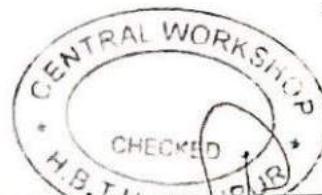


MASTER INDEX

Name : Divas Srivastava
 Branch : Bio - Chemical (BE)
 College : H. B. T. U. , Kanpur
 Year : 2017 - 18
 S. R. No. : 06

A/X



S. No.	Name Of Shop	Practice	Date of Starting	Date of Finishing	Page No.	Signature/ Remarks
1.	Machine Shop	Practice - 1 Practice - 2	23/08/17 30/08/17	30/08/17 30/08/17	1 - 13 14 - 21	J. L. 22/09/2017
2.	Fitting Shop	Practice - 1 Practice - 2	6/09/17 13/09/17	6/09/17 13/09/17	22 - 37 38 - 50	K. Omkar 30/10/17
3.	Carpentry Shop	Practise - 1 Practise - 2	20/09/17 4/10/17	20/09/17 4/10/17	51 - 63 64 - 73	M. J. (31/10/17)

MASTER-INDEX

Name : Shikhar Srivastava

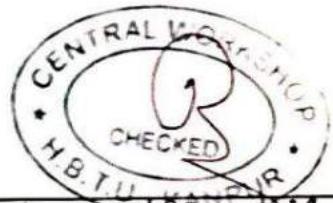
Branch : Bio-chemical (BE) (1st year)

College : H.B.T.U., Kanpur

Year : 2017-18

S.R. No. : 130101021

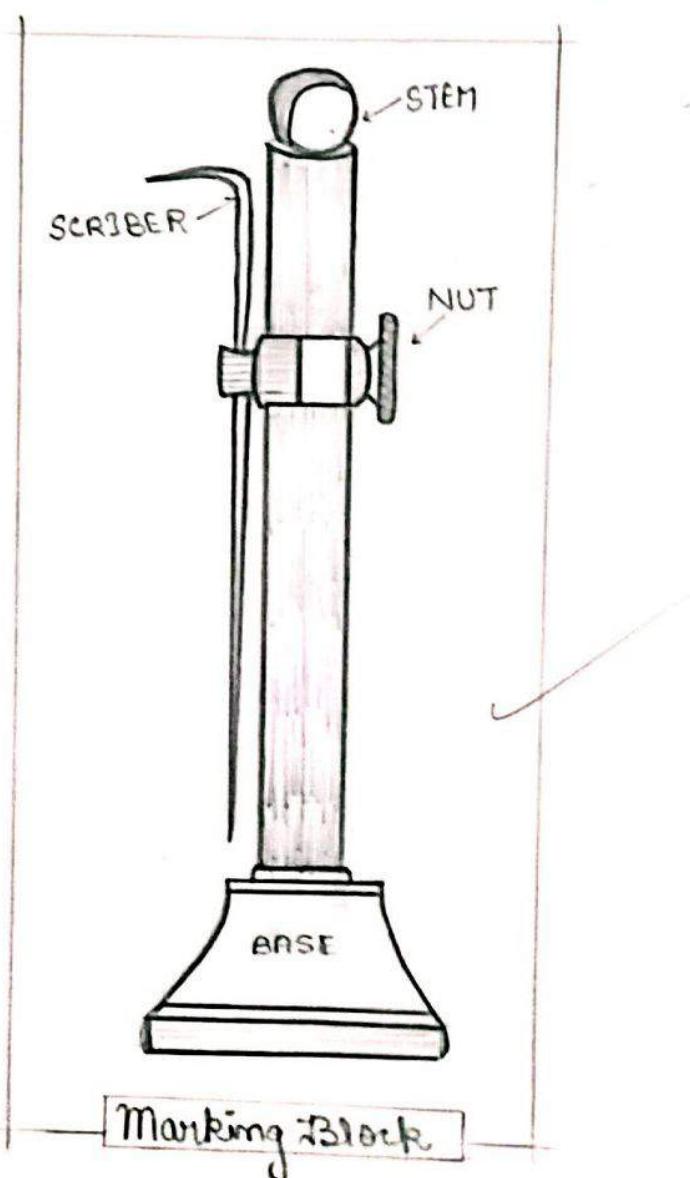
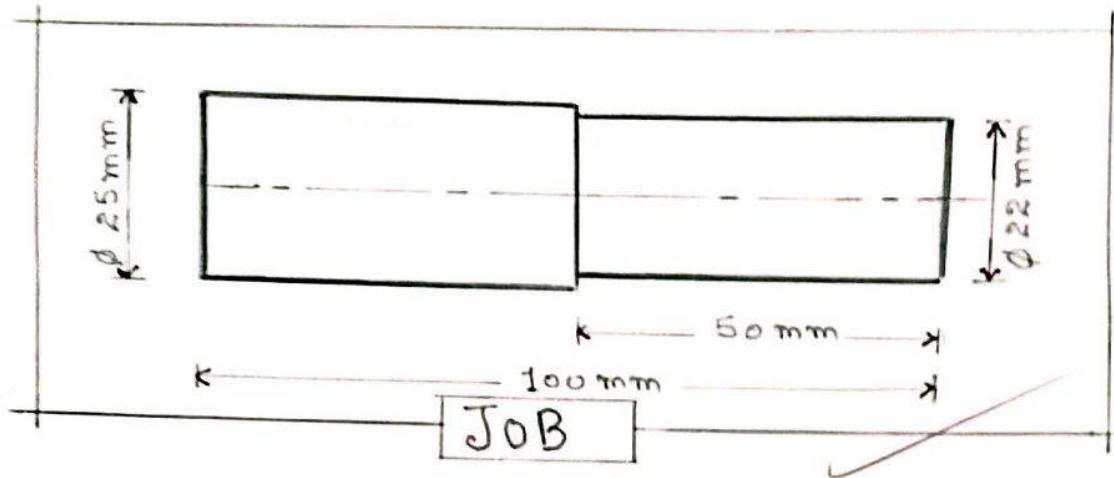
A+



S.No.	Name of shop	Practice	Date of starting	Date of Finishing	Page No.	Signature/ Remarks
1.	Blacksmithy shop	Practice 1 Practice 2	23/08/17 30/08/17	30/08/17	1-14 15-21	R 22-91 Shrikhar Srivastava
2.	Foundry shop	Practice 1 Practice 2	6/09/17 13/09/17	6/09/17 13/09/17	22-37 38-46	Shrikhar Srivastava Date: 30/10/17
3.	Melting shop	Practice 1 Practice 2	20/09/17 4/10/17	20/09/17 4/10/17	47-58 59-68	Shrikhar Srivastava Date: 31/10/17

MACHINE

SHOP



Divya Srivastava
Bio-Chemical
S.R. No. -



HARCOURT BUTLER TECHNOLOGICAL UNIVERSITY

KANPUR

WORKSHOP PRACTICE - 1

FULL NAME DIVAS SRIVASTAVA
SHOP MACHINE SHOP

1st
CLASS B.Tech
BE
DATE 23/08/17

Objective →

Study of Lathe Machine and to make a job by facing, plain turning, step turning & chamfering operation as per given drawing.

Date of Starting :- 23/08/2017

Date of Finishing :- 30/08/2017

Materials Required →

i) MS Rod (25 mm × 100 mm)

1 ★ Measuring and Marking Tools :-

- i) Marking Block
- ii) Engineering Scale
- iii) Outside Callipers

2 ★ Holding and supporting Tools :-

- i) Chuck
 - Four jaw chuck
- ii) Centres
 - Dead center
 - Live center
- iii) Tool post

3 ★ Cutting Tools :-

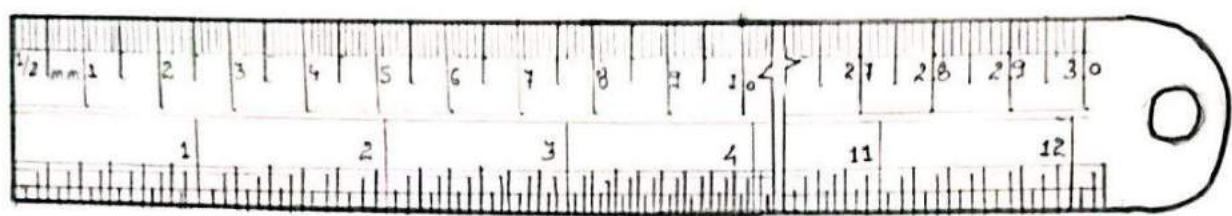
- i) Turning tool
- ii) Chamfering tool

4 ★ Latho Machine

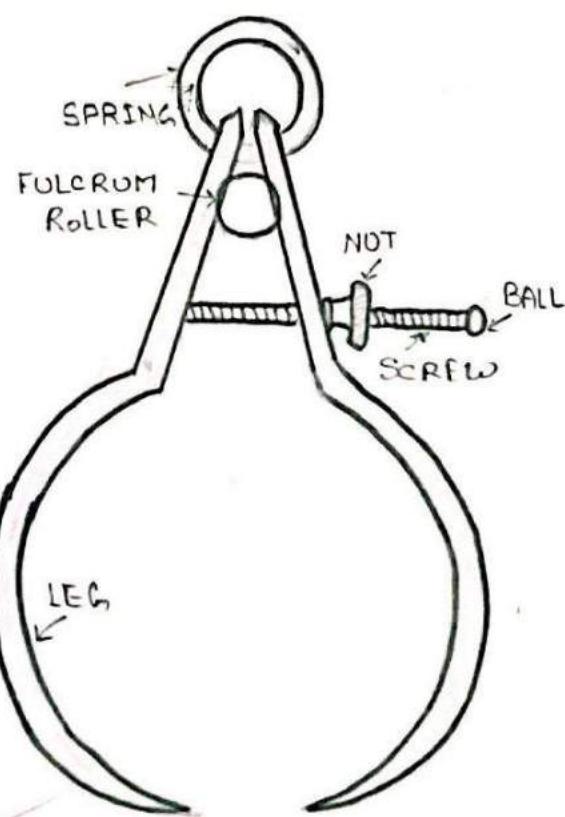
Description of Tools and Equipments →

① Marking Block →

It consist of a cast iron sliding base fitted with



Engineering Scale



Spring Type Outside Caliper

Dinesh Srivastava

Bio-Chemical

S.R. No. -

(7) (5)

a vertical steel rod, called stem. The marker is fitted into an adjustable device carrying a knurled nut as shown in figure. By means of the nut the scriber can be loosened or tightened to set it at desired position. It is mainly used during centering of job along the lathe axis more precisely.

(b) Engineering Scale →

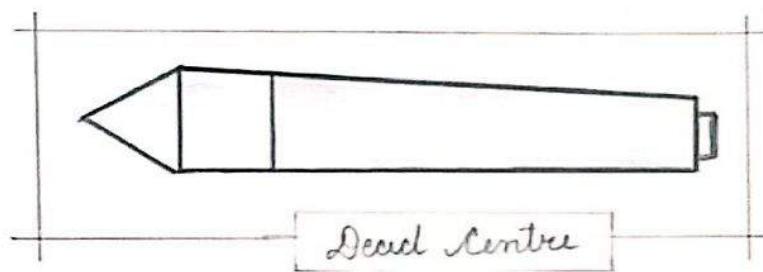
It is a stiff straight steel strip having all the faces machined true. On one of the flat faces graduations are marked in inches and centimeters. The least count is $\frac{1}{64}$ inch and 0.5 mm.

(c) Outside Caliper →

Outside calipers are the devices used for measuring and transferring the outside dimensions of components as shown in figure.

(d) Chuck →

They provide very efficient and true device for holding the work on the lathe during the operation. There is fairly large variety of chucks used on lathes.



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S.R. No. -

S.R. No. -

① Four Jaw Chuck :

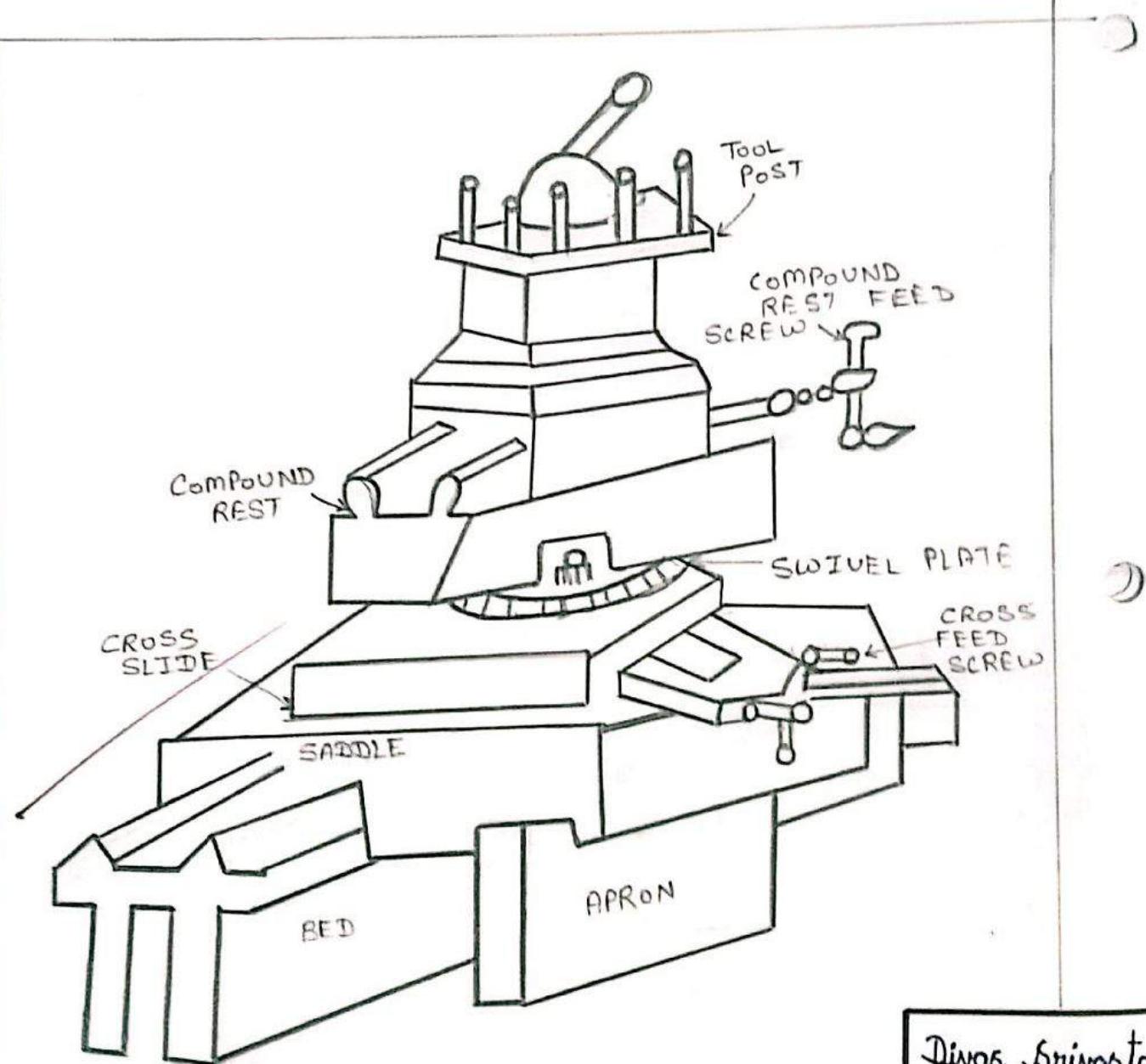
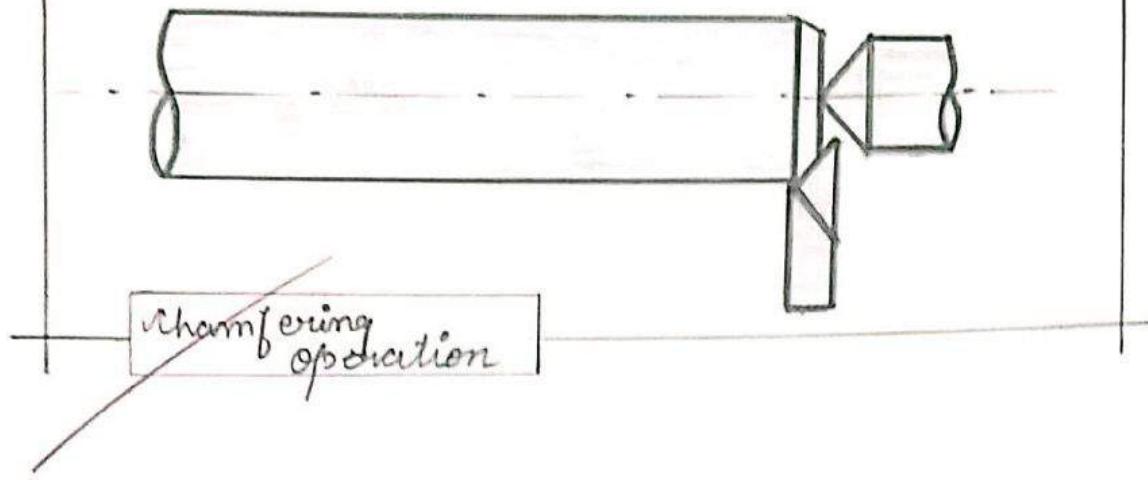
It is also known as independent chuck. The rear portion of its jaws is threaded and is engaged with separate adjusting screws. With the result all the jaws can be moved separately and adjusted at the designed distance from the center of the chuck. This enables the chuck to successfully hold irregular or eccentric jobs.

② Dead Center →

The most common method of holding the work piece in lathe is between the 2 centres. They are made of very hard materials. It is fitted in tail stock and remains stationary. This center due to high friction proves to be inefficient at high speeds. Centers are made of cast steel or high grade tools steel and ground to correct angle. The shank of all the centers are machined to the morse tapers.

③ Live Center →

The centre which is used in the head stock spindle revolves with it, known as live center. The center are usually 60° for general purpose work.



Dinesh Srivastava
Bio-Chemical
S.R. No. -

(g) Tool Post →

It is the top most part of the carriage, rest on compound slide and is used for holding the tool or tool holder in position.

(h) Turning Tool →

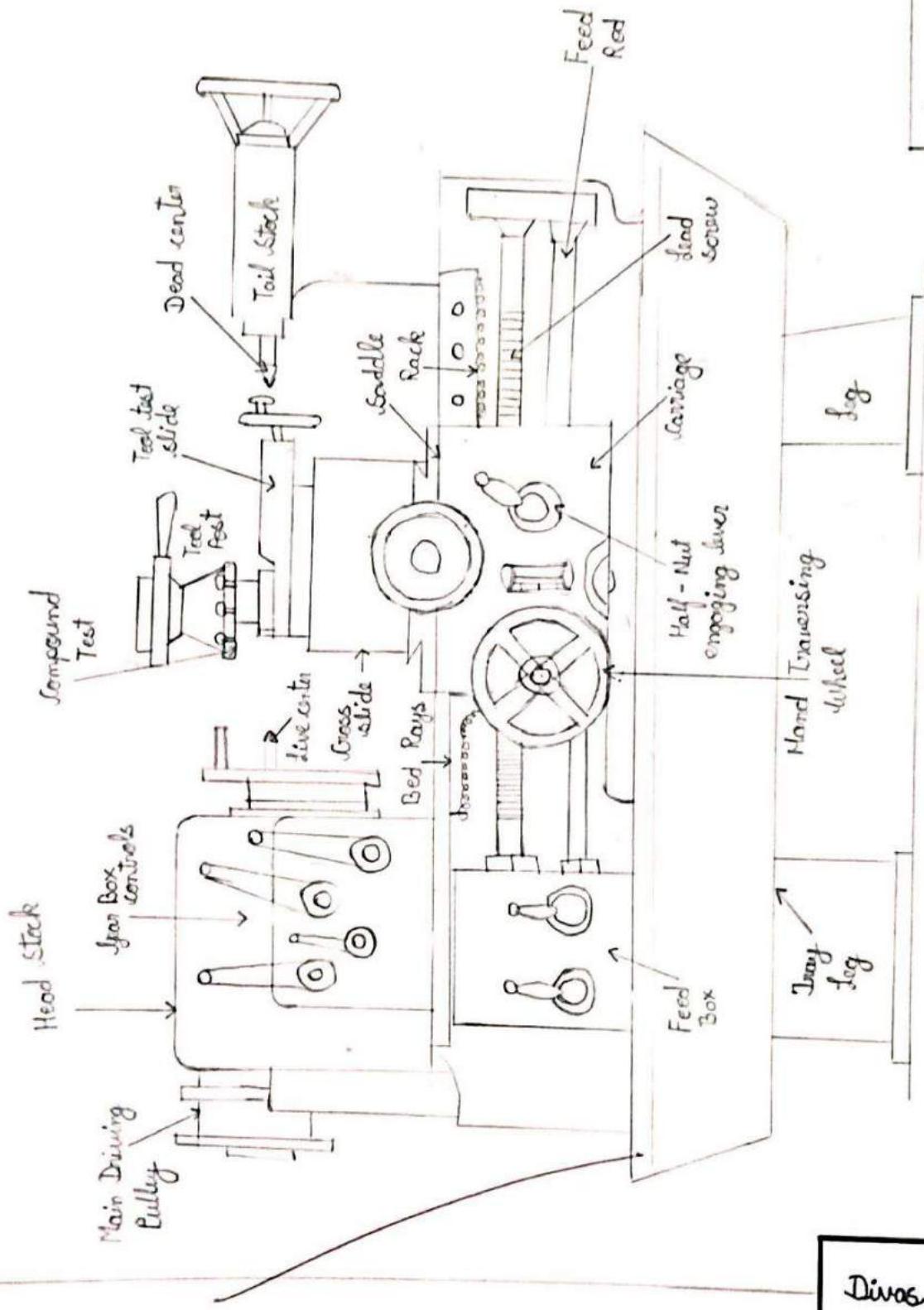
There are mainly 2 classes of turning tools. Rough turning tool and finish turning tool. The main function of rough turning tool is used to remove a very small amount of metal.

(i) Chamfering Tool →

A straight turning tool may be used as a chamfering tool when the cutting edges are set at the angle of chamfering. However a large amount of chamfering work is to be performed a special chamfering tool is used. A chamfering tool is shown in figure.

(j) Lathe Machine →

The lathe machine can be defined as a tool which holds the workpiece between 2 rigid and strong supports called centres or in a



Lathe
Machine

Dinesh Srivastava
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S.R. No. -

chuck or face plate while the latter revolves. The chuck or the face plate is mounted on the projected end of the machine spindle. The cutting tool is rigidly held and supported in a tool post and is fed against the revolving work. While the work revolves about its own axis. The tool is made to move either parallel to or at an inclination with this axis to cut the desired material. In doing so it produces a cylindrical surface, if it is fed parallel to the axis, or will produce a tapered surface if it is fed at an inclination.

The main parts of the machine are shown in figure.

Procedure →

The procedure of the operation simply involves the application of the following described steps.

- (i) Hold the job properly in chuck on lathe machine.
- (ii) It should be in centre of the chuck which must be check with help of marking block.

- (iii) Check all the levers etc. they should be unchanged / unengaged position before starting the machine.
- (iv) After switching on the machine see visually approximate centre of job.
- (v) Start the machine and mount the tool bit in the tool post in proper position it should be well tight on top centre of job.
- (vi) The position at tool post should be in such a manner that its tip of comes about 30-40° with the top / job.
- (vii) Then by feeding with the help of cross slide wheel tilt the tip of tool bit to reach at center of job. This process of metal removing is known as facing.
- (viii) After facing, tilt back the tool post to its previous position so that the tip of tool bit come at right angle position with job. Now feed will be given with the help of star wheel. This metal removing process from surface of job is known as plain turning. Do plain turning till we get the required diameter of bar.

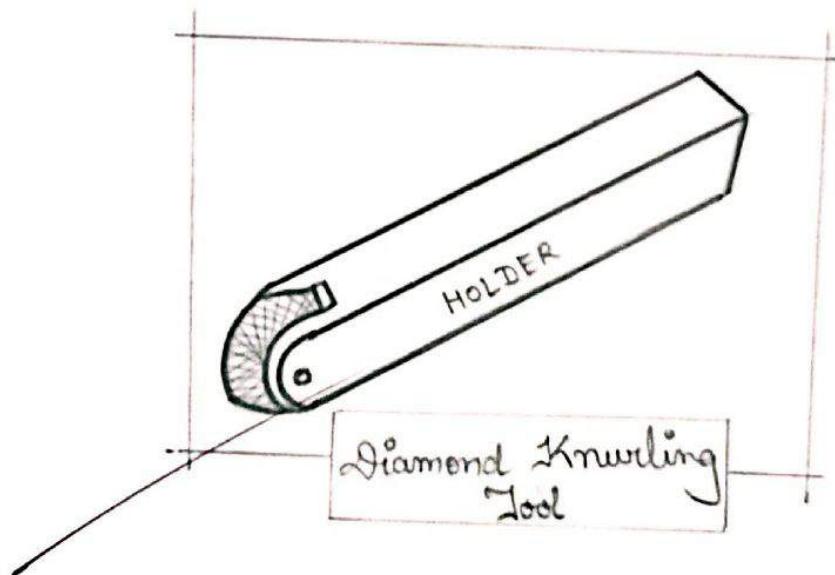
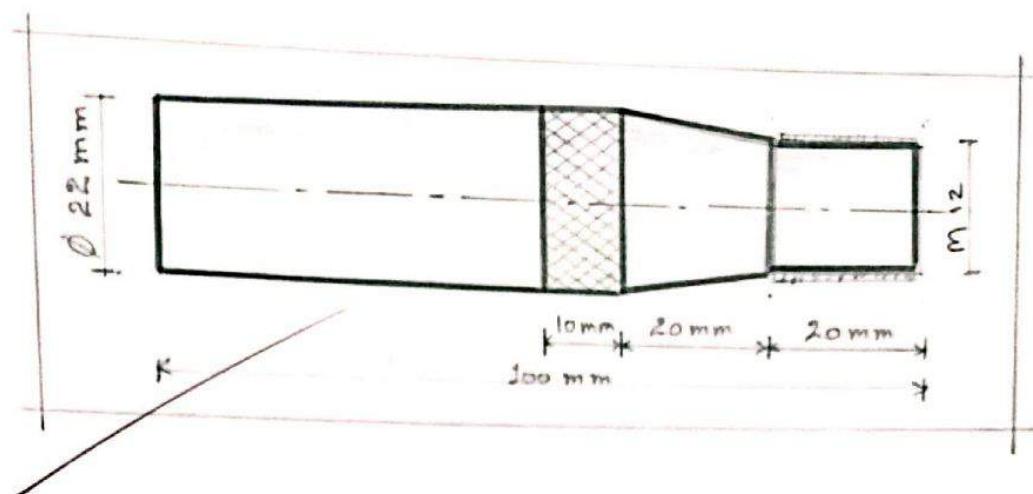
(ix)

Make greater diameter first then turn the position of job in the chuck and do plain turning upto desired length and diameter as per given dimensions. This plain turning of different diameters at different length is known as Step turning.

Precautions →

- i) Know the basics of cutting mechanism very well before operating the machine.
- ii) Adopt always right tool and right procedure for every operation in machine shop.
- iii) Always check that all the gears are idle and levers are in free or unengaged position before operating the machine.
- iv) Make sure that the job and tool bit are mounted in proper position and well tightened before starting machine.
- v) Use proper feed to the tool bit with appropriate speed.

- (13)
- vi) Never use calipers/steel scab in running condition
 - vii) When the machine is in running condition operator should not do any mischief with the other operator.



