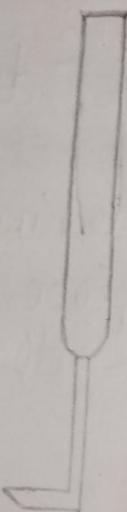
Result :- The step turning is thus

formed on workpiece by CNC machine
through following the above sequence
of operation.

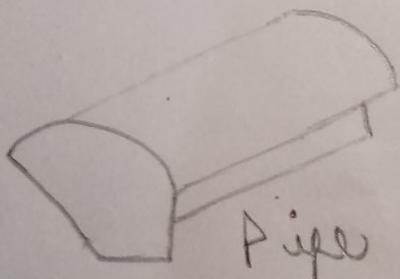
Practical - II
Aim :- To study various types of following tools
used in a foundry shop.



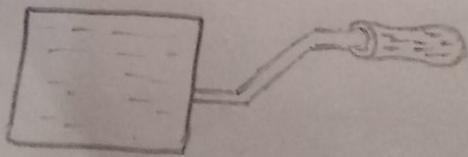
shovel



Lifter



Pipe



Trowel

Practical - 11

Aim 8- To study various types of following tools used in a foundry shop.

Pattern \Rightarrow A pattern may be defined as a model of a desired product, constructed in such a way as can be used for forming an impression called mould (cavity) in damp sand.

Shovel \Rightarrow It consists of a square pan fitted with a wooden handle. It is used to transfer sand to sand mixer and pouring sand in the moulding flask.

Hand riddle \Rightarrow It is also known as a sieve. It is used to remove the lumps and foreign particles from the sand.

Trowels \Rightarrow These are used for finishing flat surface and joints in

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the mould after withdrawal of the pattern.

Lifters \Rightarrow These are used for removing loose sand from inside the mould cavity.

Smoothers and corner slicks \Rightarrow

\Rightarrow These are used to repair and finish the round and square corners, round and flat surfaces and edges etc.

Moulding Box \Rightarrow The boxes used in

sand moulding may be made of wood, cast iron or steel. It is a container in which sand is packed and rammed.

Ladle \Rightarrow Ladles are used to transport molten metal from melting furnace to the mould and vice versa.

Crucible \Rightarrow Crucible is used to melt the metal in a furnace. It is

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packed inside the furnace and coil
material is put in the crucible.