Divya Srivastava
Bio - Chemical
S.R. No. -



HARCOURT BUTLER TECHNOLOGICAL UNIVERSITY KANPUR

WORKSHOP PRACTICE - 2

FULL NAME DIVAS SRIVASTAVA
SHOP MACHINE SHOP

1st CLASS B-Tech
GE DATE 30/08/17

PRACTICE - 2

Objective →

To make a job by taper turning threading and knurling operation as per given drawing.

Date of starting :- 30/08/2017

Date of finishing :- 30/08/2017

Materials Required →

i) MS Rod (25 mm × 100 mm)

1 ★ Measuring and Marking Tools :-

i) Marking Block

- ii) Engineering scale
- iii) Outside calipers

2 ★ Holding and supporting tools →

- i) Chuck

- Four jaw Chuck

3 ★ Cutting tools →

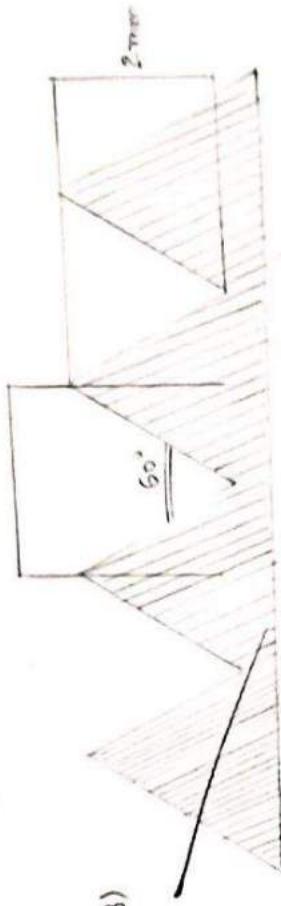
- i) Turning tool
- ii) Threading tool
- iii) Knurling tool

4 ★ Lathe Machine

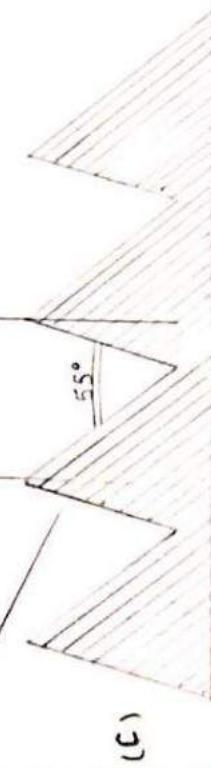
Description of Tools and Equipments →

ⓐ Threading Tool →

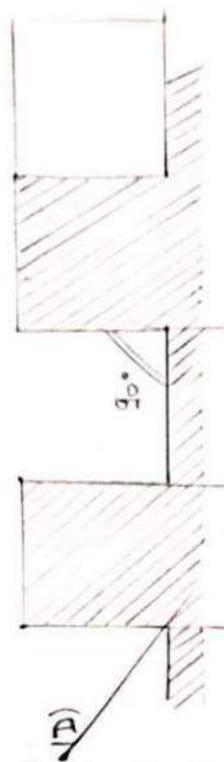
Metric, B.S.W., threads are produced by a single point thread cutting tool with its cutting edges ground to the shape and size of the thread to be cut. The shape of the angle of tool may be 60° for metric



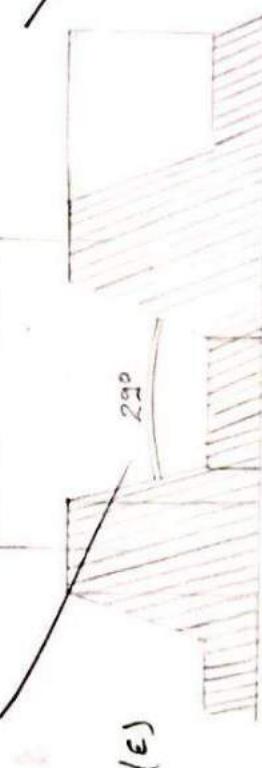
Sellier's Thread



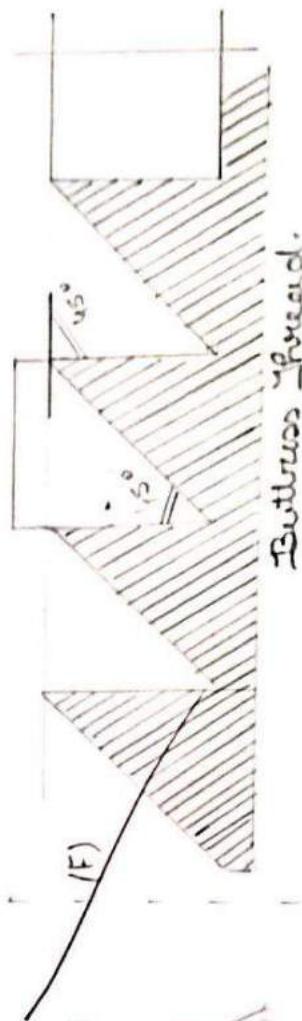
Sharp V. Thread



Square Thread



ACME - Thread



Buttress Thread.

threads or 55° for B.S.W. threads. The size or cross section of the cutting edge of the tool depends upon the pitch of the thread.

(b) Knurling Tool →

The tool consists of a straight shank fitted with one or 2 knurling wheels at its front. These wheels are made of hardened tool steel and carry teeth on the outer surface as shown in the figure. This tool is used for producing a knurled surface.

Procedure →

- i) Hold the job properly in chuck on lathe machine.
- ii) Check the position of job. It should be in center of chuck. Check it with the help of a surface gauge.
- iii) Check that all the levers etc. should be in unengaged position before starting the machine.
- iv) After switching on the machine see visually the approximate center of job. It should not

revolve in elliptical position.

- v) Switch off the machine and mount the tool bit in the tool post in proper position. It should be well tightened and tip of tool bit should coincide with the center of job.
- vi) Tilt the position of tool post in such a manner that the tip of tool bit come about 30-40° with the job.
- vii) Then apply feed with the help of cross-slide wheel till the tip of tool bit come at center of job. This process of metal removing is known as facing.
- viii) After facing, tilt back the tool post to its previous position so that the tip of tool bit come at right angle position with job. Now feed will be applied with the help of star wheel. This metal removing process from surface of job is known as plain turning. Do plain turning till you get the required diameter of job.
- ix) Make greater diameter first then turn the position of job in the chuck and do

plain turning upto desired length.

- x) Calculate the angle of taper by using the formula.

$$\tan \alpha = \frac{D-d}{2L}$$

(where 'D' is big diameter, 'd' is the small diameter, 'L' is the length of taper, 'α' is the angle of taper.)

- xi) Now change the position of job in chuck and tilt the compound rest at desired angle and feed the tool with the help of compound rest wheel till get the desired dimension.

- xii) After Taper turning operation is complete replace the threading tool bit with turning tool bit. Now engage the feed rod lever and suitable gears in proper way. Now threading tool will be moved with the help of half-nut lever.

- xiii) After threading is complete engage back-gear and reduce the speed of spindle and replace the threading tool bit with knurling tool bit.

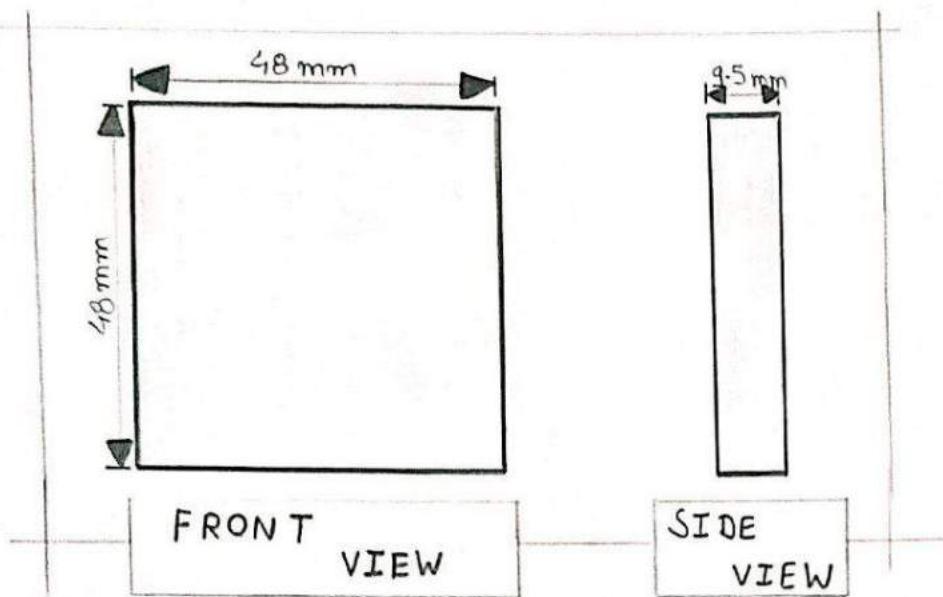
and do knurling in the same way by applying feed as applied in plain turning operation.

Precautions →

- (i) Known the basics of cutting mechanism very well before operating the machine.
- (ii) Adopt always right tool and right procedure for every operation in machine shop.
- (iii) Always check that all the gears are idle and levers are in free or unengaged position before operating the machine.
- (iv) Make sure that job and tool bit are mounted in proper position and well tightened before starting machine.
- (v) Use proper feed to the tool bit with appropriate speed.
- (vi) Switch off the main switch when the work of the day is over! This is to avoid short circuits.

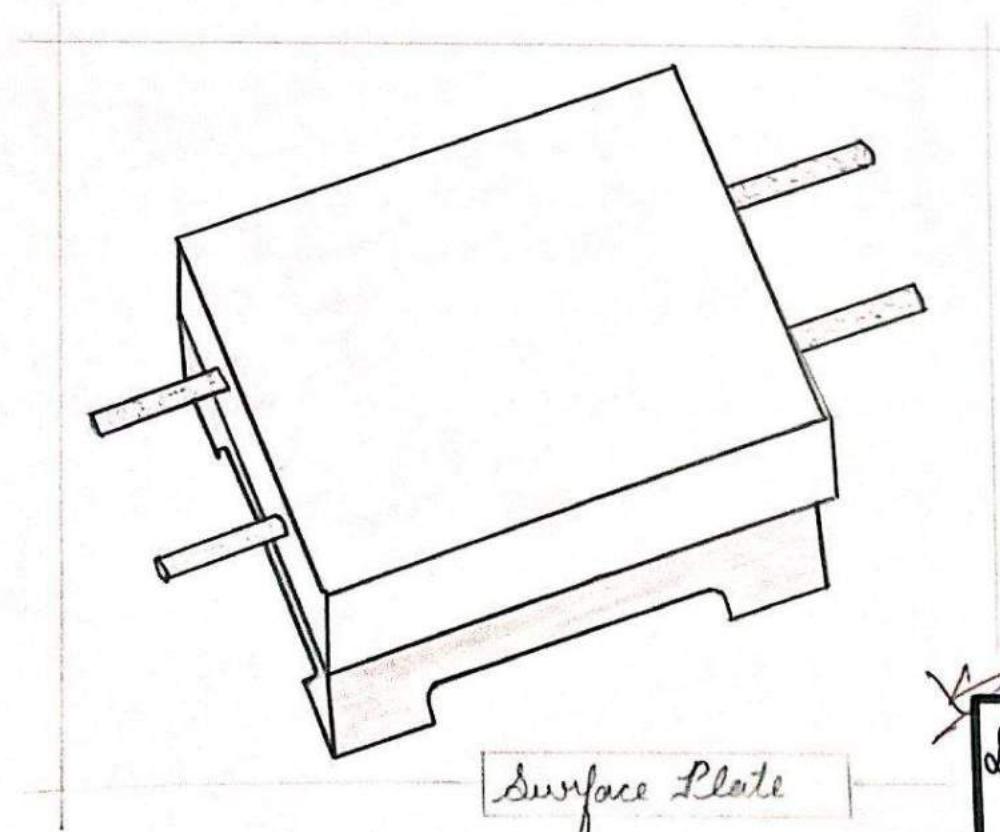
FITTING

SHOP



FRONT
VIEW

SIDE
VIEW



~~andur
30/10/19~~

Divas Divastu
Bio - Chemical
S.R. No.



(23) 5

HARCOURT BUTLER TECHNOLOGICAL UNIVERSITY

KANPUR

WORKSHOP PRACTICE

FULL NAME Divya Srivastava

SHOP Fitting Shop

CLASS 1st BE

DATE 06/09/17

Objective →

To prepare a practise work piece as per given drawing involving measuring, marking and filing operation.

Date of Starting :: 06/09/2017

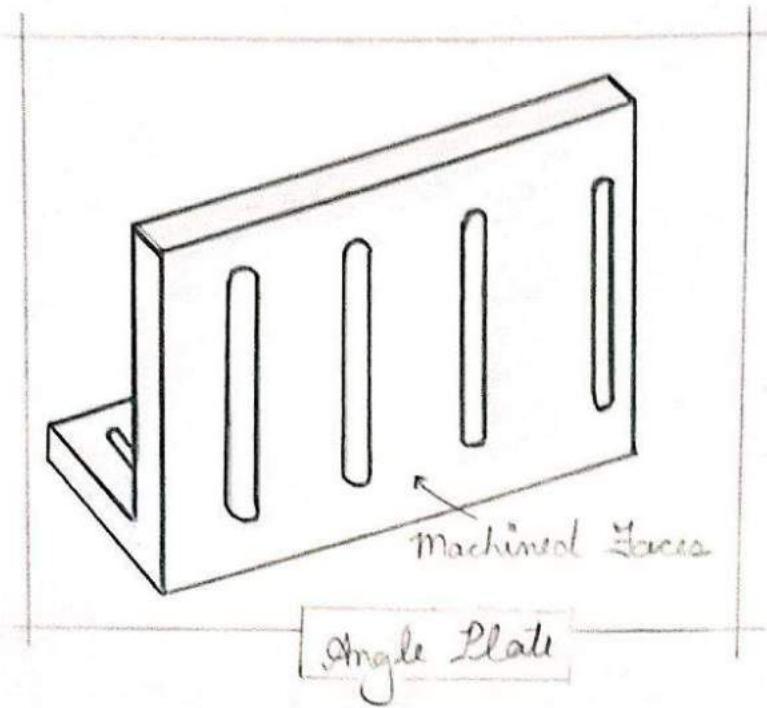
Date of Finishing :: 06/09/2017

Materials Required →

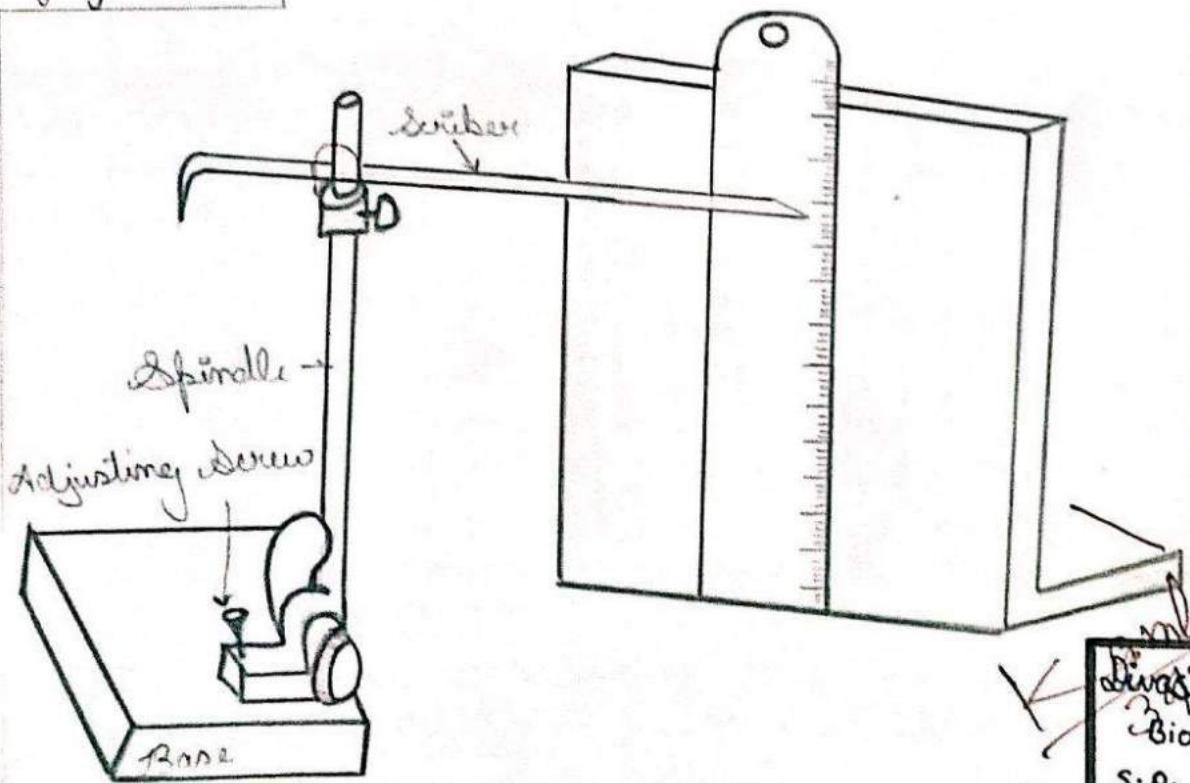
- 1) MS Flat 50 mm × 50 mm × 10 mm

Tools and Equipments Used →

- 1 * Measuring and marking tools :-



Universal Surface Guage



- i) Surface Plate
- ii) Angle Plate
- iii) Universal Surface Gauge
- iv) Try square
- v) Engineering Scale
- vi) Centre Punch
- vii) Calipers

2 * Holding and Supporting Tools :-

- i) Bench Vice

3 * Cutting Tools :-

- i) File
- ii) Chisel

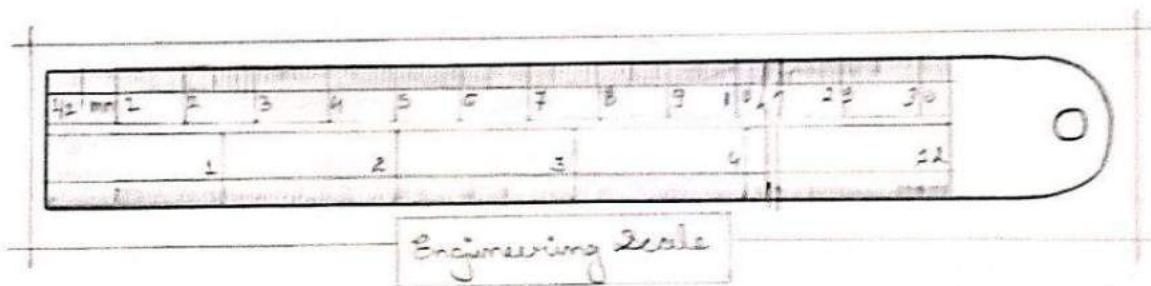
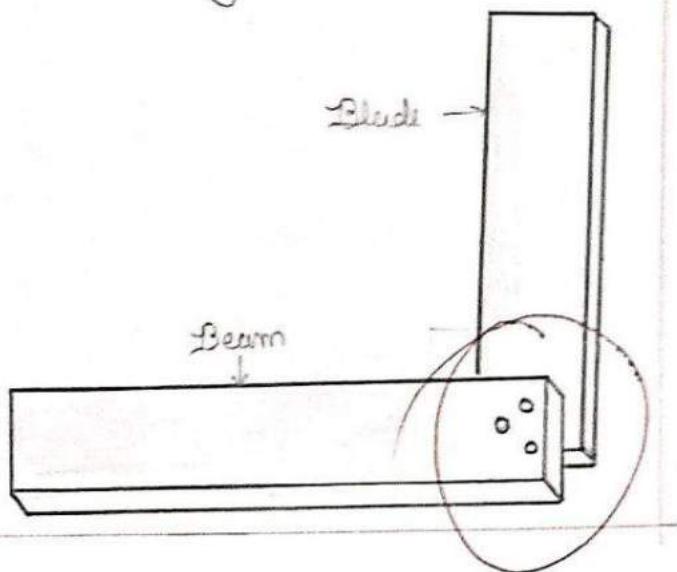
4 * Striking Tools :-

- i) Ball Peen Hammer

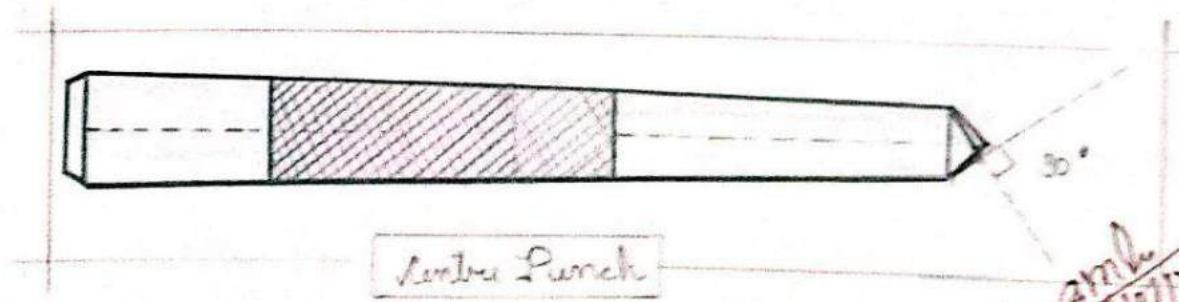
Description of Tools and Equipments →

- ① Surface Plate : Surface plate is used for testing the flatness, trueness of the

Tiny Square



Engineering Scale



Center Punch

Amber
Date: 11/11/11
Divine Engineering
Bio-Chemical
S.E. No.

surface. It is made of gray cast iron. Its upper face is planed to form a very smooth surface. It is covered with a wooden cover while not in use.

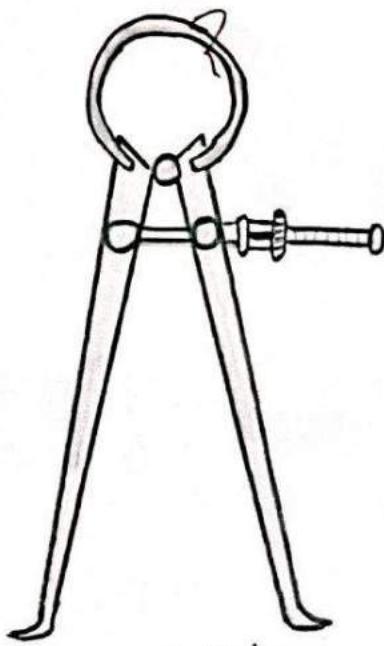
② Angle Plate : It is made up of cast iron in different sizes. It has 2 planed surfaces at right angle to each other. It has various slots in both the surfaces to hold the work firmly by means of bolts and clamps. It is used for holding and supporting the job.

③ Universal Surface Gauge : It consists of a heavy base, a scriber and a bar. The scriber can be adjusted to any position with the help of screw and nut. It is used for scribing parallel lines.

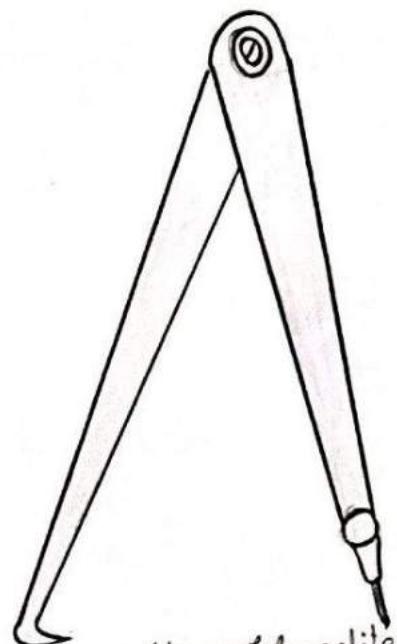
④ Try Square : It is used for checking squareness of surfaces and set off lines at right angle to given edge. It consists of a block made up to steel which is attached to a base at 90° checking right angles and measuring straightness of surface.

⑤ Engineering Scale : It is a stiff straight steel strip having all the faces

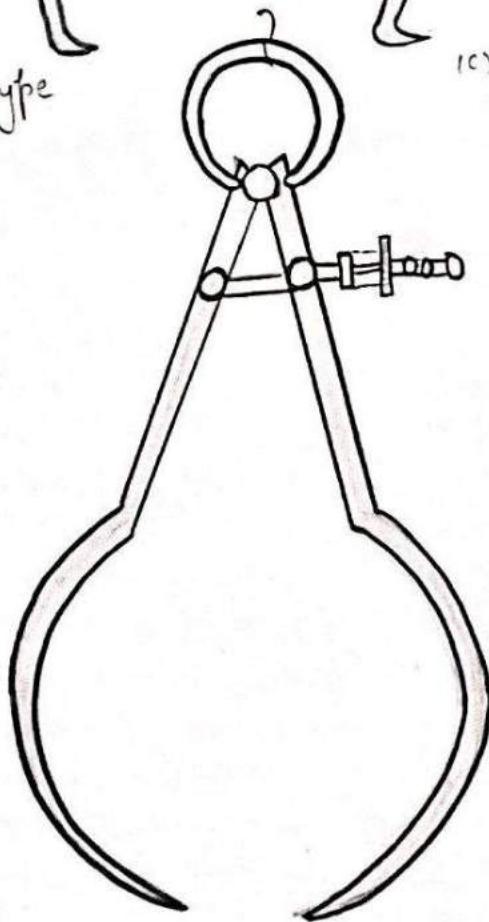
Types of Calipers



(A) Inside Type



(C) Vernier Caliper



(B) Outside Type

*Ardu
30/10/11*

Divas Srivastava
Bio - Chemical
S.R. No.

machined true on one of the flat faces, graduation are marked in inches and centimeters. The least count is $1/64$ inch and 0.5 mm.

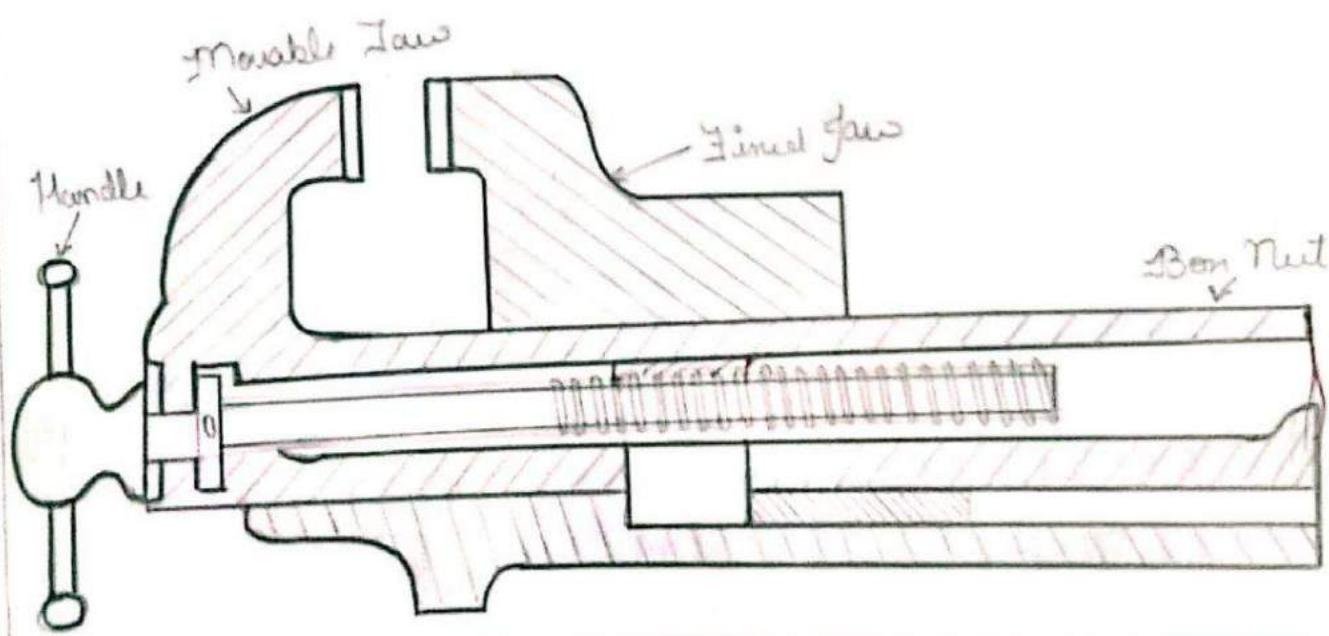
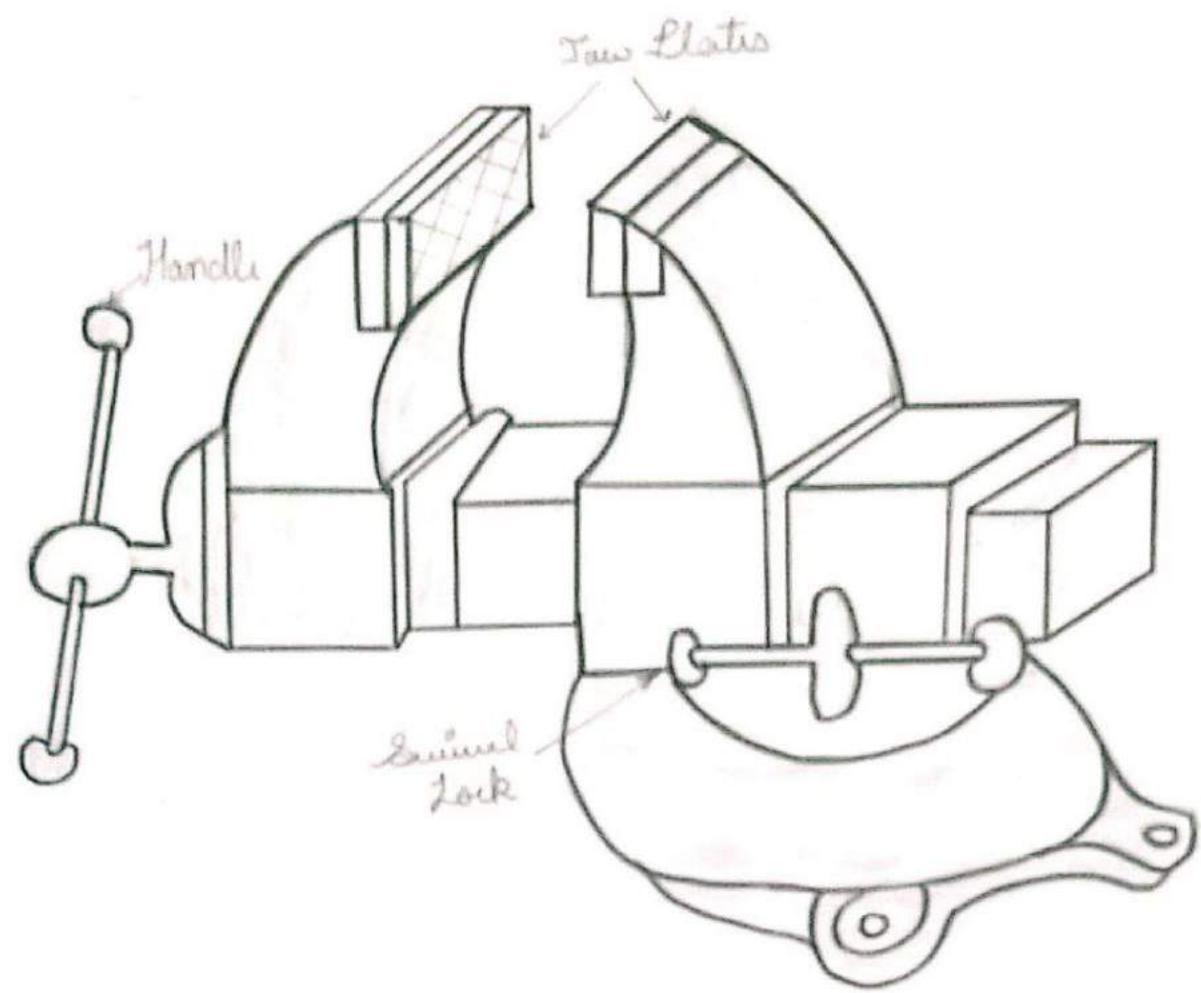
⑥ Centre Punch : It is primarily a marking tool used in bench work. It is generally made from octagonal cast steel about 100 mm long. It is used to mark the center of the hole before drilling. One end of punch carries point ground to an incline angle 90° . The body is knurled for gripping by hand.

⑦ Calipers : It is generally used to measure the inside or outside sizes diameters and lengths. It is made in different sizes and shapes. It consist of two bent legs connected at one end by means of rivets or bolts. The edges are made to just touch the job.

- (i) Inside caliper
- (ii) Outside caliper
- (iii) Mitre -

⑧ Bench Vice : Vice is used for gripping and holding the work in position during various operations such as filing, chipping and scrapping. Bench vice fixed on the bench with the help

Bench Vice

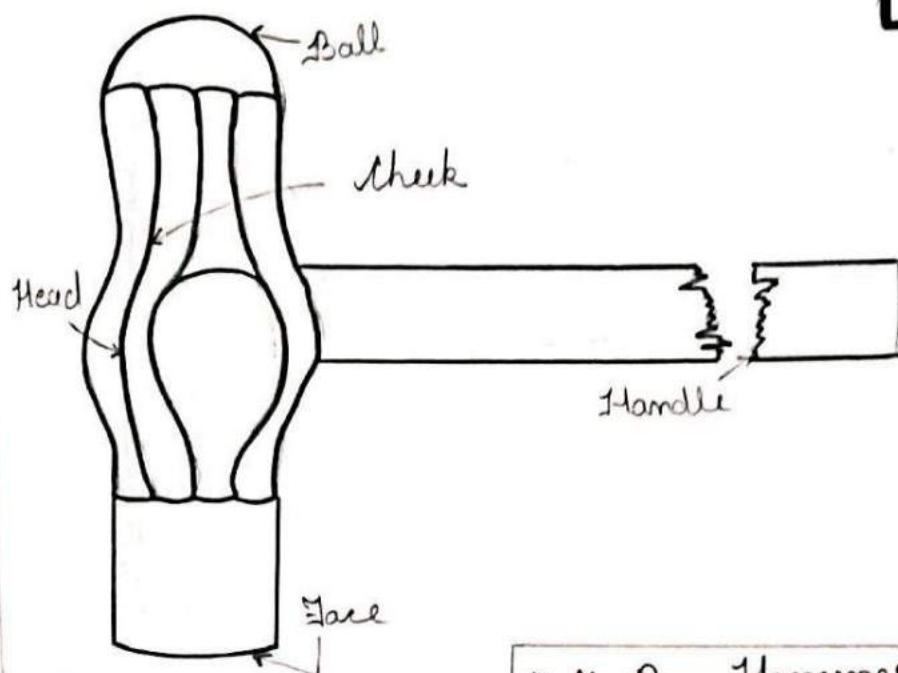


of nut and bolts. It consist of cast iron body fixed jaw, moveable jaw both of cast iron, spindle, handle, jaw plates, nut spring and washer. The height of vice should be such that the vice jaws are about same height as the operators elbow. The size of the vice is given by width of the jaws and maximum opening between opening between the jaws.

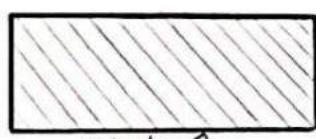
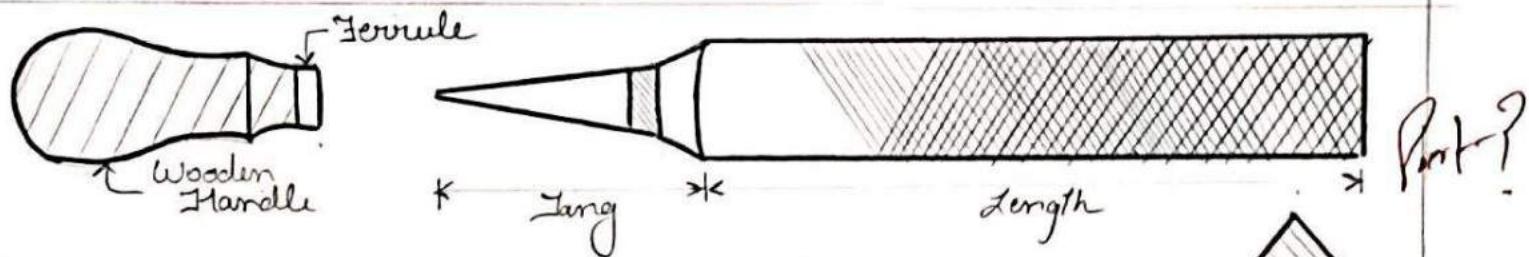
(9) Ball Peen Hammer : This hammer is most commonly used. It has round ball shaped head and is used for all general purpose work. The peen and face are hardened. The middle portion of the hammer is not hardened so as to absorb the shocks. It is mostly used for riveting i.e. forming a shape head on a tail of rivet and chipping.

(10) File : A file is a hardened piece of high carbon steel with steel with slanting rows of teeth. It is used to cut, smooth or fit metal parts in each other. It cuts all metals except hardened steel and it cut only on the forward stroke. It consist of a blade or body with a tang for fixing into the wooden handle. The teeth are cut on the blade which are

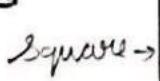
divas Srivastava
Bio - Chemical
S.R. No.



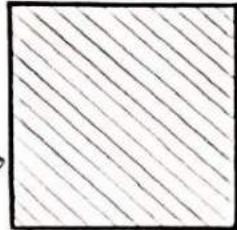
Ball Peen Hammer



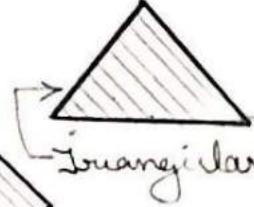
Flat →



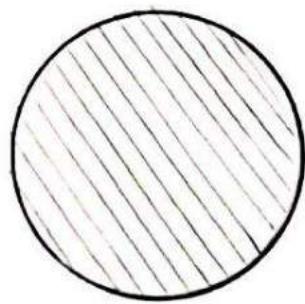
Square →



Diamond →



Part?



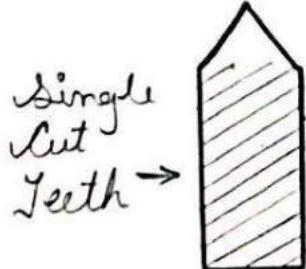
Round →



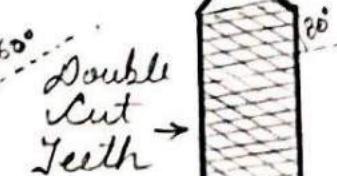
Knife Edge →



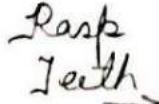
Half Round



Single Cut
Teeth →

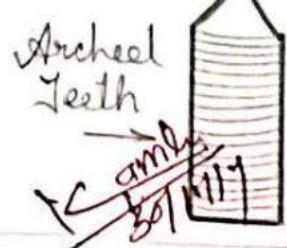


Double Cut
Teeth →



Rasp
Teeth →

FILE



Arched
Teeth

~~amby
301111~~

hardened and tempered. The metal ring on the file handle is called ferrule provided in order to prevent splitting of the handle.

→ Classification of File →

→ ① According to Shape :

Flat, Square, Triangular, Round, Halfround, Knife edge, Diamond

→ ② According to Size :

3, 4, 6, 8, 10, 12, 14, 16 and 18 inches

→ ③ According to Cut :

Single cut teeth, Double cut teeth, Rasp teeth, Arch'd teeth

→ ④ According to Grade :

- Rough - 8 teeth per cm

- Middle or Coarse - 10 teeth per cm

- Bastarded - 12 teeth per cm

- Second cut - 16 teeth per cm

- Smooth - 20-24 teeth per cm
- Dead smooth - 40 or more teeth per cm.

→ ⑤ Types of Filing :

- Straight filing
- Crossed filing
- Draw filing

⑪ Chisel :

- Flat
- Crosscut or Sape
- Roundnose
- Diamond Point

All chisels are forged from bar stock of carbon steel followed by annealing, hardening and tempering process to make chisel body tough and obtains sharp cutting edge about 20-30 mm cutting edge hard included angle at cutting point varies $40^\circ - 70^\circ$ (Brass and Copper - 40°), wrought iron - 50° , cast iron & general cutting works - 60° , steel (cast) - 70° .

⇒ Uses :-

- i) Flat → Chipping of large surface, cutting of metal sheet, strips, bars, sections etc. It cuts the metal in cold state so it is frequently known as cold chisel.
- ii) Gross cut → It is comparatively narrow chisel having its cutting edge slightly bevelled than the blade. Normal width of cutting edge varies from 3 mm to 12 mm. Used in deep cutting. Cutting of parallel grooves and keyway.
- iii) Round Nose → Drawing the eccentric hole back to correct center which has run-off center during the drilling operation. Cutting of grooves and channel in bearing and pulley bushes clear small round corner.
- iv) Diamond Point → Chipping of rough plate, cutting of cast iron pipes, V grooves, cleaning of angles etc.

Procedure →

- i) Check the given piece of raw material and ensure it is not under size.
- ii) Hold it in vice and file on flat face and check its trueness with the help of set square.
- iii) Hold it in vice again and file on adjacent side surface. Check that the 2 surfaces are at right angle with the help of try square.
- iv) Now apply wet chalk on the flat filed face and let it get dried.
- v) File all the four sides to bring the piece to the required side ($48 \text{ mm} \times 48 \text{ mm}$) keep checking the squareness of these surface with their adjacent surface during the surface.

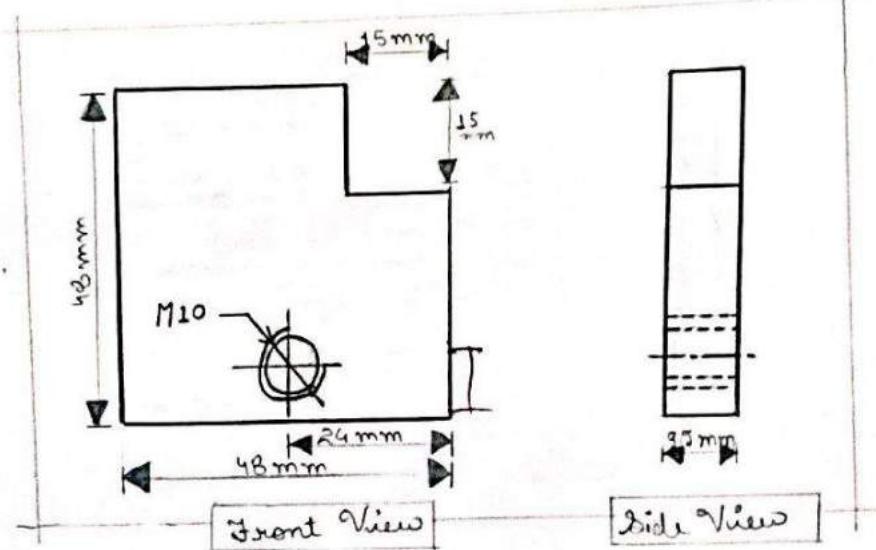
Precautions →

- i) Job should be held tightly in vice in right position.
- ii) Filing should be done very carefully and pressure should be applied only in forward direction.

strokes.

- iii) Don't do hammering on surface plate.

~~V. M. S. S. P. T. M.~~



Correct it

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HARCOURT BUTLER TECHNOLOGICAL UNIVERSITY

KANPUR

WORKSHOP PRACTICE

FULL NAME Divas Srivastava

CLASS 1st B.E.

SHOP Fitting Shop

DATE 13/09/12

Objective →

To prepare a practice work piece as per given drawing involving measuring, marking, sawing, filing, drilling & Tapping operations.

Date of Starting :- 13/09/2017

Date of Finishing :- 13/09/2017

Materials Required →

- i MS Flat 50 mm × 50 mm × 10 mm

Tools and Equipments Used →

- 1 ★ Measuring and marking tools :-

Surface Plate

Angle Plate

Universal Surface Gauge

Jry Square

Engineering Scale

Centre Punch

Calipers

Holding and Supporting Tools :-

Bench Vice

Drill chuck

Machine Vice

Tap Handle or

type wrench

Cutting Tools :-

File

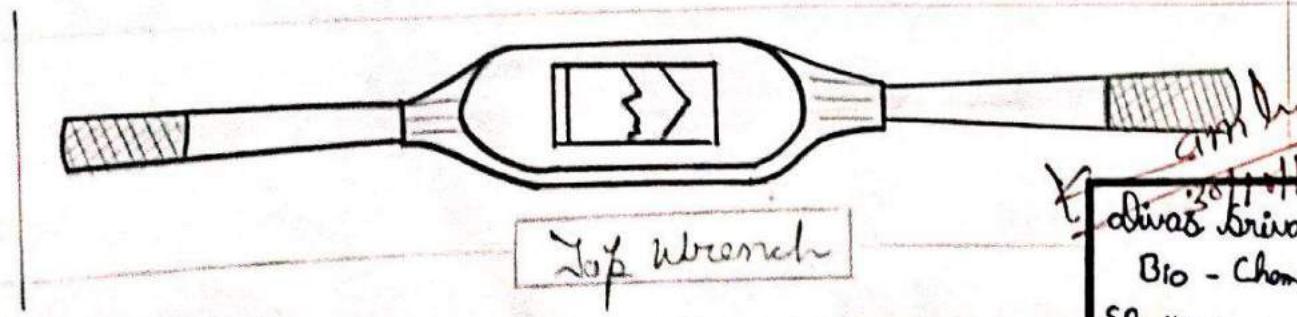
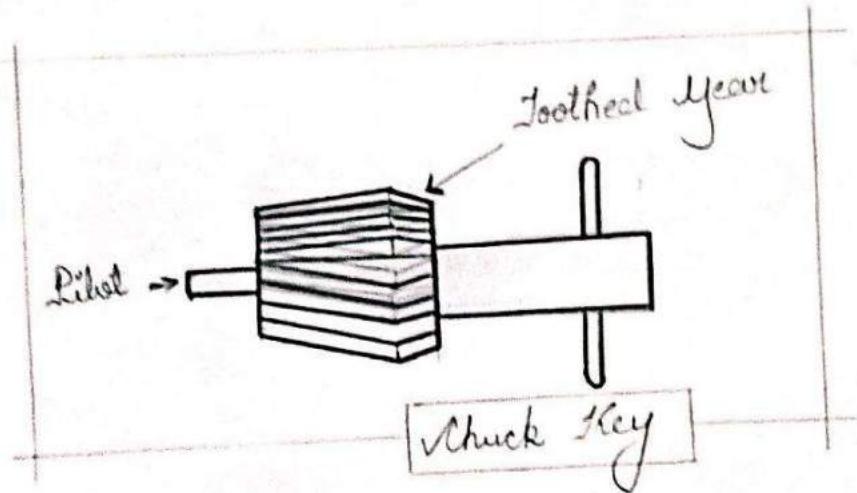
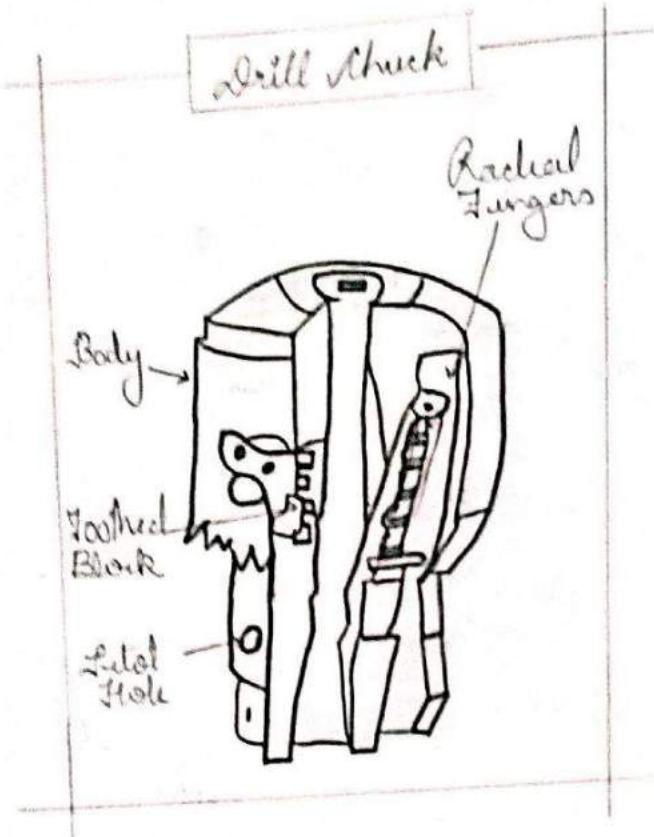
Hacksaw

Drill

Hand - tap set

Striking Tools :-

Ball peen Hammer



5 ★ Machine :-

- i) Pillar Type Drilling machine

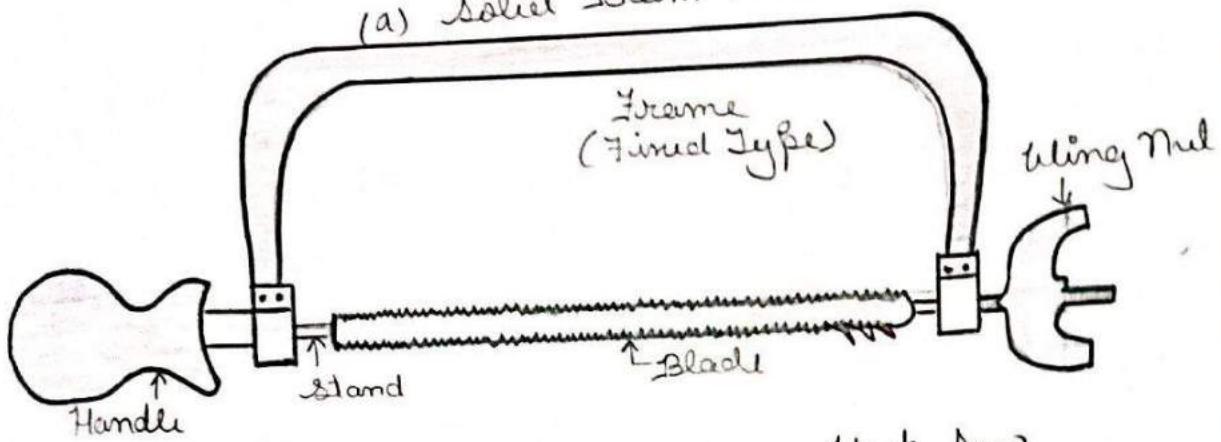
Description of Tools and Equipments →

① Drill Chuck : A drill chuck is the most popular and useful device for holding parallel shank drill and other small tools. A drill chuck is capable of holding a fairly wide range of drill size and it is usually provided with radial fingers for this purpose. The chuck key is used for rotating the toothed body of chuck.

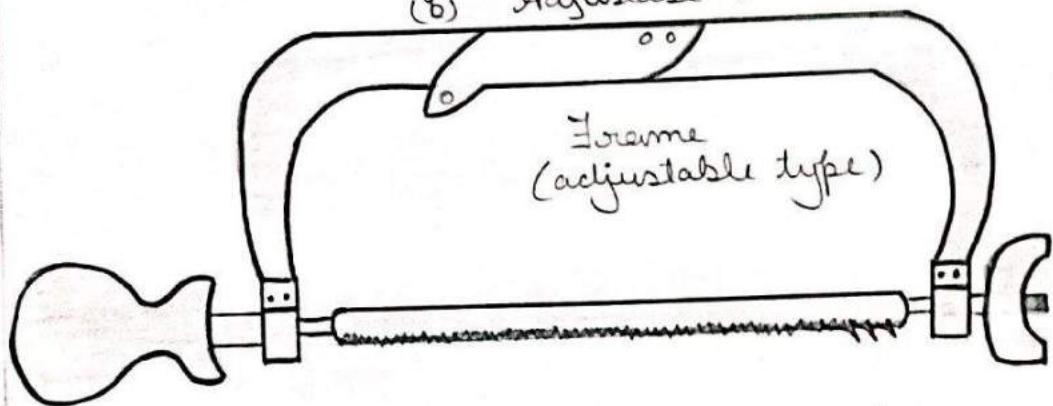
② Machine Vice : It is particularly used for holding small work for filing or drilling. It is made of mild steel. It consist of a body with a solid jaw, a moveable jaw, a screw and a handle for the control of movement of movable jaw.

③ Jap Handle / Jap Wrench : It is used for tap holding purpose. It consist

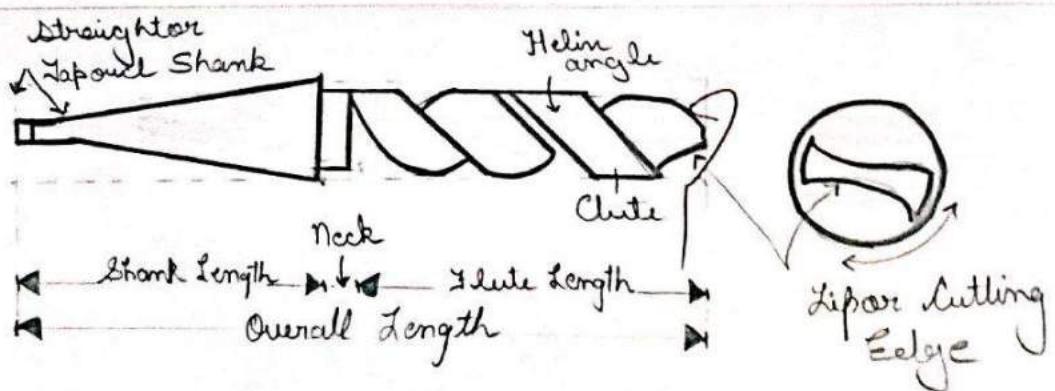
(a) Solid Frame Hack Saw



(b) Adjustable Frame Hack Saw



Hack Saw



Drill

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of handle, body, fixed jaw & movable jaw.

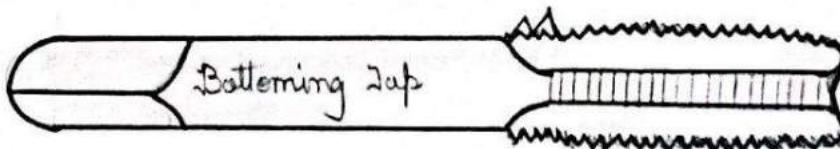
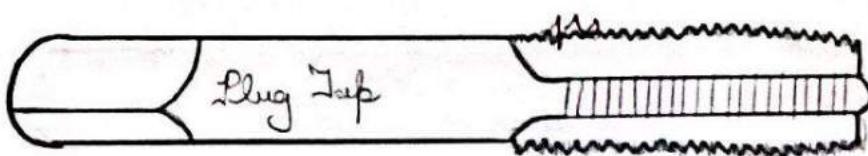
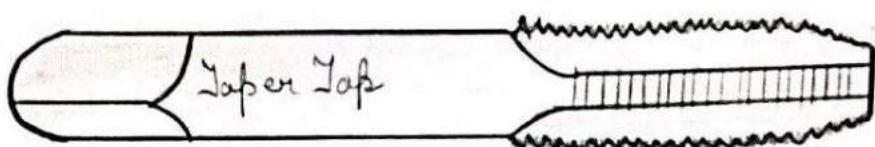
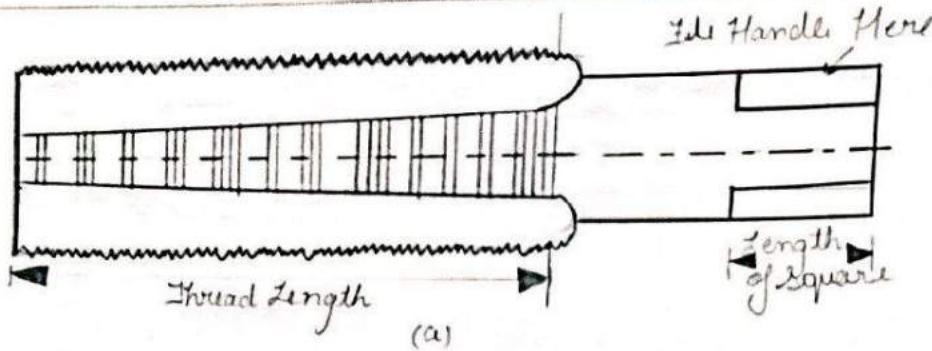
④ Hacksaw : It is used for cutting rods, bars and pipes into desired length. It consists of a metal frame, a wing nut & a blade. Hacksaw consist of 2 major part.

(i) The Frame

(ii) Blade

The frame may be solid or adjustable as shown in figure. The fixed type accommodates the same length of blade always. While adjustable can accommodate blade with different length. The cutting blade has holes at both ends to fit with the hacksaw frame. Blades are made of hard and tempered alloy steel with set teeth.

⑤ Drill : The tool used for making round holes is called drill. It is made up of high speed steel containing 18% tungsten, 4% chromium and 1% vanadium. Twist drill is commonly used variety of drills and is made with two, three, four cutting tips. It has cylindrical body on which grooves are cut.



(b)

?

Parts of a tap are shown at (a) The three taps are (available in a set) shown in (b)

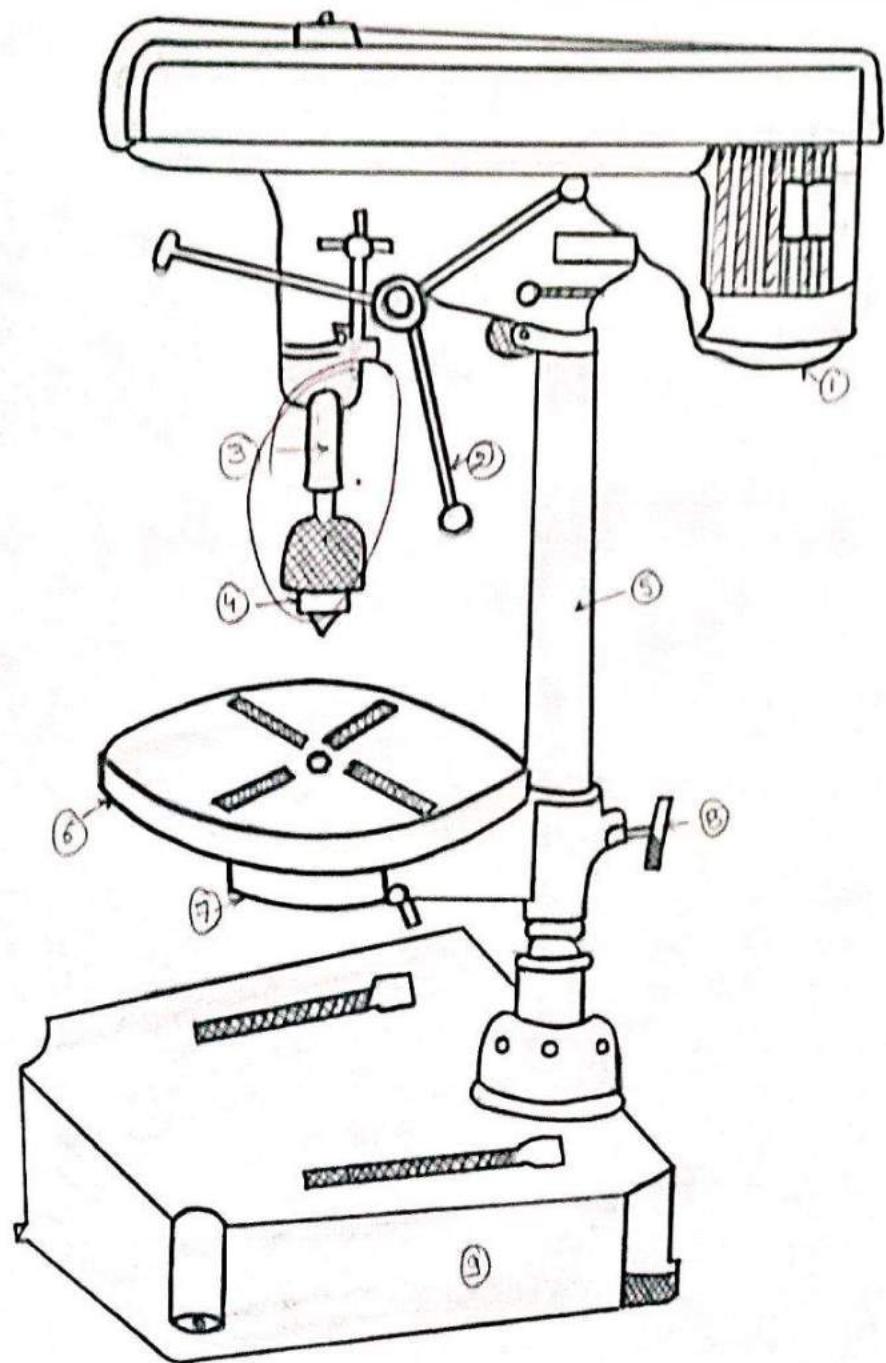
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Date 21/11/17
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Bio-Chemical
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These grooves are called flutes. These flutes carry the chips during drilling operation.

⑥ Hand Tap Set → Taps are used for making internal threads into hole. It is inserted into the face of the hole at right angle. In hand tapping a set of 3 taps is used. Taps are made from high carbon steel or high speed steel. The shank of the tap is left plain and end is squared to accommodate the tap wrench.

⑦ Pillar Type Drilling Machine : A very commonly used drilling machine used for light and precision work & normally available in a training workshop. Its main parts includes a column, base, swiveling table, table clamp, spindle, vertical feed handle and spindle drive mechanism at the top with electrical motor. The cutting tool i.e. drill bit is held in the drill chuck and vertical movements given to it by means of the feed handle to feed the revolving tool into the work piece, held on the machine table, to drill the required hole.



Pillar Type
drilling Machine

- ① Motor
- ② Feed Handle
- ③ Spindle
- ④ Drill Chuck
- ⑤ Column
- ⑥ Table
- ⑦ Dial Clamp
- ⑧ Table Clamp
- ⑨ Base

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Procedure →

- i) Check the dimension of the given piece and ensure that it is not undersize.
- ii) Apply wet chalk on the filed flat face & let it get dried.
- iii) Mark over all dimension and make permanent marks along these lines by means of hammer and centre punch.
- iv) Locate the center of the hole to be tapped & marked permanently by using a hammer & a center punch.
- v) Remove the extra material from the job near the marking by hacksaw leaving a little margin for filing.
- vi) File along the surface and check trueness with the help of try square.
- vii) Select a suitable drill bit, hold it in drill chuck on a drill machine, hold the job in the machine vice and bring the marked hold center exactly below the drill point. Drill the

through hole in the job slowly.

- viii) Then, hold the job in bench vice with axis of the drilled hole vertical. Hold the tap in tap handle & produce internal threads by tapping operation.

Precautions →

- i) Job should be held tightly in vice in right position.
- ii) Filing should be done very carefully & pressure should be applied only in forward strokes.
- iii) Make sure that the teeth of hacksaw is in forward direction & blade is firmly tightened in the hacksaw frame.
- iv) Hacksaw should be driven very carefully.
- v) Job should not be cut on the line of punching.
- vi) Drill should be held firmly in the drill chuck.
- vii) While drilling, appropriate pressure must be given

to the drill & drill should be taken out from the hole in between to clear the chips.

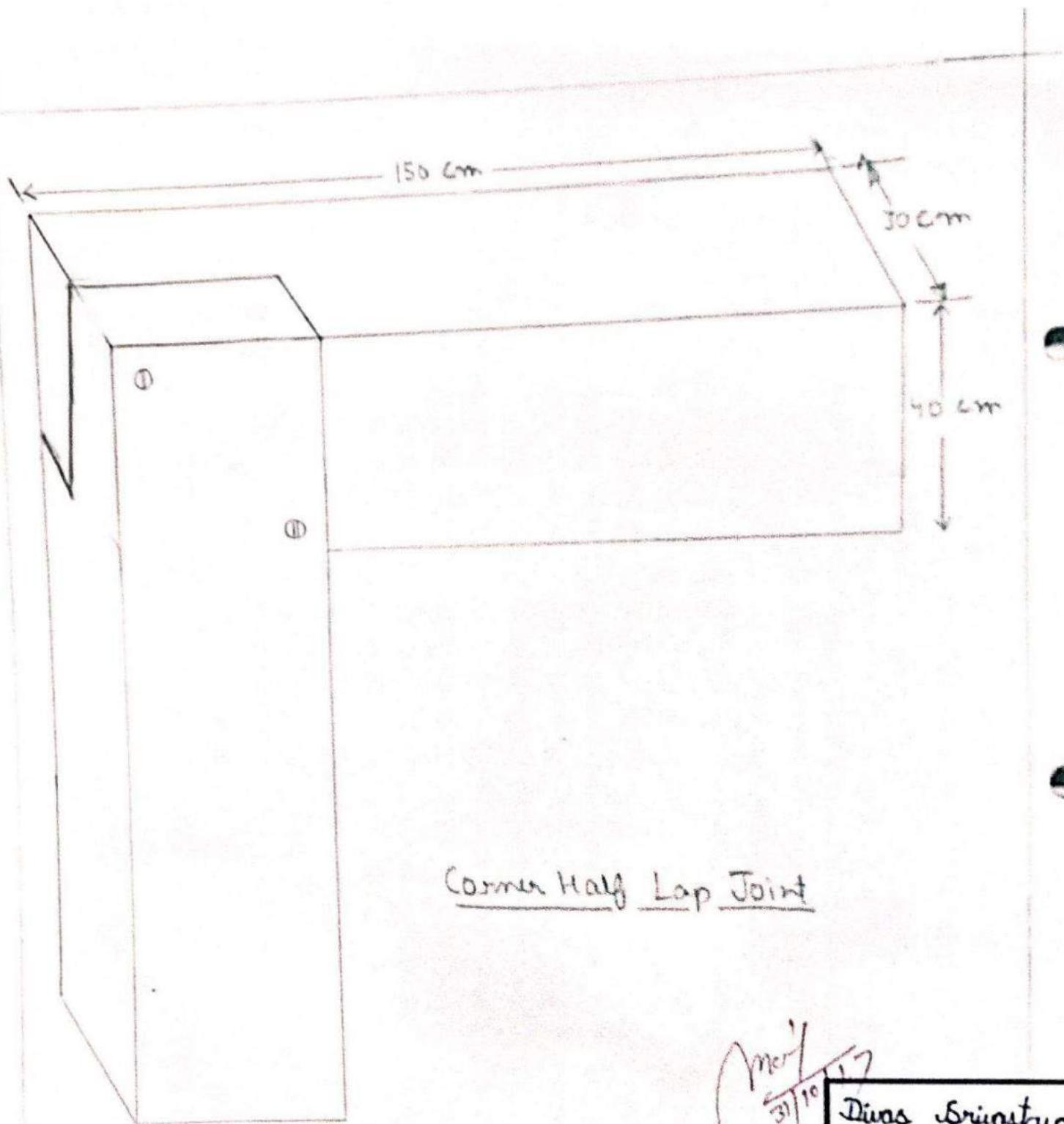
- viii Tap must be held vertical with the job & Taping should be done starting with first tap then second tap followed by final tap.
- ix During Taping after every 2 or 3 forward turn a backward turn must be given in order to clear the chips.

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(1)
②

CARPENTRY

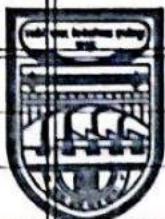
SHOP



Corner Half Lap Joint

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Bio - Chemical
S.R. No.



HARCOURT BUTLER TECHNOLOGICAL UNIVERSITY
KANPUR
WORKSHOP PRACTICE - I

FULL NAME Divas Srivastava
SHOP Carpentry Shop

CLASS 1st BE
DATE 20/9/17

Objective →

To make a corner half lap joint as per given diagram.

Material Required →

Mangowood 30 mm × 40 mm × 30 mm

Date of Starting :- 20/09/2017

Date of Finishing :- 20/09/2017

Tools and Equipments Used →

- i) Folding Rule
- ii) Try square
- iii) Scriber
- iv) Marking Gauge

(ii) Holding & Supporting Tools :-

- i) Work bench
- ii) Carpenters quick action bench vice

(iii) Cutting Tools :-

- i) Iron jack plane
- ii) Tenon saw
- iii) Hand Drill

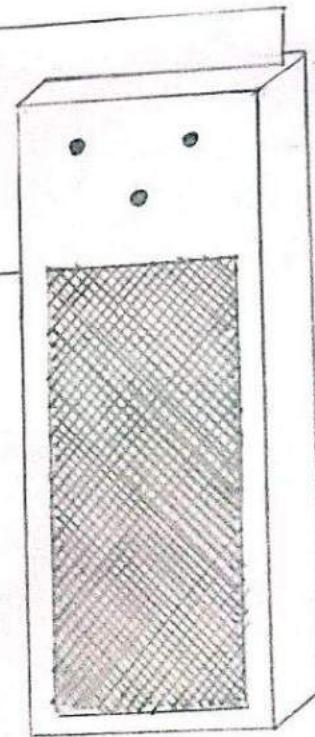
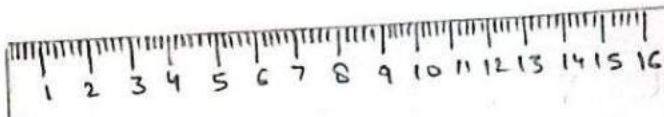
(iv) Striking Tools :- not required.

(v) Miscellaneous Tools :-

- i) Screwdriver

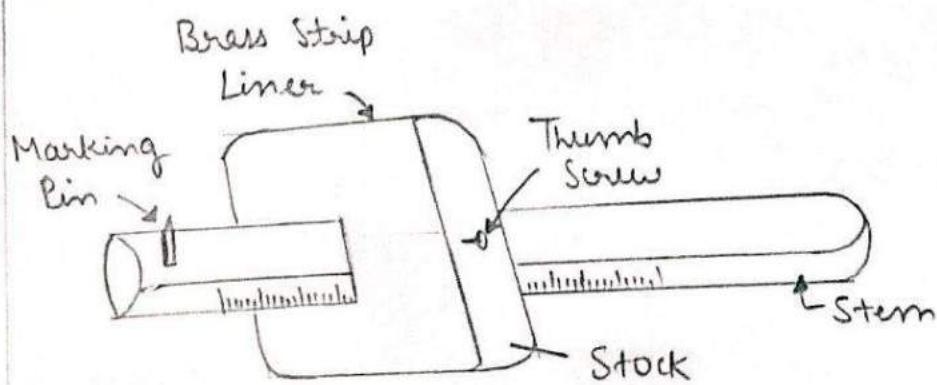
Description of Tools & Equipments →

⇒ Folding Rule :



Try Square

Cair



Marking Gauge

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It is a wooden scale consisting of 4 pieces each 150 mm long joined together by hinges. It is mainly used for measuring and setting out dimensions.

⇒ Jig Square :

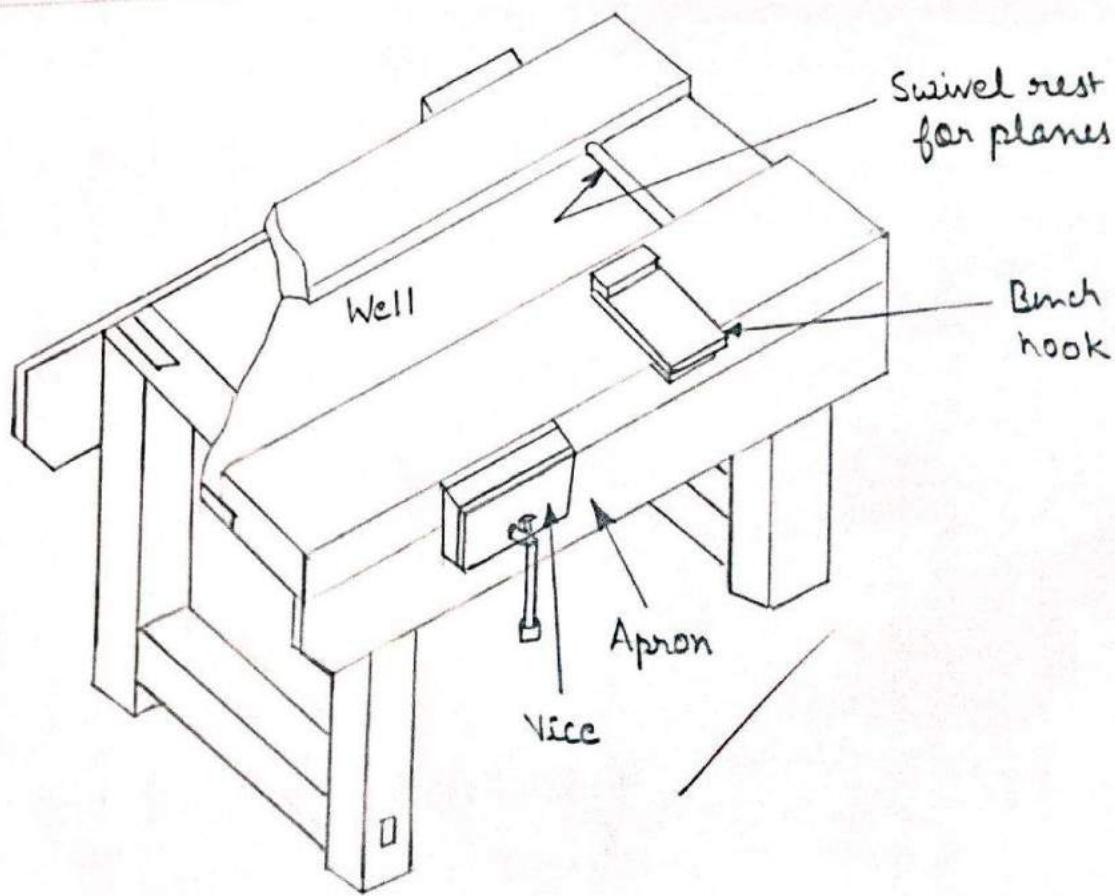
It consists of a steel blade fitted into a metallic stock at a right angle. It is used for measuring & testing of the planned surfaces. Draw parallel lines at right angle to a plane surface. Draw mutually perpendicular lines over a plane surface and test the squareness of 2 adjacent surfaces.

⇒ Scriber :

It is a steel rod having sharp point at one end. It is mainly used for locating & marking points and scribing lines on wood surface.

⇒ Marking Gauge :

It is consisting of wooden stock of rectangle or square cross-section, & scribing pin as shown in figure. It is used for scribing



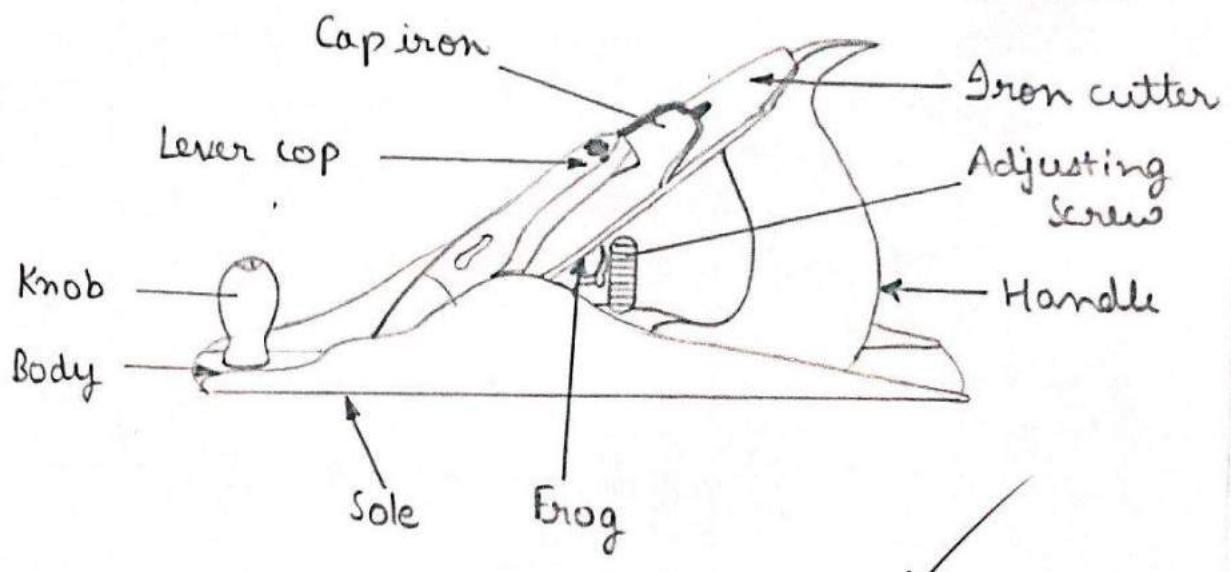
Work Bench

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Bio - Chemical

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Iron Jack Plane

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Divya Srivastava
Bio-Chemical
S.R. No..

lines parallel to a finish face or edge.

⇒ Work Bench :

It is heavily table of rigid construction made of hard wood. 2 or 4 carpenters vice are fitted on opposite side to hold the work piece during the operations.

⇒ Carpenter quick action bench vice :

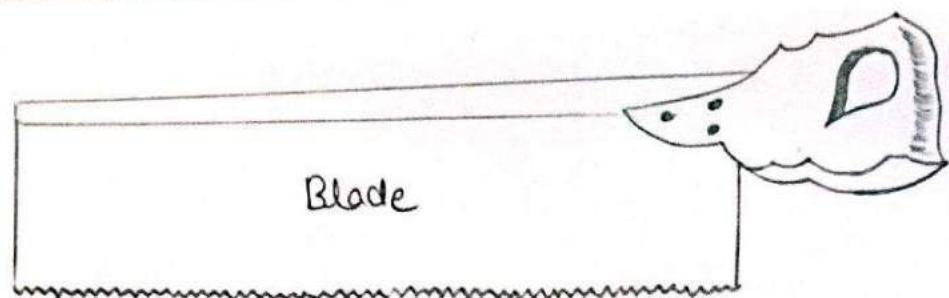
Vice are fitted on work bench to hold the job during operation inside opposite faces of the jaws are fitted with wooden liners so as to prevent damaging of job surfaces.

⇒ Iron jack plane :

It is used for planning of wood surfaces. Its whole body is made of cast iron provided with wooden handle call the main parts of the plane shown in fig.

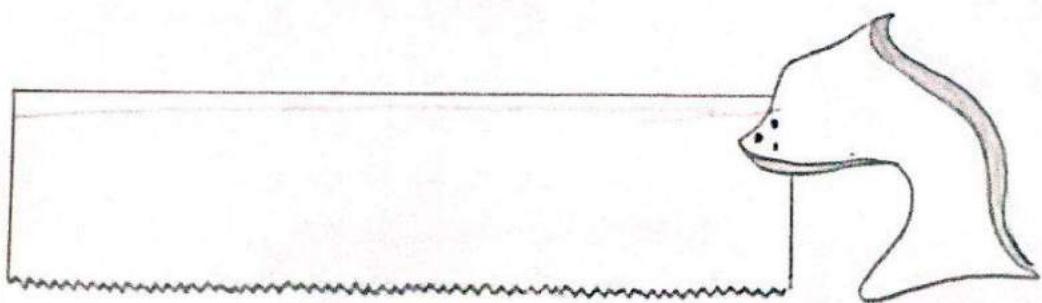
⇒ Tenon saw :

It has a parallel blade, 2.5 to 1.5 cm



Blade

Tenon Saw



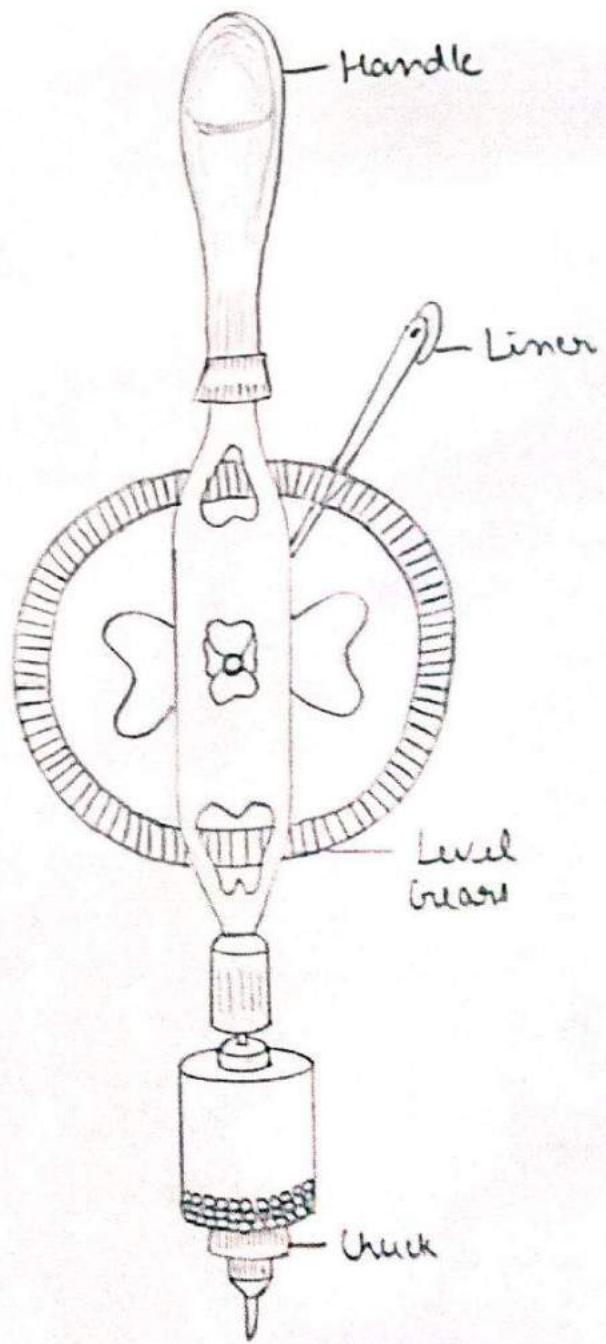
Dovetail Saw

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Divas Srivastava

BIO - Chemical

S.R. NO.



A Hand Drill

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Divas Sriya
Bio-Chem
S.R. No.

long and 6 to 10 cm wide having 5 to 8 teeth per cm length. The main use of this saw is in taking short straight cut such as for tenon for this reason. Its blade is provided with block, at the top so that the blade does not bend during the operation.

⇒ Hand Drill :

It consists of forged body on the top of which is provided wooden handle & bottom is chuck as shown. It is used for drilling small holes only.

⇒ Screw Driver :

It is used for driving the wood screw. It consist of a wooden or plastic handle and a steel blade.

Procedure →

(i) Measure and hold the workpiece in vice.

Plane one broad surface of the work piece &

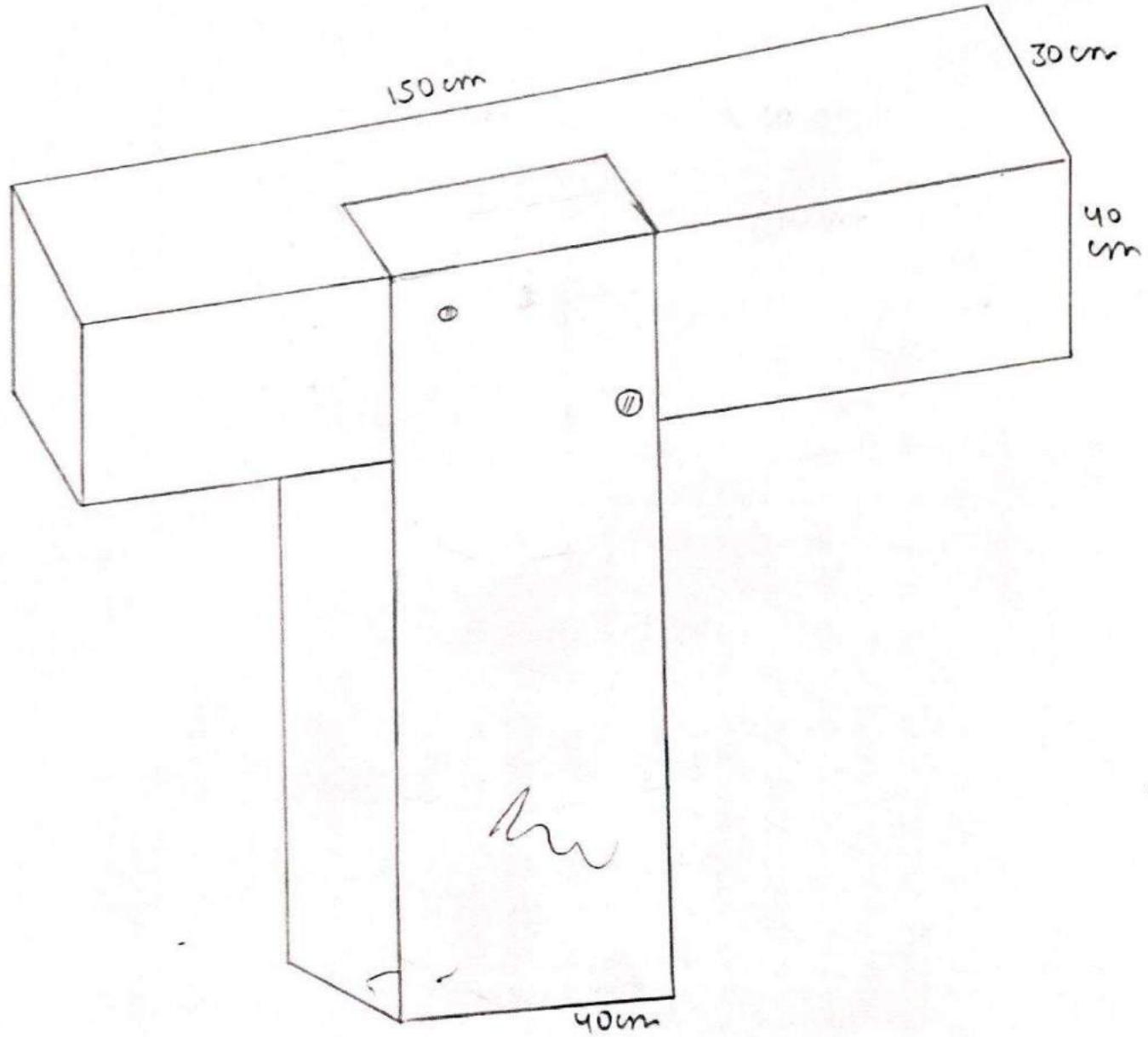
check the flatness using a try square.

- (iii) Plane remaining work piece surface with respect to true surfaces.
- (iv) Mark the middle point of the length & mark a line each on adjacent surfaces to divide the job in 2 equal parts.
- (v) Hold the job and cut it along the marked lines by tenon. 2 identical wooden piece of $30 \text{ mm} \times 40 \text{ mm} \times 130 \text{ mm}$
- (vi) Let the half thickness of work place in marking gauge. On bench, the pieces mark from one end of the job upto 40 mm length by scale, try square & working gauge.
- (vii) By means of tenon saw cut the marked line along its vertical faces of both pieces.
- (viii) Remove unwanted wood from this part.
- (ix) Fill both pieces together with screw with screw driver to obtain the required joint.

Precautions →

- i) Keep your fingers at a distance from blade of tool while performing.
- ii) Blunt, defunctionary defective or damaged tool should not be used.
- iii) Place the job tightly in the bench vice.
- iv) Repeatedly check that you are cutting the job in a straight line.

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A T-half lap Joint

Dinesh Srivastava

Bio-Chemical

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HARCOURT BUTLER TECHNOLOGICAL UNIVERSITY

KANPUR

WORKSHOP PRACTICE - II

FULL NAME Divas Srivastav

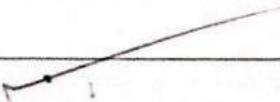
CLASS 1

SHOP Carpentry Shop

DATE 4/10/2017

Objective →

To make a T-half lap joint as per given drawing.



Material Required →

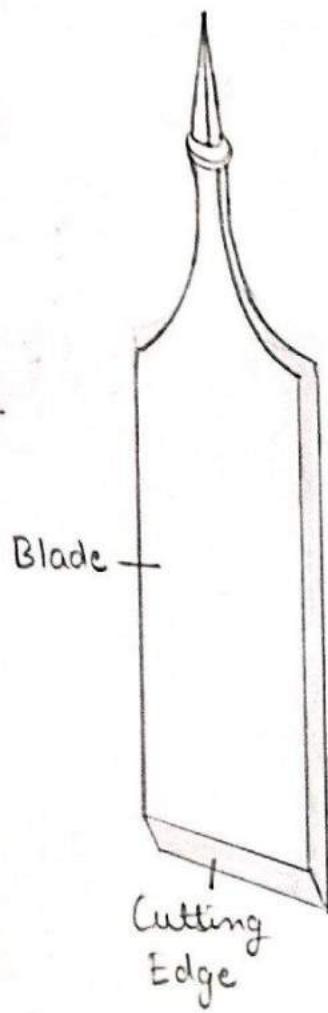
Mangowood 30 mm × 40mm × 300 mm

Date of Starting : 04/10/2017

Date of Finishing : 04/10/2017

Tools Required →

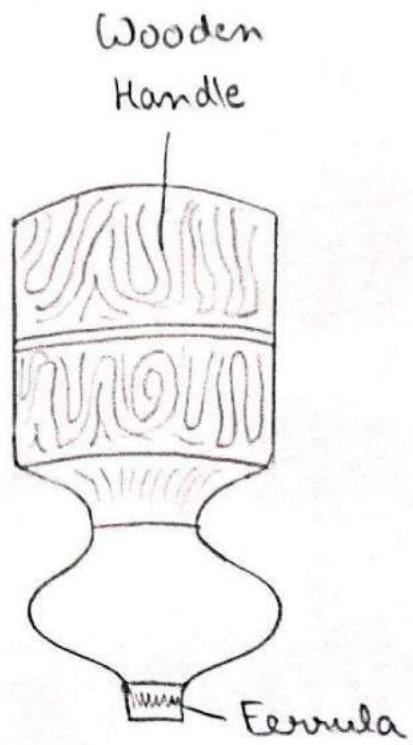
Measuring & marking tools :-



Blade

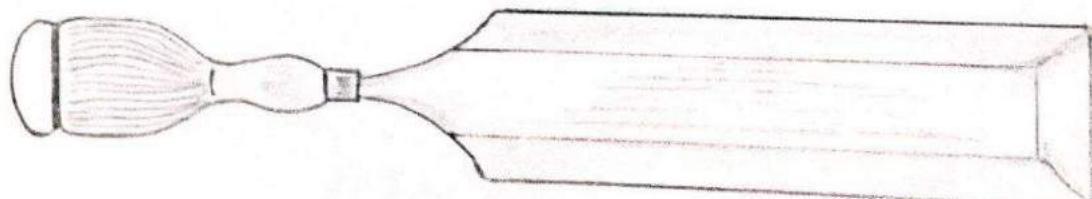
Cutting Edge

A Corner Chisel



Wooden Handle

Ferrule



A Dovetail Chisel

31/10/17
Divas 5
Bio-A
S.R. No -

- i) Folding rule
- ii) Try square
- iii) Scriber
- iv) Mortise gauge

(ii) Holding & supporting Tools :-

- i) Work Bench
- ii) Carpenter quick action bench vice

(iii) Cutting Tools :-

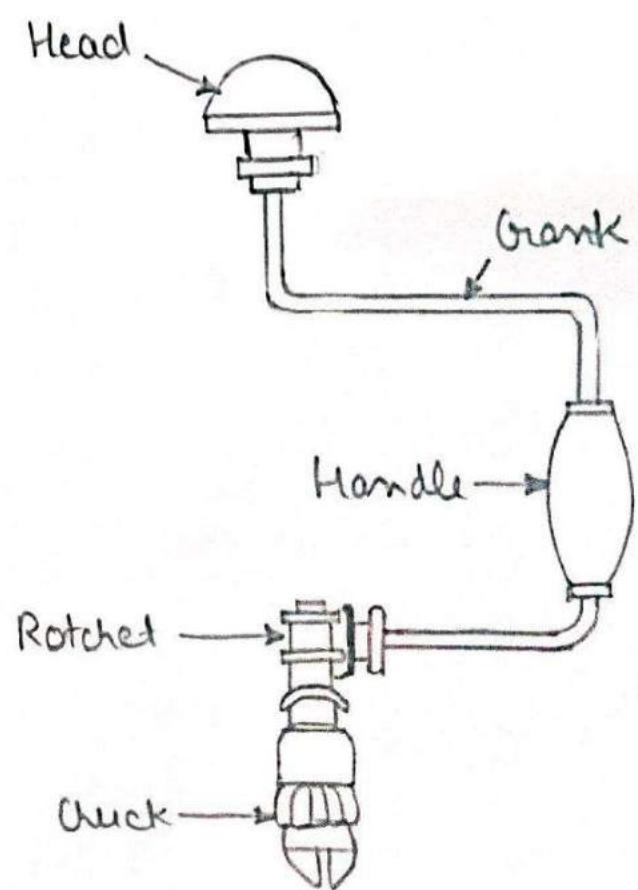
- i) Iron jack plane
- ii) Tenon saw
- iii) Mortise chisel / Dovetail chisel
- iv) Firmer chisel
- v) Ratchet Brace

(iv) Striking Tool :-

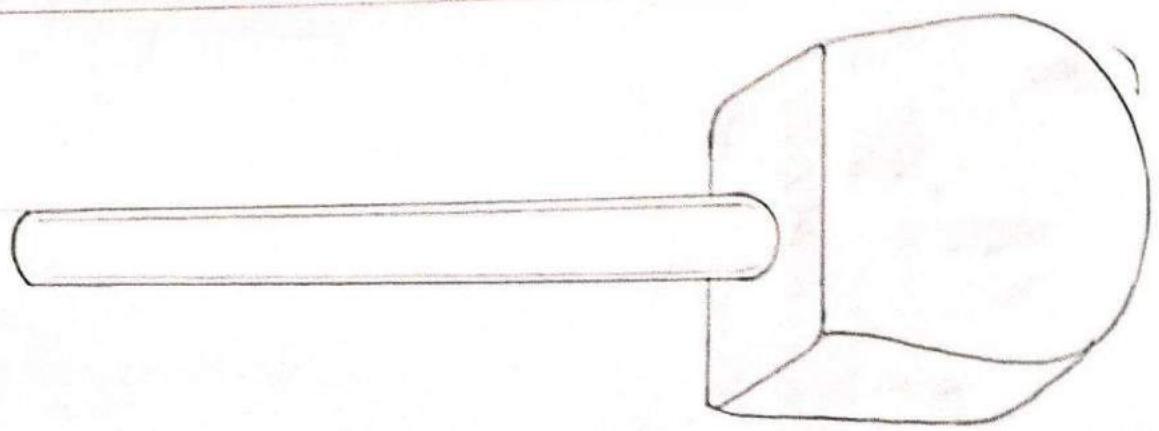
- i) Wooden Mallet

Description of Tools →

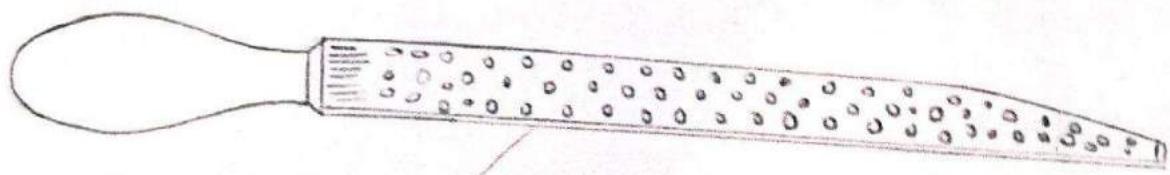
⇒ Dovetail chisel :



A Ratchet Brace



A Mallet



A Rasp

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Dovetail chisel or leveled edge firmer chisel consists of a leveled edge to reduce the blade thickness on slides. It is generally used to finish narrow, corners where ordinary firmer chisel is unsatisfactory due to its thick sides.

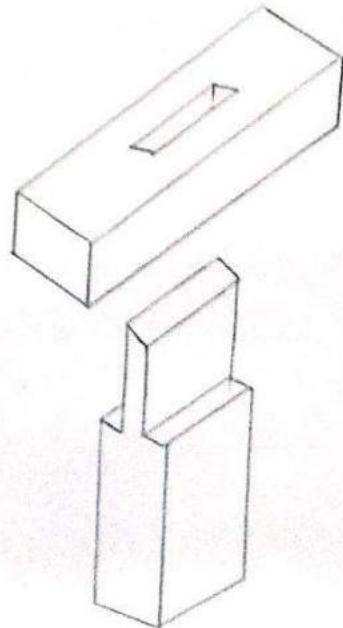
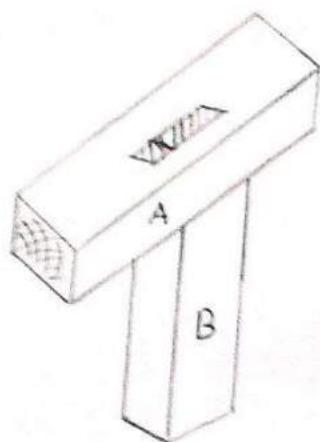
Ratchet Brace :

It consists of a steel crank having a wooden hemispherical head at the top of a wooden handle in the middle and a chuck for the bit at the bottom end. It is similar for drilling holes in those positions where the space does not permit complete revolution of the crank. In operation of the proper size of the bit is gripped in jaws of Clark thread of broader side passed downwards & handle is rotated.

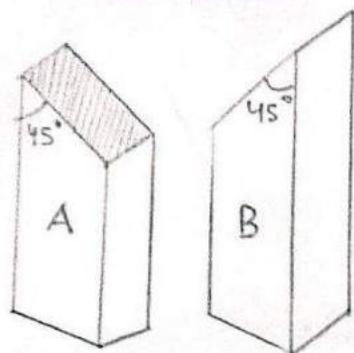
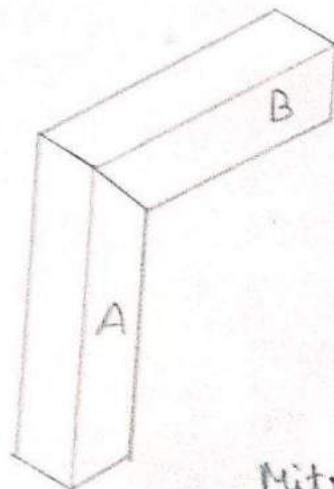
Wooden Mallet :

It is made of hard wood & may be round or rectangle in shape. These are used to strike cutting tools which have wooden handle such as chisel.

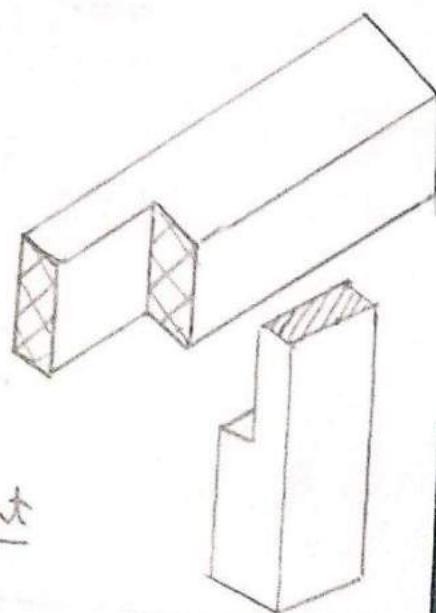
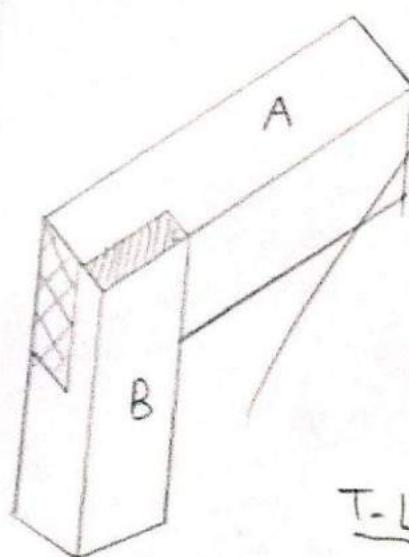
Screw Driver :



Shoulder Angle
(MandT) joint



Mitre Joint



T-Lap Joint

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Bio-Chemical

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Screw drivers are used for driving the screws into the wood or for unscrewing them.
They are of 2 types =>

- i) Simple screw driver
- ii) Ratchet screw driver

Procedure →

- i) Rip the wooden piece in the vice & plane all its surfaces according to required dimensions while checking its squareness by try-square.
- ii) Mark the middle point of length & mark a line & of 2 equal adjacent surfaces to divide the job into 2 equal parts.
- iii) Rip the workpiece again in the vice & using tenon saw. Cut the job into 2 equal parts.
- iv) Mark the slot dimensions on both the pieces & cut the slots using Tenon saw.
- v) Remove the unwanted part from the middle slot using firmer chisel by hand pressure.

(vi)

After finishing both the parts in above manner.
Fix together by screw.

Precautions →

i)

Loose clothing should be avoided.

ii)

Blunt tool should not be used for cutting purpose.

iii)

Before starting the cutting process, allow the saw to attain fast speed.

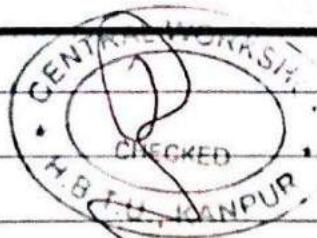
iv)

Tools not in use should be kept away.

v)

No machine should be operated without the permission of shop incharge.

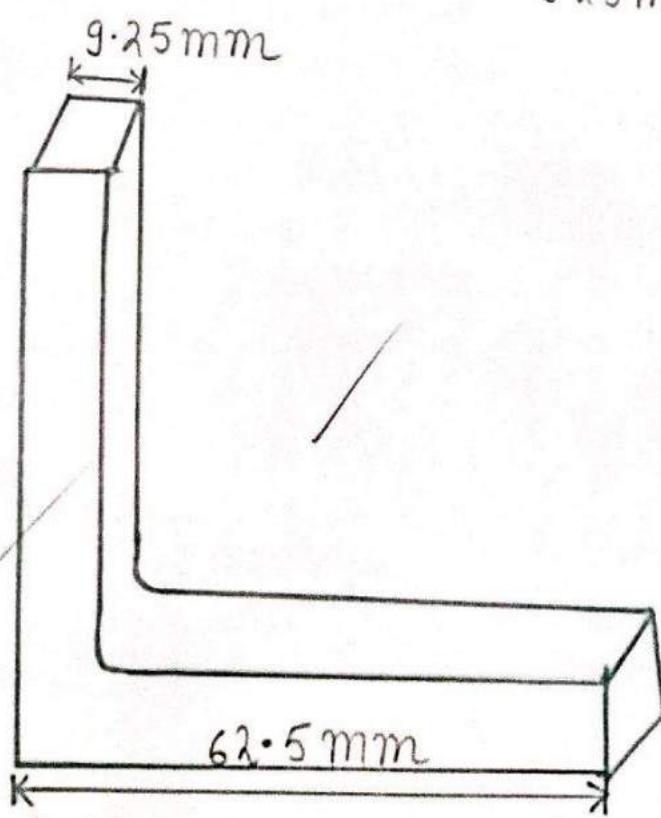
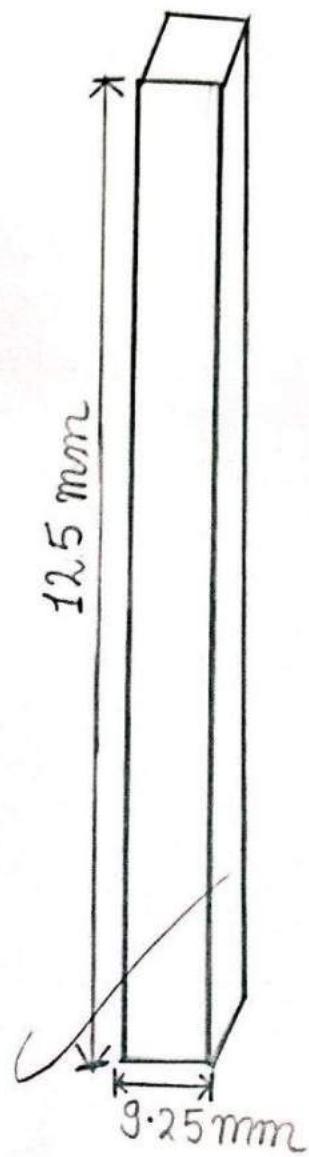
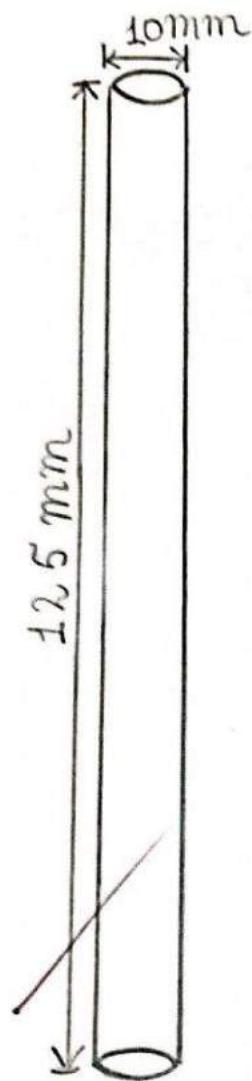
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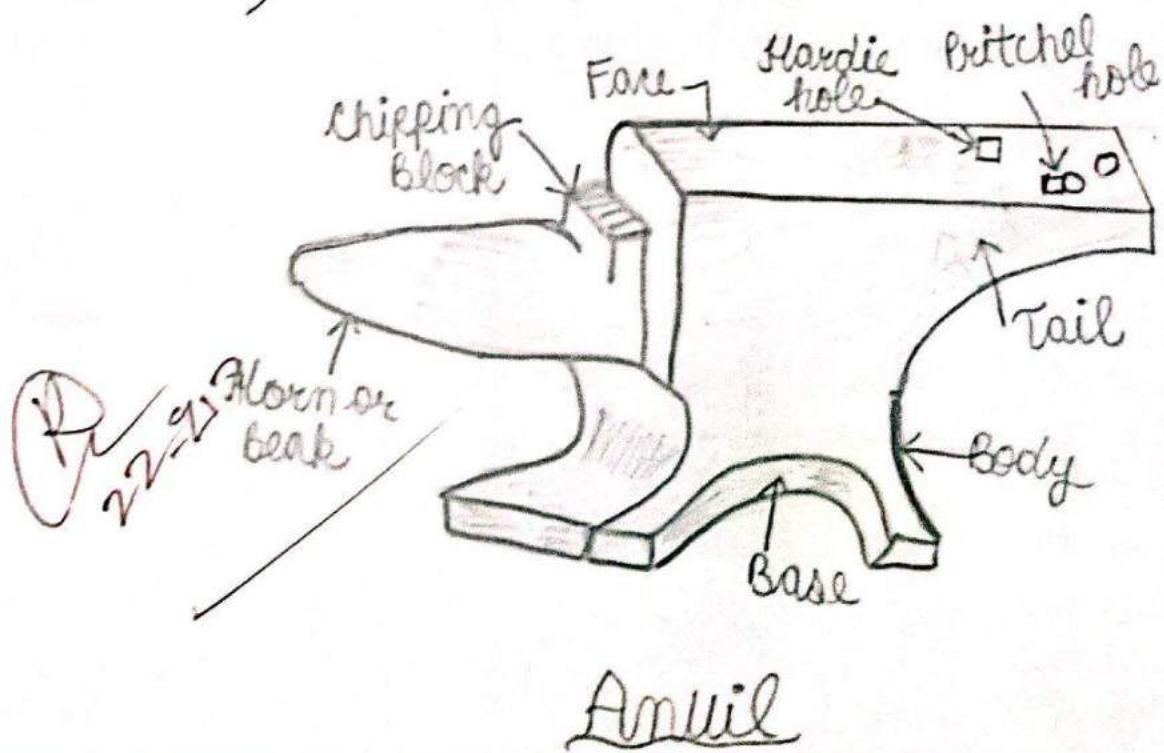
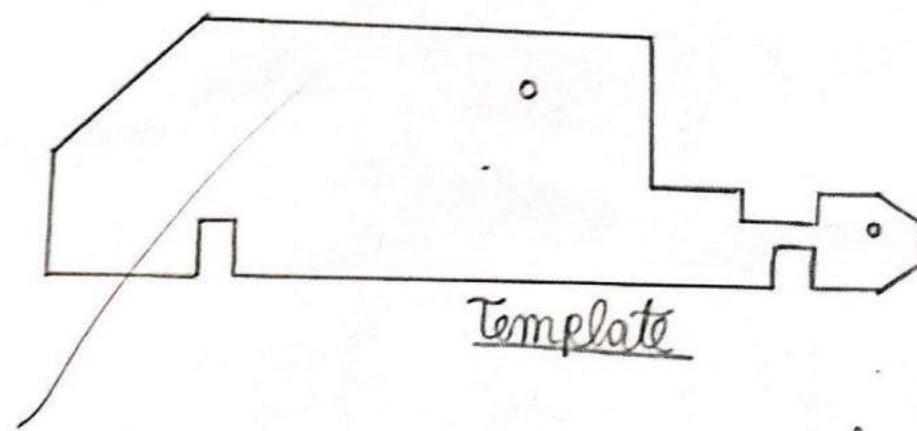
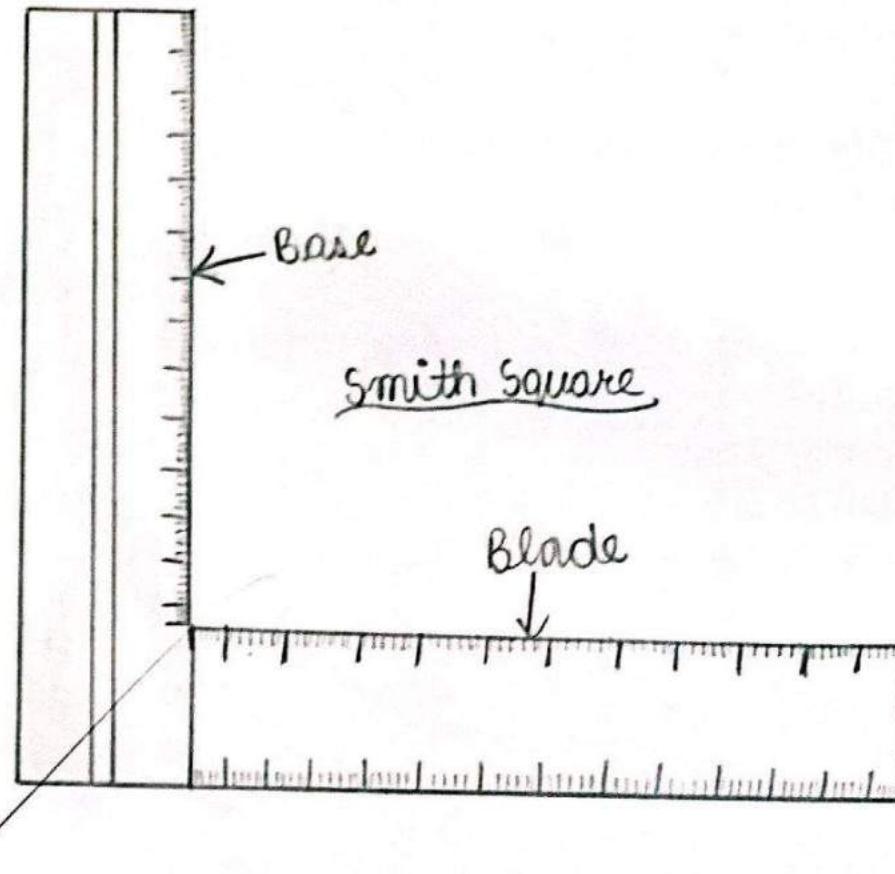
BLACK ~

SMTTHY

SHOP



'L' shaped job





HARCOURT BUTLER TECHNOLOGICAL UNIVERSITY

KANPUR

WORKSHOP PRACTICE - 1

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SHOP BLACKSMITHY SHOP

CLASS 1ST B.T.U.
BE
DATE 23/08/17

PRACTICE - 1

OBJECT :- Study of tools and equipments to make a 'L' shape job by hand forging operation as per given drawing diagram.

DATE OF STARTING :- 23/08/17

DATE OF FINISHING :- 30/08/17

MATERIALS REQUIRED :-

- (i) Mild steel rod (15mm x 10 mm)
- (ii) Steam coal

TOOLS AND EQUIPMENTS REQUIRED :-

- (1) Marking and Measuring tools :
 (a) Smith square
 (b) Template

- (2) Holding and supporting tools :
 (a) Anvil (d) Leg vice
 (b) Sludge block
 (c) Tongs

Striking Tools :

Ball peen hammer
 Cross peen hammer
 Straight peen hammer
 Sledge hammer

Cutting Tools :

Chisels
 Hot chisels
 Cold chisels
 Hardie

Miscellaneous Tools :

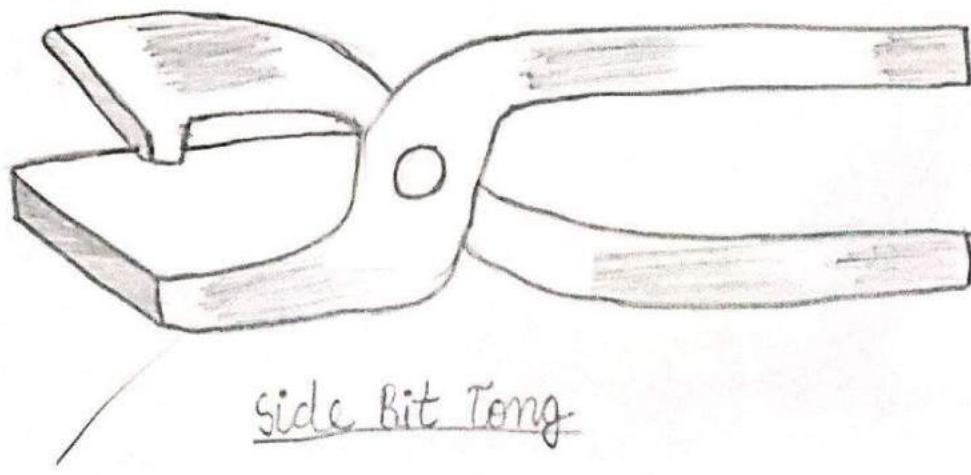
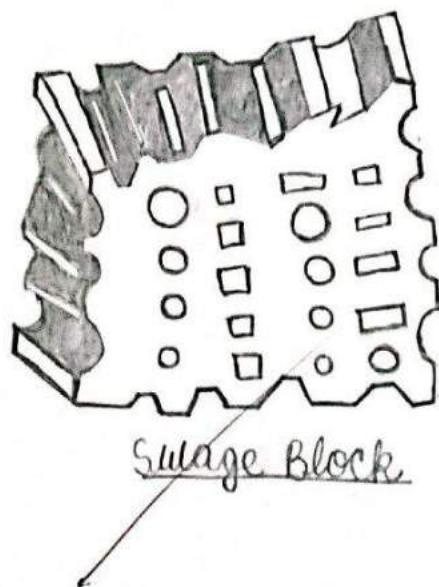
Slung
 Fuller
 Punch and drift
 Smith's forge or Hearth

Brief description of Tools and equipments :-

Marking and Measuring Tools :

Smith Square : Smith square is used for marking, measuring and checking the accuracy of right angled jobs. It is available in two sizes 9" x 18" and 12" x 24"

Template : Templates are locally manufactured tool. Dimensions are cut approximate to measure the hot jobs.



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Bio-chemical

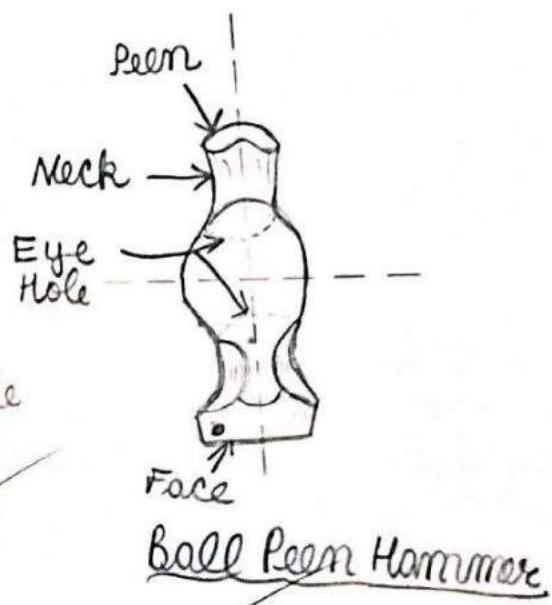
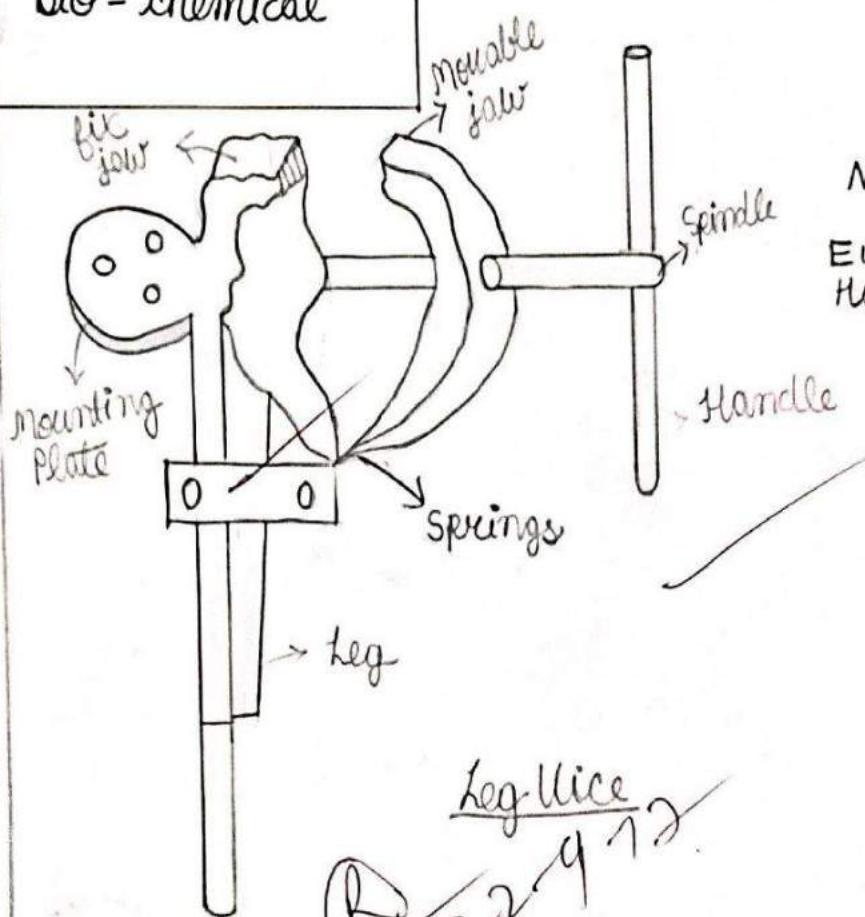
(2) Holding and supporting tools:

(a) Anvil: It provides the necessary support during forging by resisting blows rendered to the job. It performs operations such as bending, swaging etc. Its body is generally made of cast steel, wrought iron or mild steel with a hardened top layer of about 20 to 25 mm thick. The Horn or Beak is used for bending metal or forming curved shapes. The Hardie hole which is square is used to hold square shape tools like hardies, swages and fullers. The punching hole is used for bending small rods and punching holes in the work. Anvil generally weighs from 25 to 250 kg.

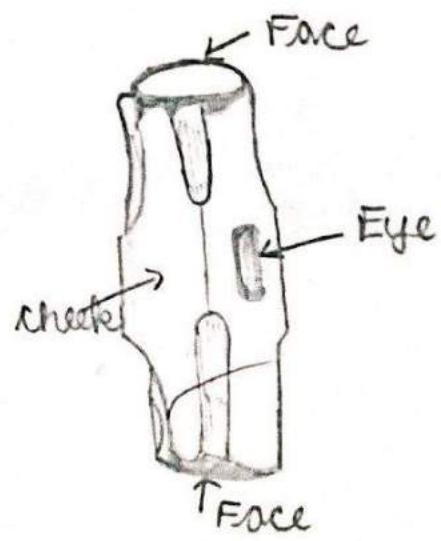
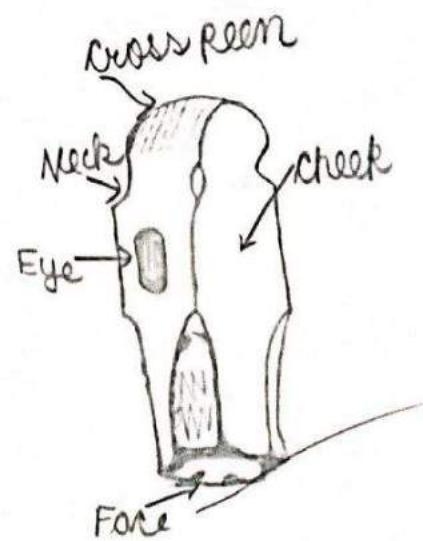
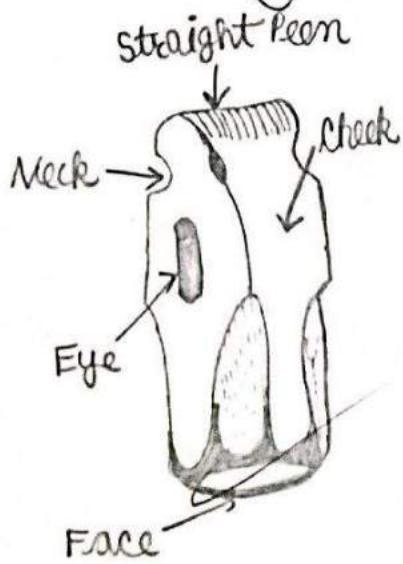
(b) Swage Block: The swage block is generally made of cast iron and has round, square, rectangular and half round grooves. In addition, to this, it is provided with holes which are useful for holding jobs while bending and breaking up heads. The swage block is usually supported at a suitable height on a stand which is adaptable to hold it flat wise or on its edge.

(c) Tongs: Tongs are holding tools, made of mild steel, normally used for gripping hot metals. Tongs come in a great variety of shapes and sizes. Most commonly used are the close mouth tong, open mouth tong and pick up tong.

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Leg Vice
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straight peen
sledge hammer

cross peen
sledge hammer

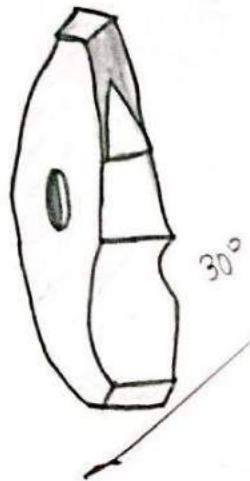
Double faced
sledge hammer

- (d) Hot Vice: It is used to hold the hot job for further operations like hammering and bending etc. This is generally made up of mild steel. It is specified by length of its jaws.
- (3) Striking Tools:
- Ball Peen Hammer: It is a lighter hammer used by the black smith by one hand during the cast steel operation. It is also used in fitting shops.
 - Cross Peen Hammer: In this hammer, the peen at its top is perpendicular to axis of its edge. It is also a lighter hammer and used by one hand by smith.
 - Straight Peen Hammer: It is similar to a cross peen hammer except that peen is parallel to the axis of its edge.
 - Sledge Hammer: It is used for heavy blows by the smith for heavy reduction in metal size and many other operations.

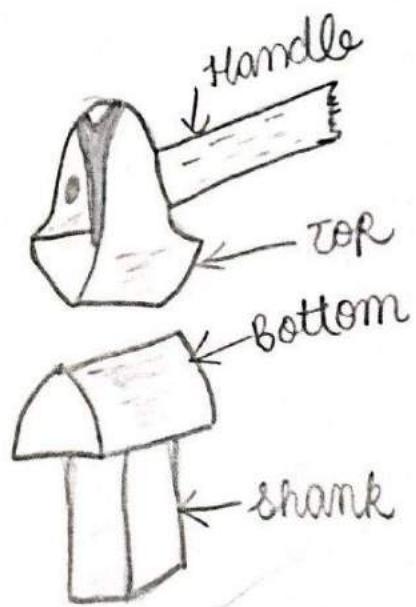
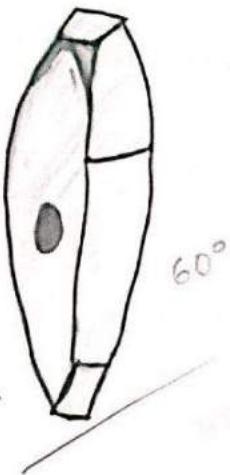
(4) Cutting Tools:

- Chisels: The chisels are used for cutting metals and for breaking. They may be cold or hot depending upon whether the metal to be cut is cold or hot. The main difference between the two chisels is in

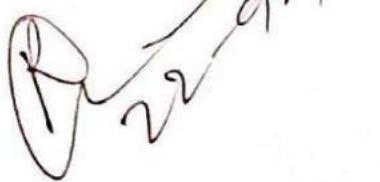
Hot chisel



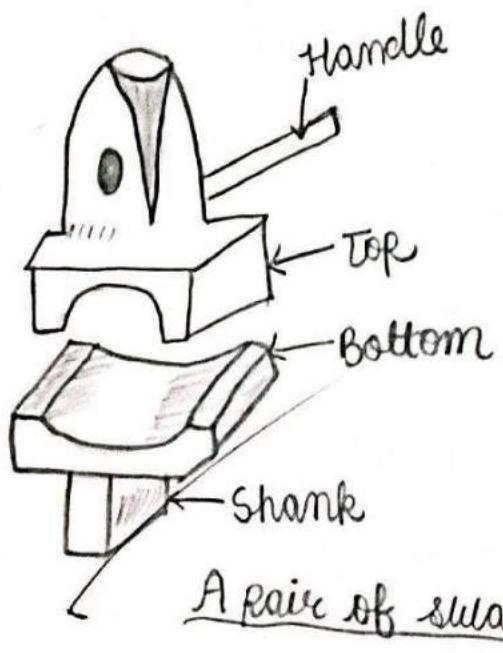
cold chisel



A pair of fullers



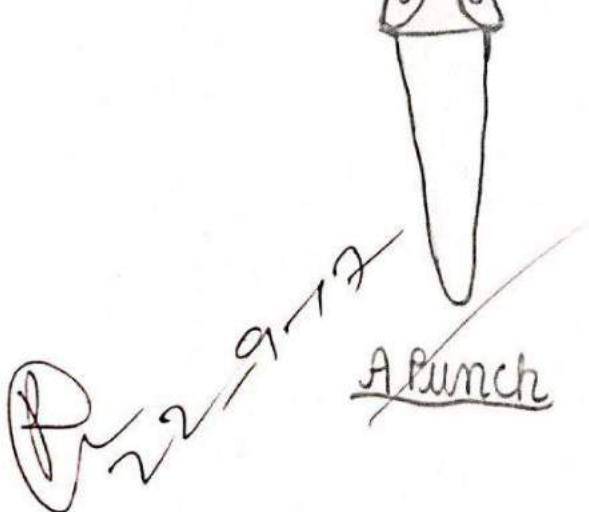
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A pair of surages



Hardie



the edges. The types of chisels are :

(i) Hot chisels :

The hot chisels are made up of low carbon steel and has a cutting angle of 30° . The hardening of the edge is not necessary as the hot metal would soften it. These type of chisel is fitted with wooden shafts.

(ii) Cold chisels :

The cold chisels are made of high carbon steel with a cutting angle of about 60° and its edge is hardened and tempered.

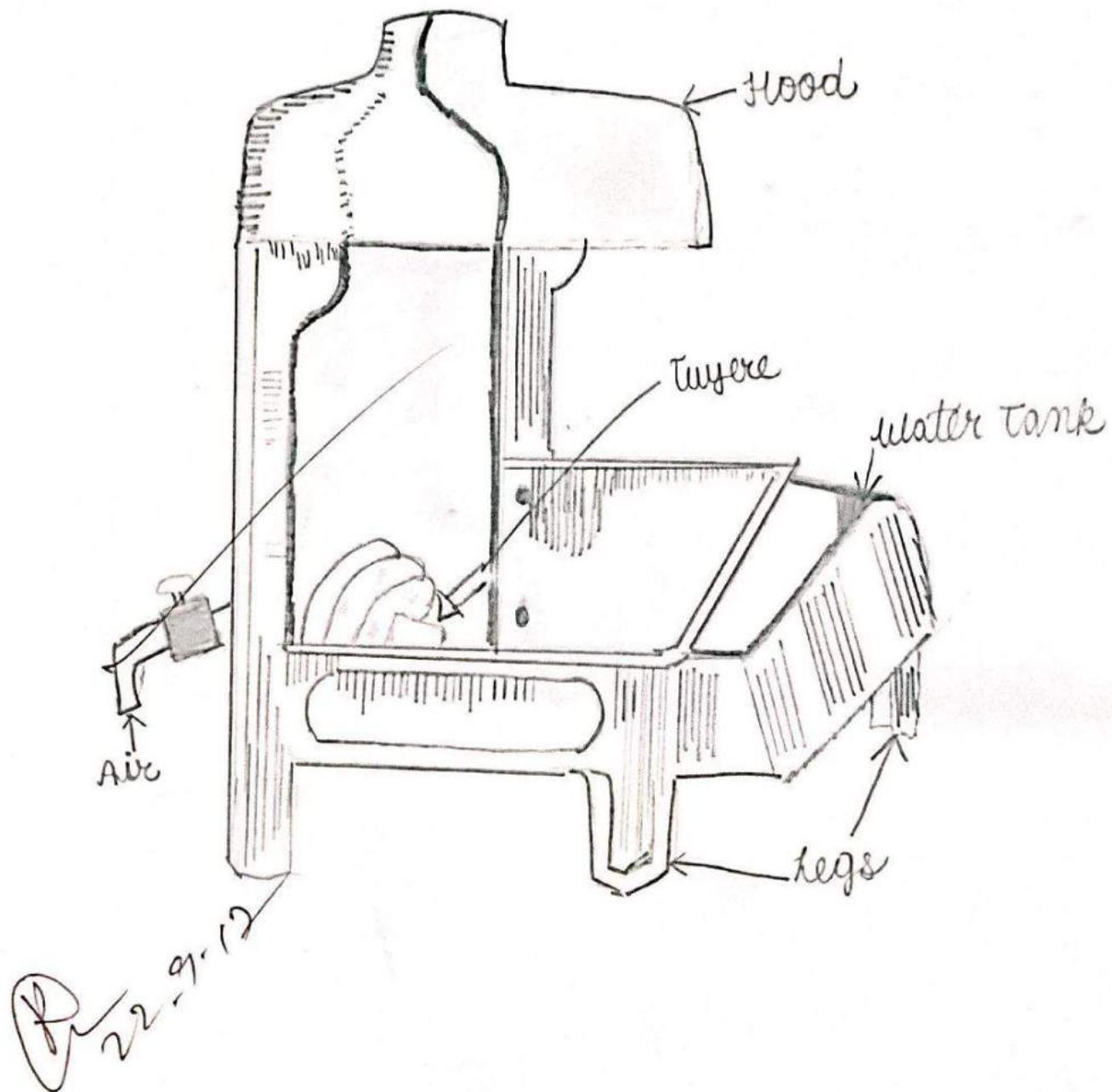
(iv) Hordie :

The chisels are generally used in pairs. The top chisel which is held by the smith may be hot or cold chisel. The bottom chisel (often called hordie) has square shank and fits in the square hordie hold in the anvil face.

(5) Miscellaneous tools :

(a) Swages : These are made of high carbon steel in two parts called top and bottom edges. They are used for increasing the length of a circular rod or for finishing the circular surface of a job after forging.

Hearth



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- (b) **Fullers:** These tools are made of high carbon steel in different sizes to suit the various types of jobs. Their working edges are normally rounded.
- (c) **Punches and Drifts:** Punches are used for producing holes in red hot jobs. The job is placed on the anvil and the punch is hammered through it upto about half its depth. A drift is a large sized punch used to expand the hole to the desired size and shape after the punching is over but it carries a small taper near its tip only and the remaining part of its length is of uniform cross-section.
- (d) **Smith's forge or Hearth:** It has a robust cast iron or steel structure consisting of 4 leg supports, an iron bottom known as Hearth. The Hearth carries the coal and is therefore provided with fire bricks lining to withstand the extensive heat produced due to the combustion of coal.

PROCEDURE :

- Job is heated in the open hearth furnace to cherry red colour i.e. plastic state.
- Hold the job by flat bit tong and place the job on the face of the anvil.
- Upsetting is done by ball peen hammer throughout

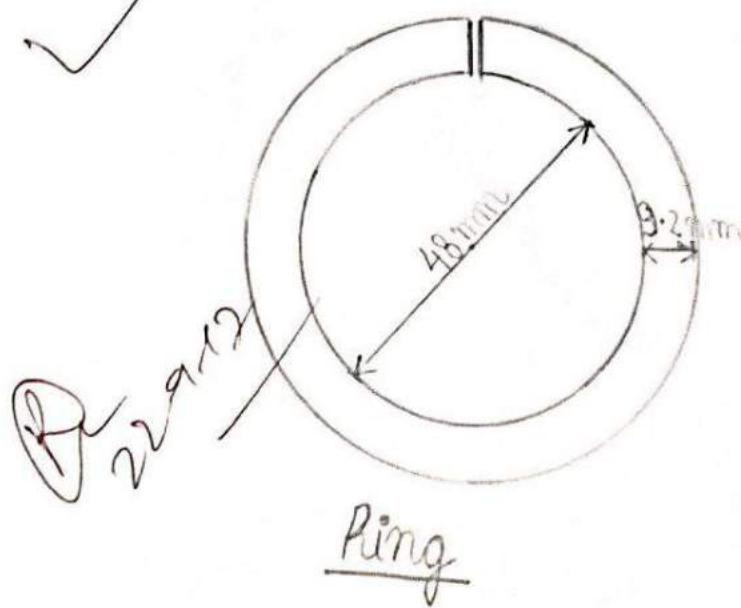
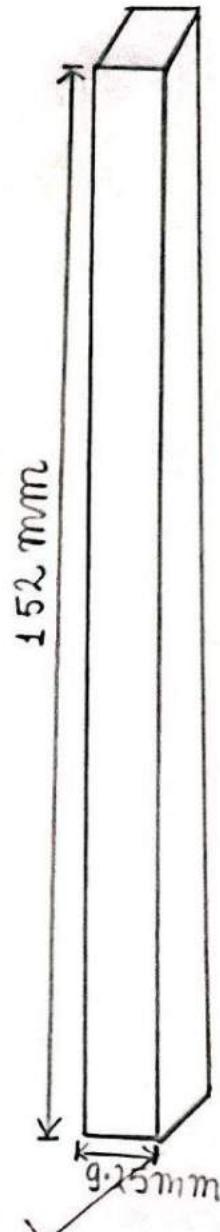
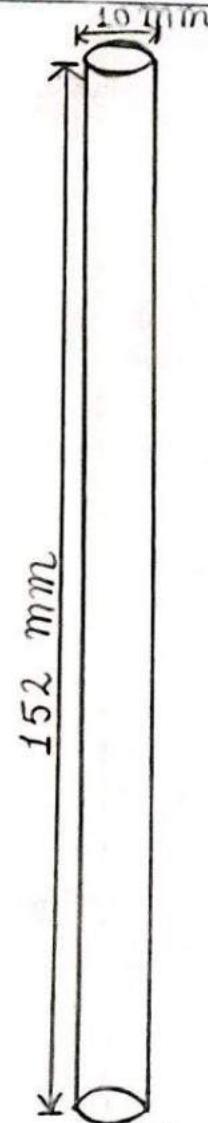
the length of the round bar. Do this process from all the sides.

- Keep upside down and forge the bottom portion of bar.
- At this stage, equality is existing on the sides. Now ousted portions is drawn out to make the square section.
- Job is heated and centre upsetting is done.
- Heated job is placed on the face of the anvil, bent at right angle from the centre.
- Twisting and buckling is removed by hammering on the top and bottom face of the job.
- Finishing is done by heating the job at the dull red colour and allowed to cool down in air gradually.

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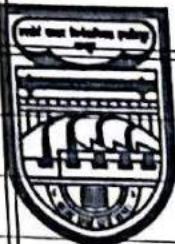
PRECAUTIONS :

- Always use proper clothing and shoes.
- Avoid over and under heating of the workpiece.
- Use suitable tongs for gripping.
- Stand very carefully near the furnace.
- Put the job in furnace with the help of tongs carefully.
- Proper hammer should be used for striking.



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WORKSHOP PRACTICE -2

FULL NAME SHIKHAR SRIVASTAVA

CLASS 1ST SEMESTER
BE

SHOP BLACKSMITHY SHOP

DATE 30/08/17

PRACTICE-2

OBJECT: Study of tools and equipments to make a 'ring' from given piece of mild steel rod by hand forging operation as per given drawing / diagram.

DATE OF STARTING : 30/08/17

DATE OF FINISHING : 30/08/17

Materials Required :

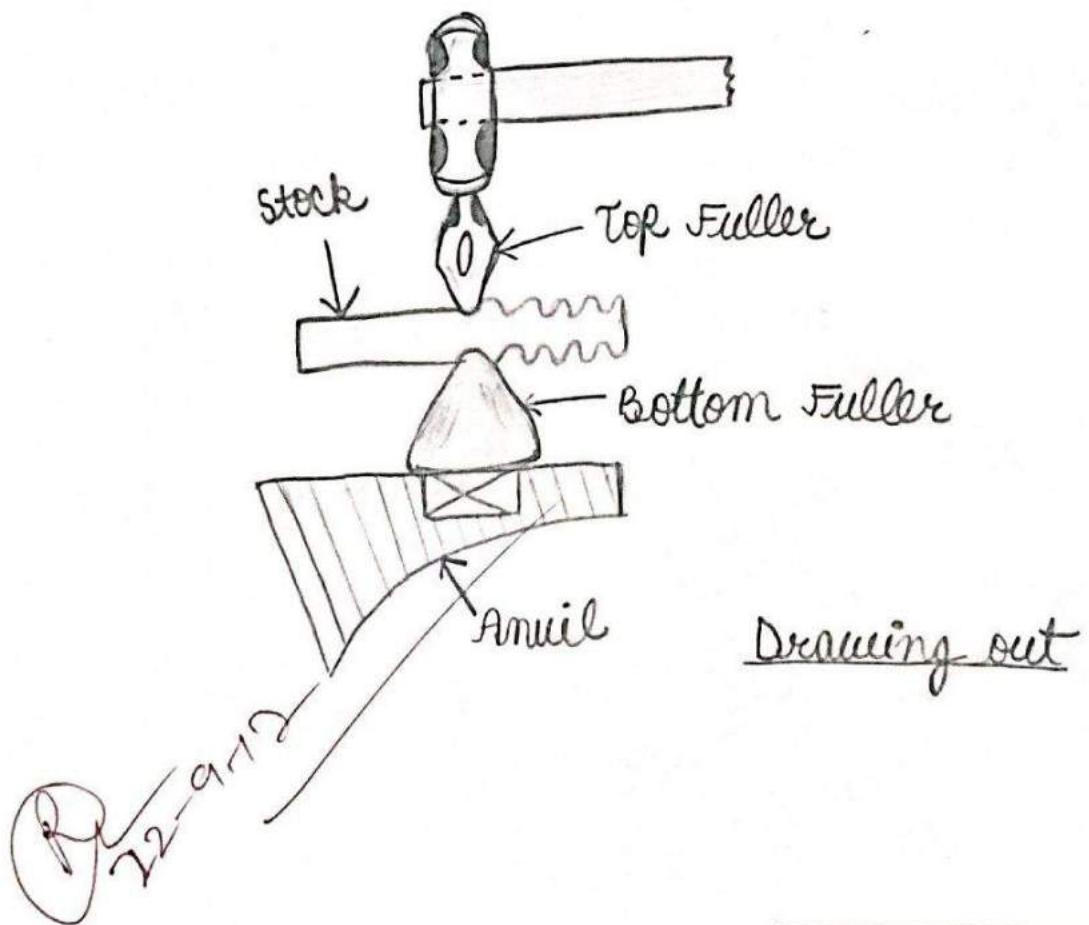
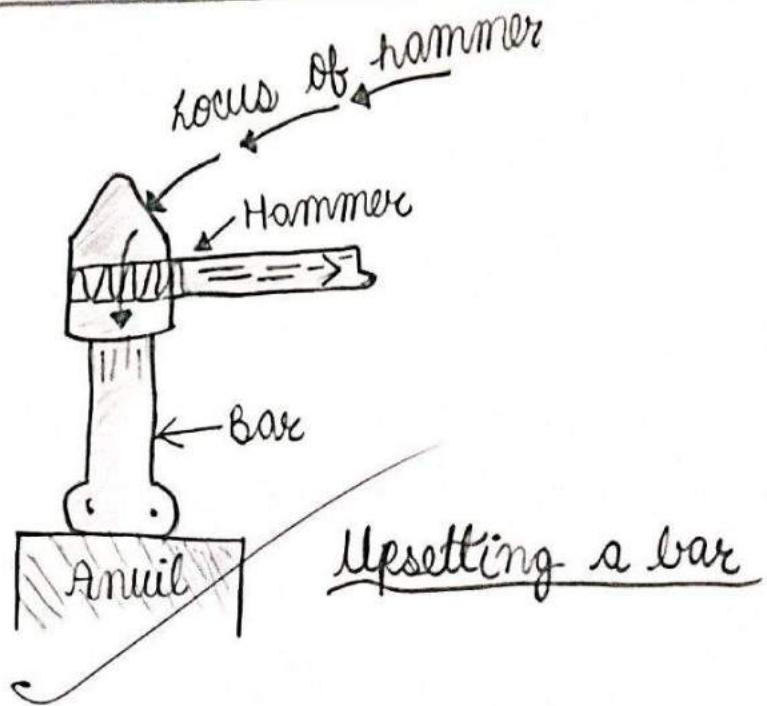
- (i) Mild steel rod (152 mm x 10 mm)
- (ii) Steam coal

Tools and equipments required :

- (1) Marking and Measuring tools:
- (a) Smith square
- (iv) Template

(2) Holding and supporting tools :

- | | |
|-----------------|--------------|
| (a) Anvil | (d) Leg vice |
| (b) Surge Block | |
| (c) Tongs | |



(3) Striking Tools:

- (a) Ball Peen Hammer
- (b) Cross Peen Hammer
- (c) Straight Peen Hammer
- (d) Sledge Hammer

(4) Cutting Tools:

- (a) Chisels
 - (i) Hot chisels
 - (ii) cold chisels
- (b) Hardie

(5) Miscellaneous Tools:

- (a) Sludge
- (b) Fuller
- (c) Punch and Drift
- (d) Smith's forge or Hearth

Brief Description of forging processes done in Blacksmithy work

(1) Upsetting or Jumping: It is the process through which the cross-section of a metal piece is increased with a corresponding reduction in its length.

(2) Drawing down or Drawing out: It is exactly the reverse process to that of upsetting in the sense that, it is employed when a reduction in thickness, width

or both of a bar is desired with a corresponding increase in its length.

- (3) Cutting: cutting of metals in hot or cold state is done by means of hot or cold chisels respectively. It is required in removing extra metal from job before finishing it.
- (4) Bending: this can be done to produce different types of bent shapes such as angles, squares and circles. Any desired angle or curvature can be made through this operation.
- (5) Punching: this term refers to the operation in which a punch is forced through a job to produce a hole. Punching is usually followed by drifting. In this, a tool known as drift is made to pass through the punched hole to produce a finished hole of the required size.
- (6) Setting Down: It is the operation through which the rounding of a corner is removed, to make it square by means of a set hammer.
- (7) Welding: In this operation, two pieces of same metal which are to be joined together are heated in the hearth to the proper temperature (white heat). When

they have acquired the welding heat they are withdrawn from the furnace and joined together by the application of external pressure, generally hammering.

PROCEDURE:

- Job is heated in the open hearth furnace to the cherry red colour.
- Heat the job by flat bit tong and place the job on the hard face of the anvil.
- Upsetting is done by ball peen hammer through out the length of the round bar.
- Keep upside down and forge the bottom portion of the bar.
- Oval portion of the sides are drawn out to make the square cross section.
- Square cross section rod is heated to cherry red colour and placed on the horn of the anvil.
- Pressure is applied by the hammer to form a circular ring.
- Twisting and buckling is removed by hammering on the top and bottom face of the jobs.
- Finishing is done by heating the job at the dull red colour and allowed to cool down in air gradually.

PRECAUTIONS:

- Proper protective clothing i.e. apron, shoes should be used.

Damaged and wrongly position tools should be avoided.

Job should be heated to proper forging limit.

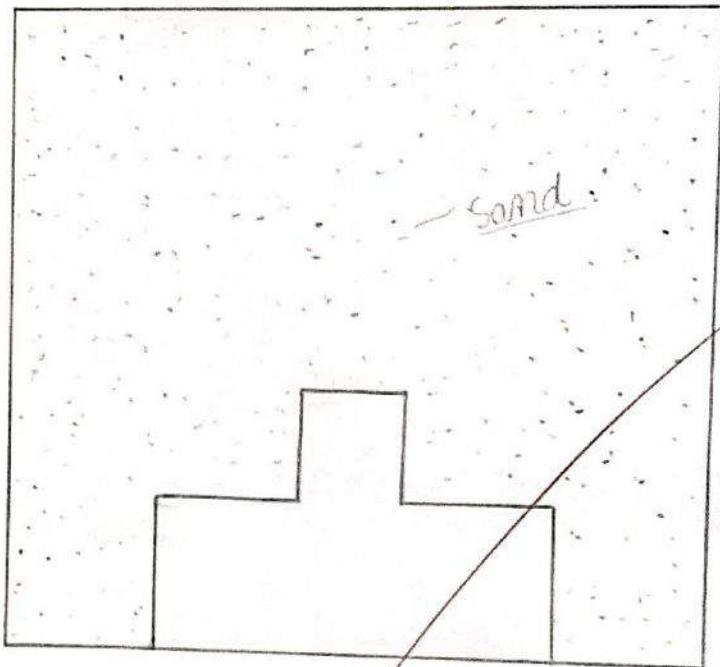
Do not stand near to to the furnace.

Job should be hold by tongs properly.

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FOUNDRY

SHOP



Front view of the job pattern

~~30 NOV 2012~~

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WORKSHOP PRACTICE - I

FULL NAME SHIKHAR SRIVASTAVA

CLASS 8E^{1st}

SHOP FOUNDRY SHOP

DATE

06/09/17

Practice - I

Object → To prepare a simple mould of a given pattern in green sand.

Date of starting → 06/09/2017

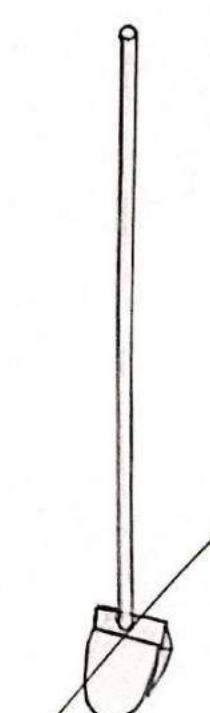
Date of finishing → 06/09/2017

Materials Required :-

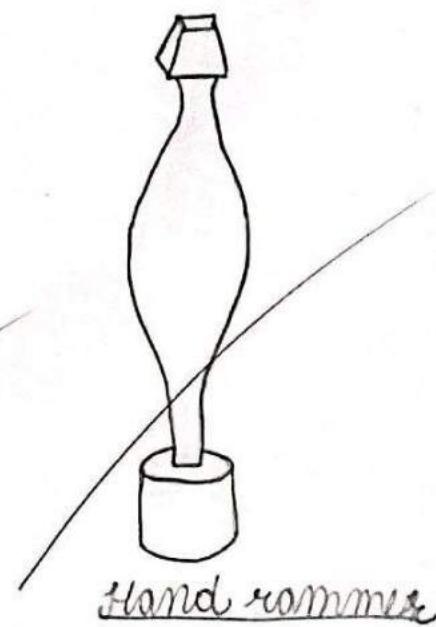
- 1> Pattern
- 2> Green sand
- 3> Parting sand
- 4> Facing sand
- 5> Water

Tools and Equipments used :-

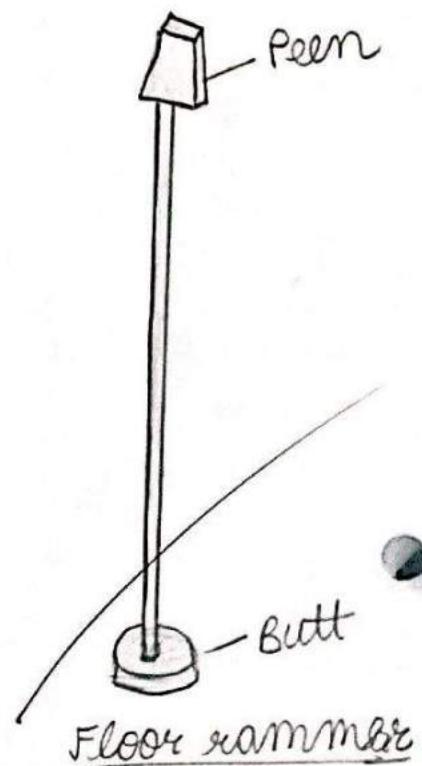
- 1> Rammers,
- 2> Vent wire , 3> Shovel , 4> Trowels , 5> Lifter or cleaner , 6> Draw spike , 7> Smoother ,
- 8> Spirit level , 9> Moulding box , 10> Hand riddle , 11> Strike off bar , 12> Sprue pin ,
- 13> Side pin , 14> Crucibles



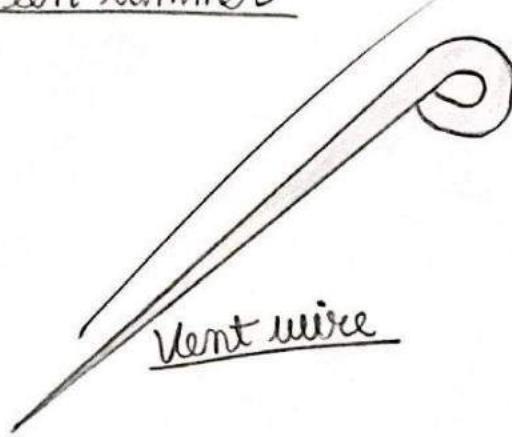
Peen hammer



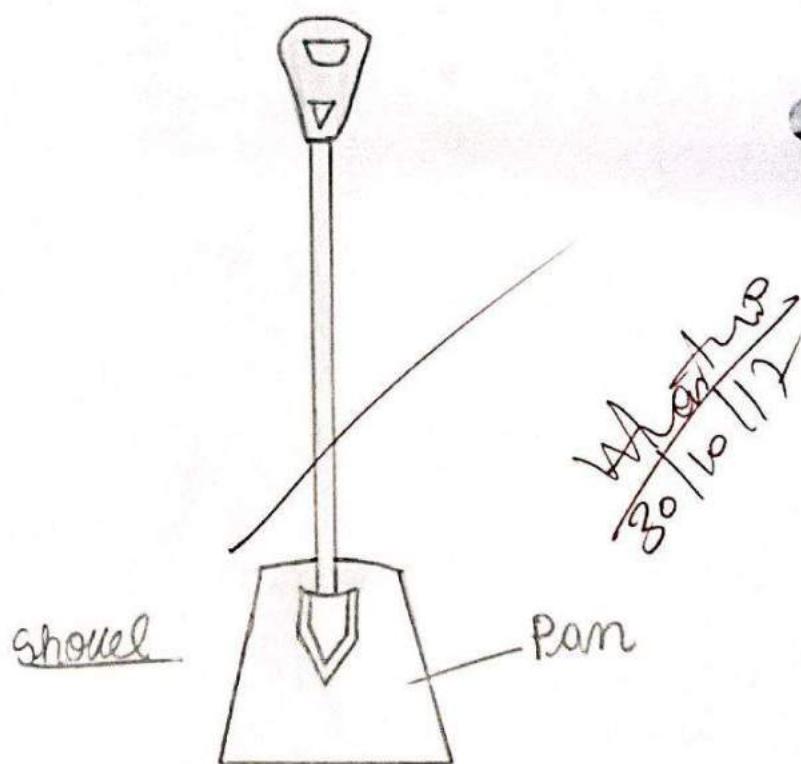
Hand rammer



Floor rammer



Vent wire



Shovel

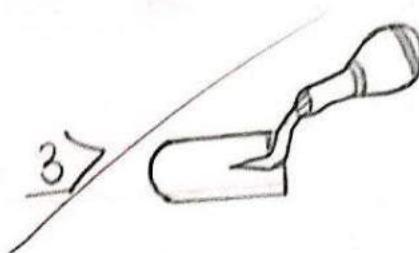
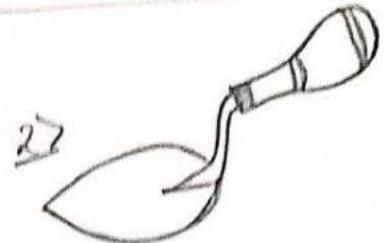
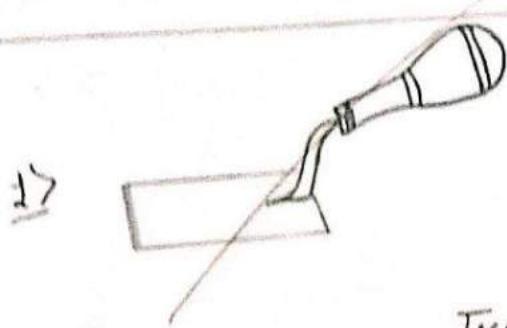
* **Rammers -**

Rammers are used for striking the sand mass in the moulding box to pack it uniformly around the pattern. The common forms of rammers used in hand ramming are the following :-

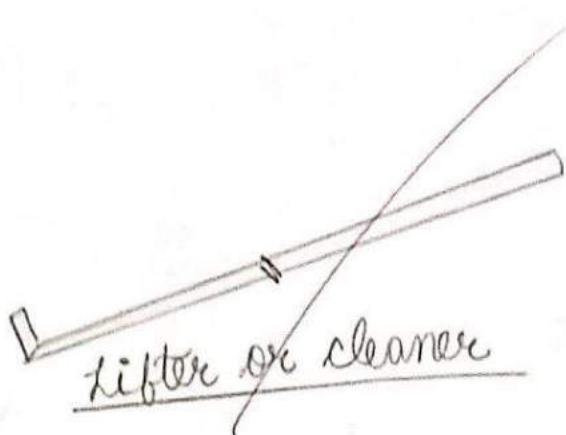
- (a) **Peen Hammer** - It has a wedge shaped construction formed at the bottom of a metallic rod.
- (b) **Hand Hammer** - It is smaller than reen hammer. On one end, it carries a wedge type construction, called peen and on the other a solid cylindrical shape, known as butt.
- (c) **Floor Hammer** - It consists of a long steel bar carrying a reen at one end and a flat portion on the other.

* **Vent wire -**

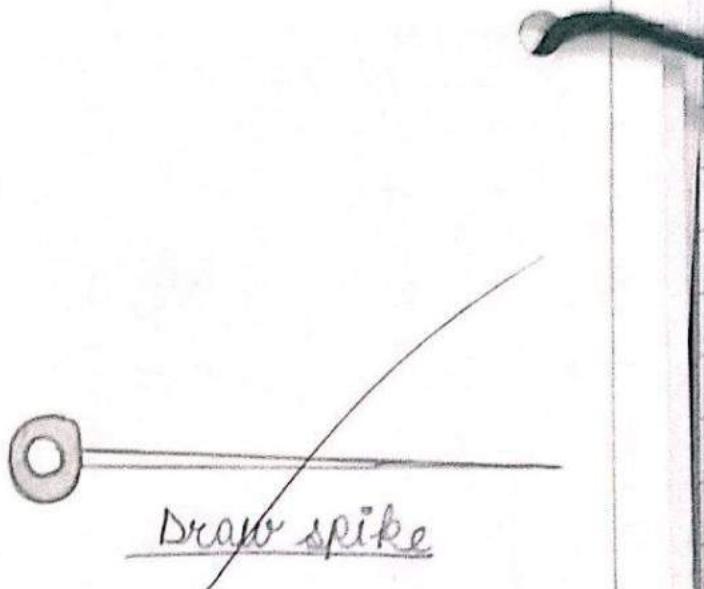
It is a thin steel rod or wire carrying a pointed edge at one end and a wooden handle or bent shape loop in the other. After ramming and striking off the excess sand it is used to make small holes called vents in the sand mould to allow the exit



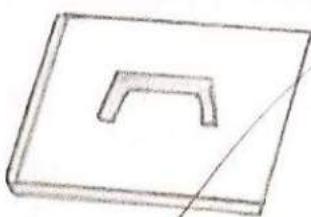
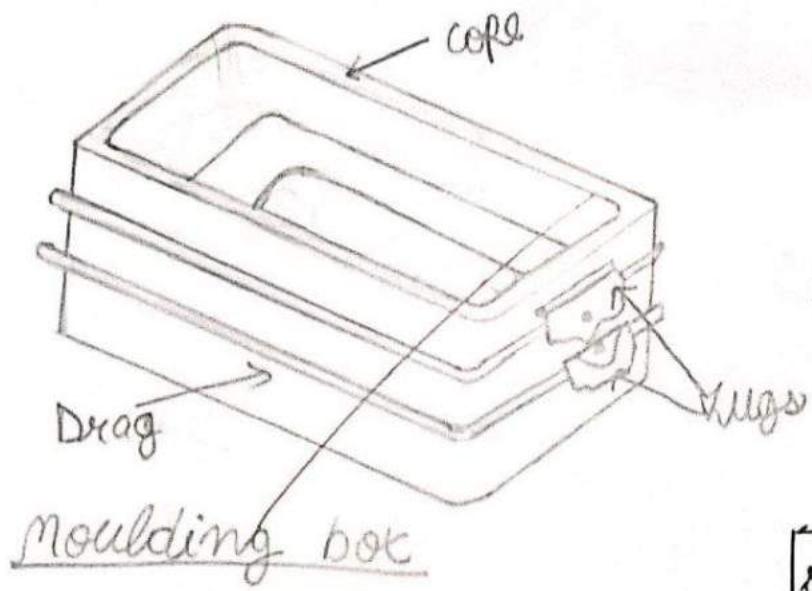
Trowels



Lifter or cleaner



Drag spike



smoother
30 Nov 17
shikhar srikantha

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Biochemical (1st)

of gases and steam during casting.

* Shovel -

It consists of an iron end fitted with a wooden handle. It is used in mixing and conditioning the foundry sand by hand and transferring it into the flask.

* Trowels -

Trowels are used for finishing flat surfaces and joints in a mould. The common shapes of trowels are shown on the left-hand side. They are made of iron and are provided with a wooden handle.

* Lifters or cleaners -

They are also finishing tools and are used for repairing and finishing the sand mould after withdrawal of pattern. They are also used for removing loose sand from mould cavity. Two useful forms are -

- Simple lifter or cleaner
- Yankee lifter

* Draw spike -

It is a tapered steel rod having a loop or ring at its one end and a sharp point

at the other. It is used to remove and draw pattern from the mould.

*

Smoother and corner flicks -

They are finishing tools used for repairing and finishing flat and round surfaces, round or square corners and edges.

*

Moulding boxes or flasks -

The moulding ~~box~~ or flasks used in sand are of two types -

(a)

Closed moulding boxes - They are a kind of closed ones - modern.

(b)

Open type or snap flasks - It is made of wood and hinged at one corner. These boxes consists of two or more parts. The lower part is called Drag, the upper part cope all intermediate parts, if used, called cheeks.

*

Hand riddle -

It consists of a wooden frame fitted with a screen of standard wire mesh at its bottom.

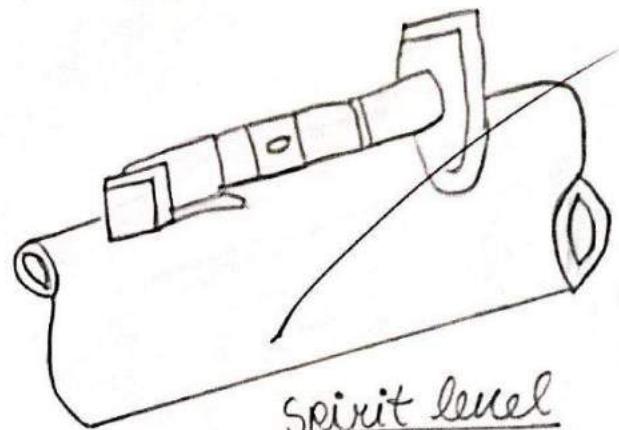
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Strike-off bar -

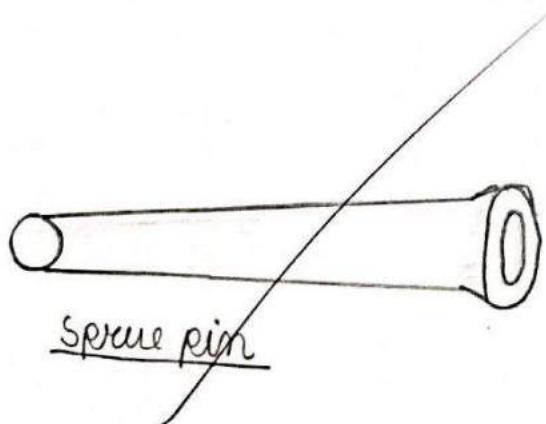
It is a flat bar, made of wood or iron, to strike off the excess sand from the top.



Hand riddle



Spirit level



Screw pin

Instrument
30/10/17

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of a box after ramming.

* Sprue pin -

It is a tapered rod of wooden or iron which is embedded in the sand and later withdrawn to produce a hole, called runner, through which the molten metal is poured into the mould.

* Crucibles -

They are similar to ladles in shape. The raw material or charge is broken into small pieces and placed in them. They are then placed in crucible or pit furnace which are coke-fired.

* Pattern -

A pattern may be defined as replica or facsimile model of the desired casting which when packed or embedded in a suitable moulding material produces a cavity called mould. The way in which a pattern differs from actual component are -

- 1) It carries an additional allowance to compensate for metal shrinkage.
- 2) It carries the necessary draft to enable its easy removal from the sand mass.

Pattern materials -

The common materials of which the pattern are made are the following :

1) Wood -

It is the most common materials used for pattern making because of the following advantages -

- cheap and abundantly available.
- Its manipulation is easier.
- Gives good surface finish.
- Can be easily shaped.

But it has certain disadvantages too -

- Wears out quickly.
- Very susceptible to moisture.
- Life is shorter.

The common woods used are -

- (i) Pine (ii) Deodar (iii) Teak (iv) Kail
- (v) Shisham (vi) mahogany

2) Metals -

Metals are also used when a higher dimensional accuracy is needed. They have a longer life than wooden ones. But they too carry some disadvantages -

- costlier.
- Need machining for surface to be fine.

- Heavy.
 - Tendency to get rusted.
- The common metals used as pattern metals are :
- (a) cast iron
 - (b) Aluminium and its alloys
 - (c) Brass
 - (d) white metal

3) Plaster of Paris -

It is used because it can be easily be casted into intricate shapes.

- * controllable expansion.
- * High compressive strength.
- * Expands on being solidified.

4) Plastics -

Plastics are gradually gaining favour as pattern materials due to their following specific characteristics -

- lightness in weight
- High strength
- High resistance to wear
- Fine surface finish

5) Wax -

Wax patterns are exclusively used in investment casting. For this, a die or metal mould is made in two halves into which the heated wax is poured.

Types of Patterns -

The type of pattern to be used for a particular casting depends upon many factors like the bulk of casting, type of moulding process, number of castings, required and the anticipated difficulty of moulding on account of the typical shape. The following types of patterns are commonly used:

- 1) Solid or single piece pattern
- 2) Two piece or split pattern
- 3) Multi piece pattern
- 4) Match plate pattern
- 5) Grated pattern
- 6) Skeleton pattern
- 7) Sweep pattern
- 8) Pattern with loose pieces
- 9) Cope and drag pattern
- 10) Follow board pattern
- 11) Segmental pattern
- 12) Shell pattern

1) Solid or Single piece pattern -

- Simplest of all patterns
- One piece
- Cheaper pattern
- Manually operated

- 2) Two-piece or split pattern -
- Have two parts
 - one part in drag and other by cope.
 - complex than previous one.

- 3) Multi-piece pattern -
- Used in complicated designs.
 - Contains 3 to 4 parts or even more.
 - More complex

- 4) Match plate patterns -
- Accurate
 - Mainly used in machine moulding
 - Expensive construction cost

- 5) Gated patterns -
- Used in mass production
 - Multi-cavity moulds needed
 - Gated formers are used

- 6) Skeleton patterns -
- consists of wooden frames and strips.
 - Filled with loam sand and rammed.
 - Surplus sand is removed by strickle.
 - Economical.

Pattern allowances -

A pattern is always made larger than required size to allow some allowance described below -

1) Shrinkage allowance -

The three form contraction takes place -

- (i) liquid contraction
- (ii) Solidifying contraction
- (iii) Solid contraction

The first two are compensated by gates and risers and the last one by providing adequate allowances in the pattern.

The amount of contraction varies with different metals, and therefore their corresponding allowances may also differ.

2) Machining allowance -

A casting may require machining all over or on certain portions, depending upon the assembly conditions and the operation it has to perform. The corresponding portions or surfaces on the pattern are given adequate allowance, by increasing the metal thickness there to compensate for the loss of metal due to machining on these surfaces.

Ferrous metals need more allowance than the

non-ferrous metals. This allowance varies from 1.5 mm to 16 mm but 3 mm allowance is quite common for small and medium size castings.

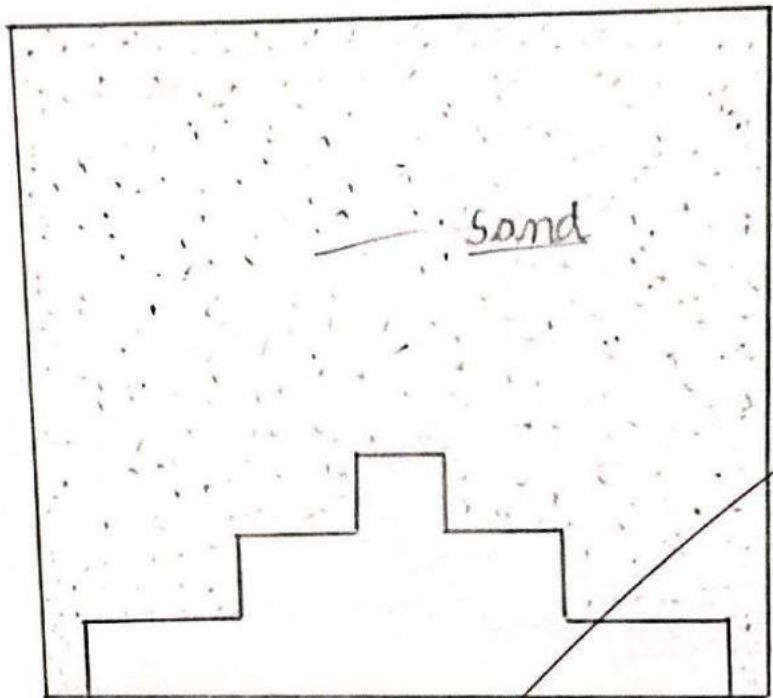
- 3) Draft allowance - All patterns are given a slight taper on all vertical surfaces i.e. the surface parallel to direction of their withdrawal from the mould. This taper is known as draft / draft allowance.
- 4) Rapping or shaking allowance - When pattern is to be withdrawn from mould it is first rapped or shaken by striking it from side to side, so that its surface may be free of the adjoining sand wall of the mould.
- 5) Distortion allowance - The tendency is not same in all the castings, only casting which has irregular shape will distort during cooling on account of the setting up of thermal stress in them.

Procedure -

- i) Prepare the sand for moulding and make sure it is not much moist.
- ii) Make a pit in sand to place the pattern.

- iii) Rub the sand between palms until it becomes finely grained.
 - iv) Fill the sand in pit and make sure that pattern lie in the upper centre.
 - v) Use the rammer according to pit by parting sand and place the cope box over the pit.
 - vi) Cover the surface of pit by parting sand.
 - vii) Make a small layer of facing sand in the copper box over parting sand.
 - viii) Fill the cope box with sand and properly use the rammer over it.
 - ix) Place the side pins in the opposite corners of cope box in outer side.
 - x) Do the ramming and finishing of cope box placing the sprue pin near the pattern with the help of hands.
 - xi) Take out sprue pin carefully.
 - xii) Make the funnel in sand with the help of lifter, separate the cope and drag.
 - xiii) Make the hole with the help of lifter.
 - xiv) The pattern is taken out with the help of drawspike ; moulding is complete.
- Precautions :-

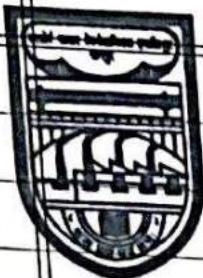
- i) Maintain the moisture in the sand. *(Good)* *19/10/12*
- ii) Use the rammer with constant force. *(Good)* *19/10/12*
- iii) Carefully separate cope box with pit. *(Good)* *30/10/12*
- iv) Carefully take out pattern from pit.



Front view of two step job pattern

~~Shikhar Srivastava
30/10/12~~

Shikhar Srivastava
Biochemical (2st)



HARCOURT BUTLER TECHNOLOGICAL UNIVERSITY

KANPUR

WORKSHOP PRACTICE - 2

FULL NAME SHIKHAR SRIVASTAVA

SHOP FOUNDRY SHOP

CLASS 1st BE

DATE

13/09/17

Practice - II

Object :- To prepare a mould with two step pulley with runner and riser.

Date of starting :- 13/09/2017

Date of finishing :- 13/09/2017

Material Required :-

- ① mould pattern
- ② Green sand
- ③ parting sand
- ④ Water

Tools and Equipment Required :-

- | | |
|-----------------|----------------------|
| 1. Shovel | 7. Moulding box |
| 2. Hand riddle | 8. Sprue pin |
| 3. Trowel | 9. Kent wire |
| 4. Rammers | 10. Side pin |
| 5. Spirit level | 11. Litter / cleaner |
| 6. Smoother | 12. Draw spike |

Moulding Sand → The common source of moulding sand are sea, river, lakes.

Types of Moulding Sand -

- 1) Green sand
- 2) Dry sand
- 3) Parting sand
- 4) Facing sand
- 5) Baking sand
- 6) Core sand
- 7) oil sand
- 8) Molesas sand

Composition of green sand - 80% - 90% Silica sand (SiO_2)
10% - 20% clay
2% - 8% water

Properties of Green sand -

- 1) Refractoriness
- 2) Permeability
- 3) Flowability
- 4) Plasticity
- 5) Cohesivity
- 6) Adhesiveness
- 7) collapsibility

- ① Refractoriness - It is that property of sand which enable it to resist high temperature of the molten metal without breaking down.
- ② Permeability - It is that property of sand which permits the steam and gases to pass through the sand mould (Porosity).
- ③ Fluidity - It is that property of sand due to which it behaves like a fluid so that when rammed it flows to all portions of mould and distribute ramming pressure evenly.
- ④ Plasticity - It is that property of sand due to which it flows to all portions of moulding flask or box and acquire a predetermined shape under ramming pressure and retain this shape when the pressure is removed.
- ⑤ Cohesiveness - It is that property of sand due to which the sand grains stick together during ramming.
- ⑥ Adhesiveness - It is that property of the sand due to which it adhere to the sides of the moulding box.

(7)

Collapsibility - It is that property of the sand due to which the sand mould collapses automatically after the solidification of the casting in order to allow free contraction of the metal.

Types of mould :-

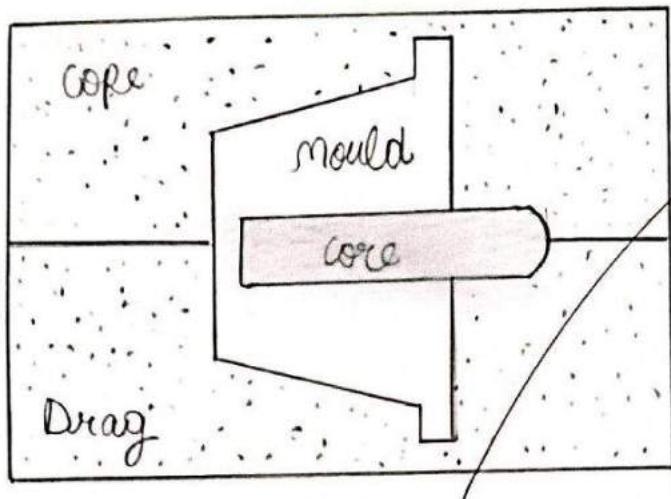
- ① Green sand mould
- ② Loam sand mould
- ③ Dry sand mould
- ④ Skin-dried mould
- ⑤ Plaster mould
- ⑥ Metal mould
- ⑦ Shell mould
- ⑧ Core sand mould

Types of moulding :-

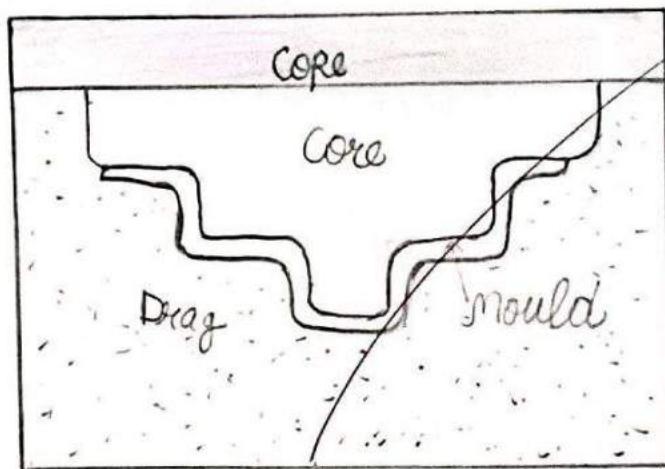
- ① Floor moulding
- ② Bench moulding
- ③ Pit moulding
- ④ Machine moulding
- ⑤ Shell moulding
- ⑥ Sagger moulding
- ⑦ Plate moulding

Core → Core can be defined as a body of sand generally prepared in a mould box,

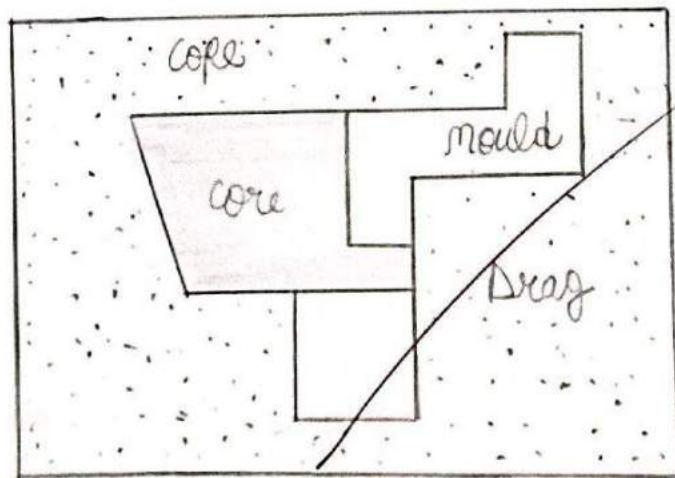
balanced
core



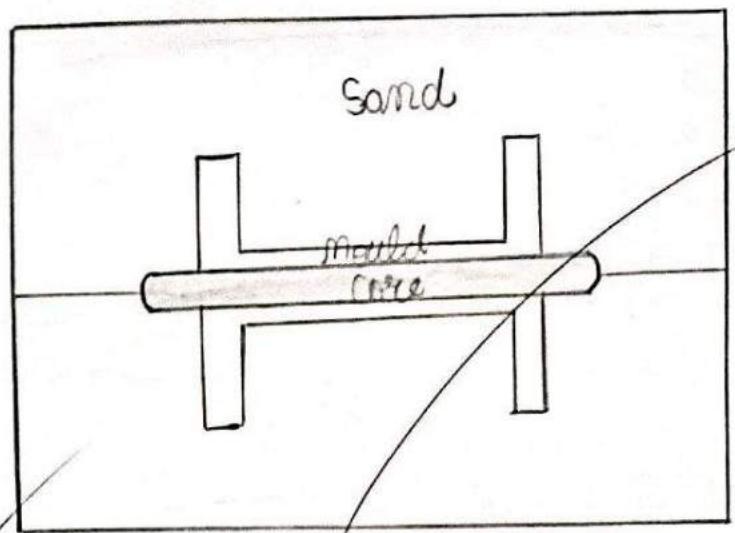
a hanging
or cores
core



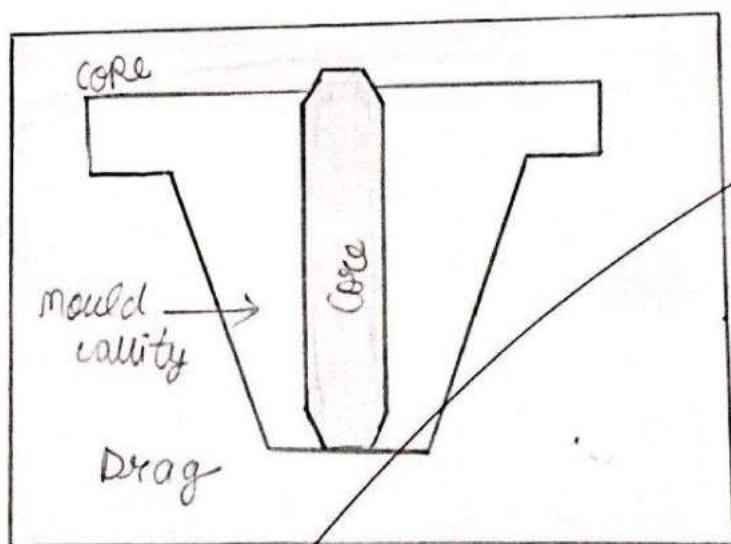
wire core



~~20/10/17~~



Horizontal core



Vertical core

~~Wastari~~
30/10/12

Shikhar Srivastava
Biochemical (1st)

which is used to form a cavity of desired shape.

Types of Core -

- ① Horizontal core
- ② Vertical core
- ③ Balanced core
- ④ Hanging or cover core
- ⑤ Wire core

Procedure -

- ① Prepare the sand for moulding purpose and make sure it is not much moist.
- ② Make a pit in the sand to place the pattern.
- ③ Rub the sand in between the palms until it become finely grained.
- ④ Fill the sand in the pit and make sure that pattern must lie in the upper centre.
- ⑤ Use the rammer according to the pit size and check the level by spirit level.
- ⑥ Cover the surface of pit with parting sand and place the mould box over the pit.
- ⑦ Make a small layer of facing sand in the moulding box over parting sand.
- ⑧ Fill the mould box with sand and properly use the rammer over it.

- ⑨ Place the side pins in the opposite corners of mould box in outer side.
- ⑩ Do the ramming and finishing of mould box, placing the sprue pin near the pattern with the help of smoother.
- ⑪ Take out both the sprue pins properly.
- ⑫ Make the funnel shape in sand with help of lifter and cleaner. Separate the mould box and pit.
- ⑬ Make the gating system out with the help of draw spike, moulding is completed.

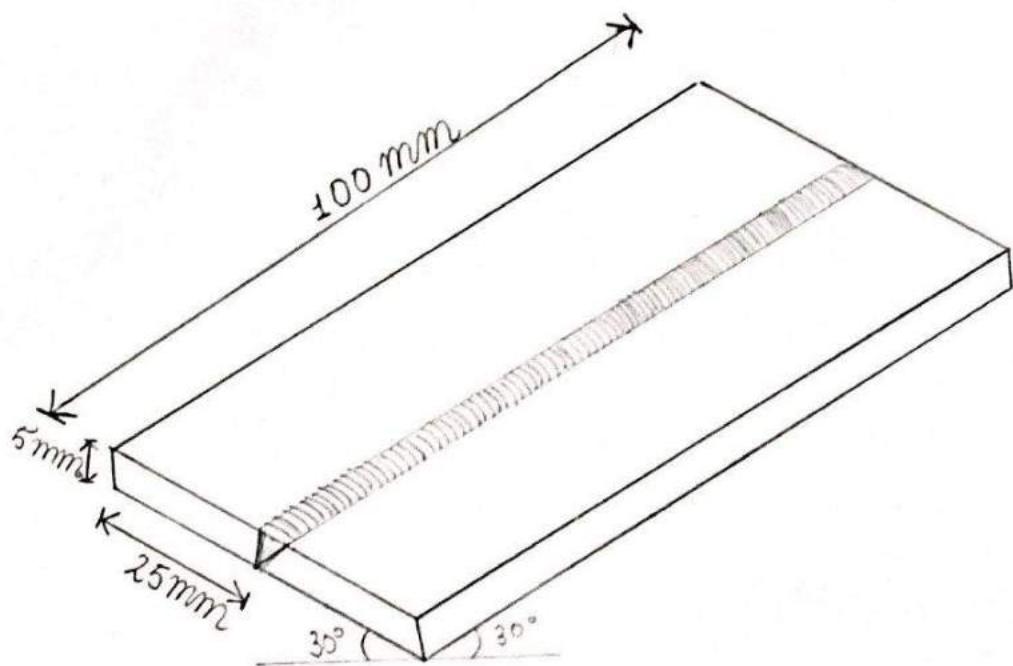
Precautions -

- ① Maintain the moisture in the sand.
- ② Use the rammer with a constant force.
- ③ Carefully separate mould box from pit.
- ④ Carefully take out the pattern from pit.

~~Nishant S
Date 30/11/17~~

WELDING

SHOP



Shikhar Srivastava
Biochemical (1st)



HARCOURT BUTLER TECHNOLOGICAL UNIVERSITY

KANPUR

WORKSHOP PRACTICE - 1

FULL NAME SHIKHAR SRIVASTAVA
SHOP WELDING SHOP

CLASS 1ST BE

DATE 20/09/17

Practice 1

Object :- To make a simple butt joint by electric arc welding process as per given drawing.

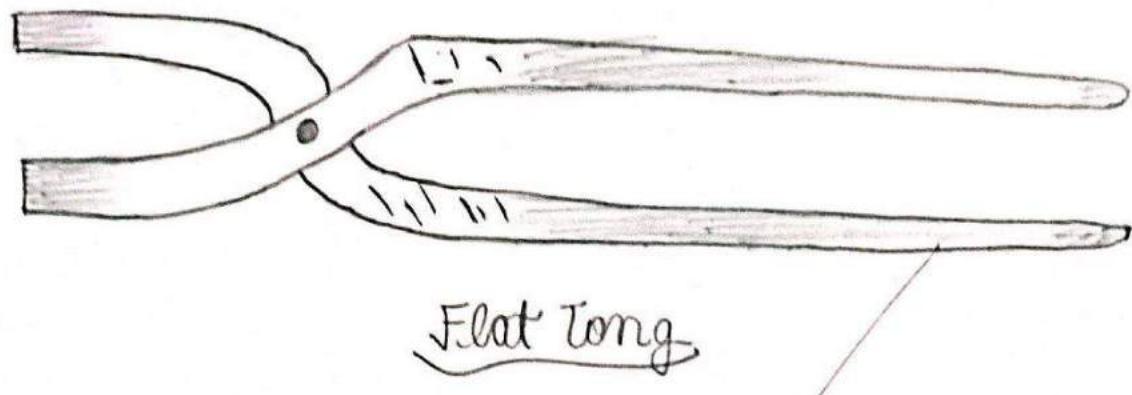
Date of starting :- 20/09/2017

Date of finishing :- 20/09/2017

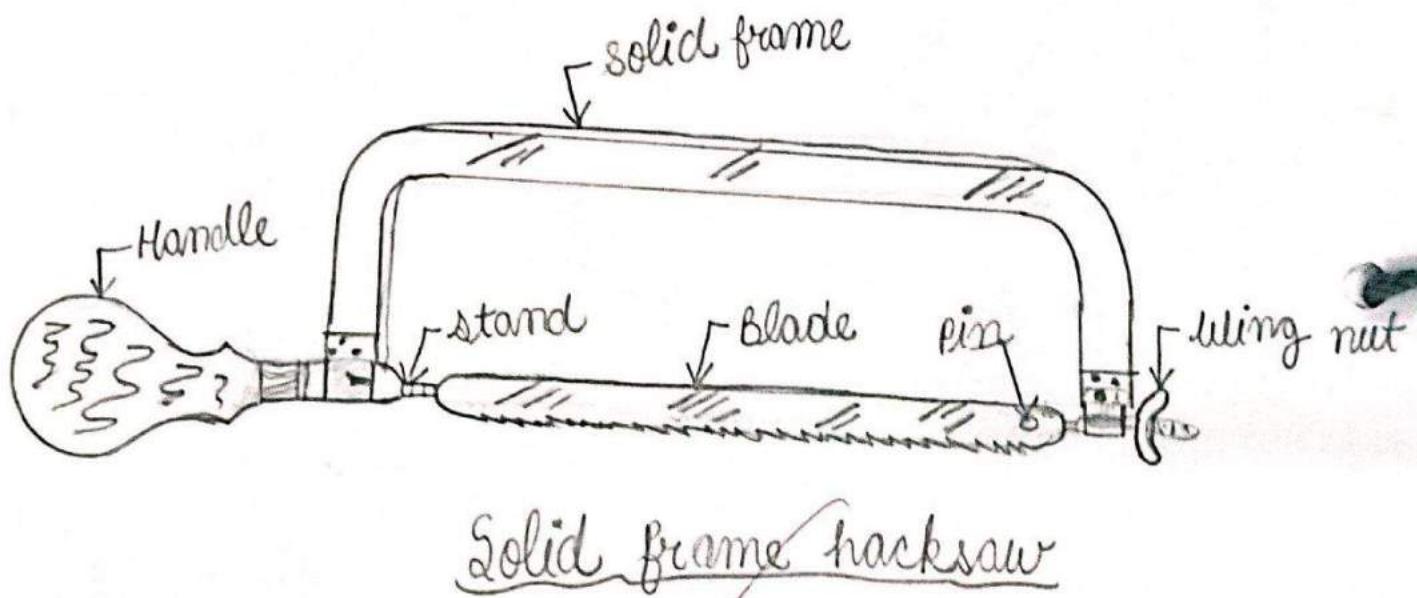
Material Required :- M.S. Flat 100mm x 25mm x 5mm - 2 Nos.
 M.S. Coated electrode 10 SWG.

Tools and Equipments used :-

- 1) **Holding Tools :**
 - a) Flat Tong
- 2) **Cutting Tools :**
 - a) Hacksaw
- 3) **Slag and Spatter Removing Tools :**
 - a) Chipping Hammer
 - b) Steel wire brush
- 4) **Welding Machine :**
 - a) A.C. Arc welding step down transformer set
 - b) D.C. Arc welding motor generator set

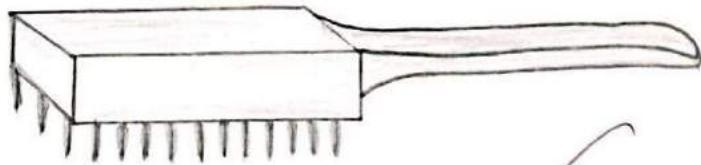
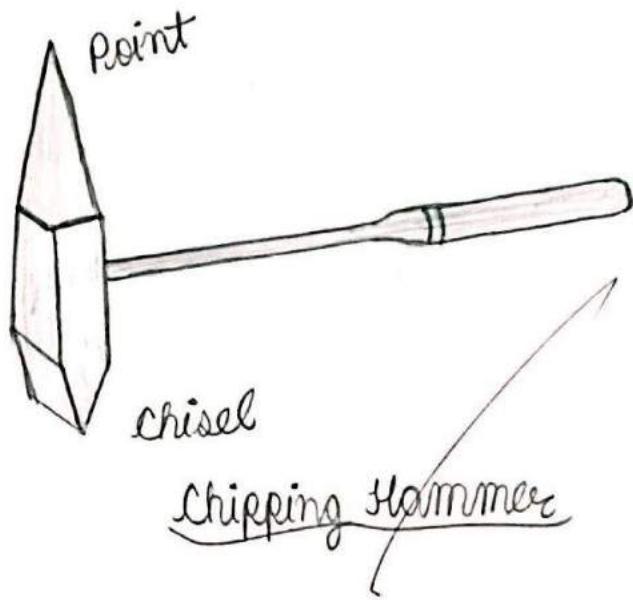


Flat Tong



Solid frame hacksaw

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Biochemical (1st)



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Biochemical (1st)

- 5> Electrode Holder
- 6> Miscellaneous Equipments:
 - a) Working Table
 - b) Earthing Clamp
- 7> Safety Equipments:
 - a) Welding screen
 - b) Leather Apron
 - c) Leather Gloves

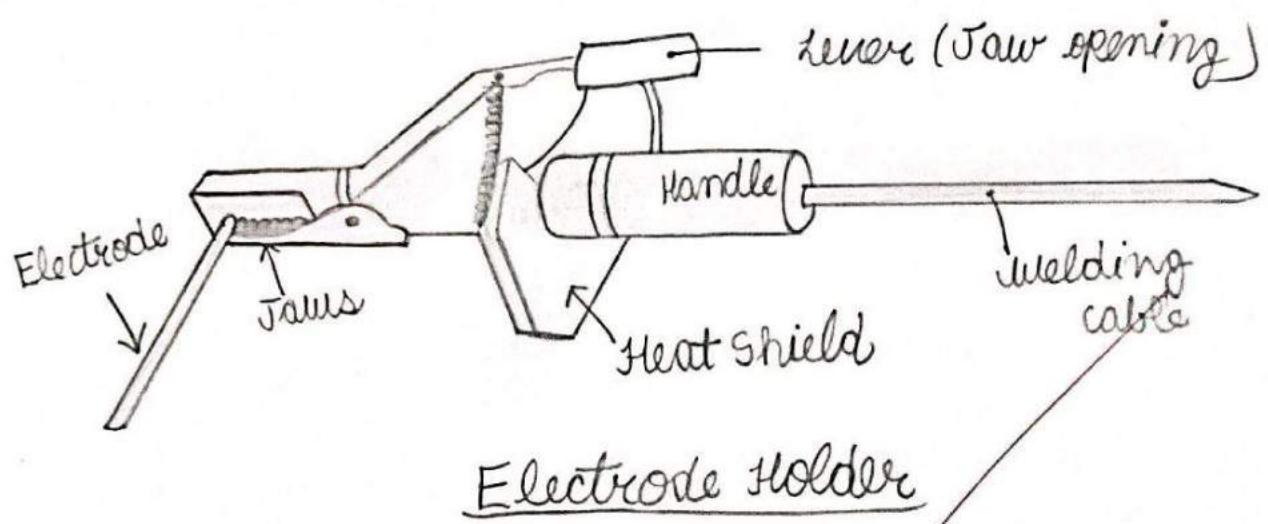
Description of Tools and Equipments:

- 1> Flat Tong: It is made of mild steel and used for holding the hot job.
- 2> Hacksaw: The hacksaw is the chief tool used for cutting flats, rods and pipe into desired lengths. It consists of a metal frame which may be solid or adjustable. The blades fits over two pegs which protect from the pins sliding in the ends of the frame. The blades are made of carbon or high speed steel and may be finished with the cutting edge only hardened or they may be hard all over.
- 3> (a) Chipping Hammer: These are hammers having pointed or sharp striking face and used for removing slag and spatter from the work pieces after welding.

(b) Steel wire Brush : It is used for removing slag and unwanted materials from metal surface in fine way than chipping hammer.

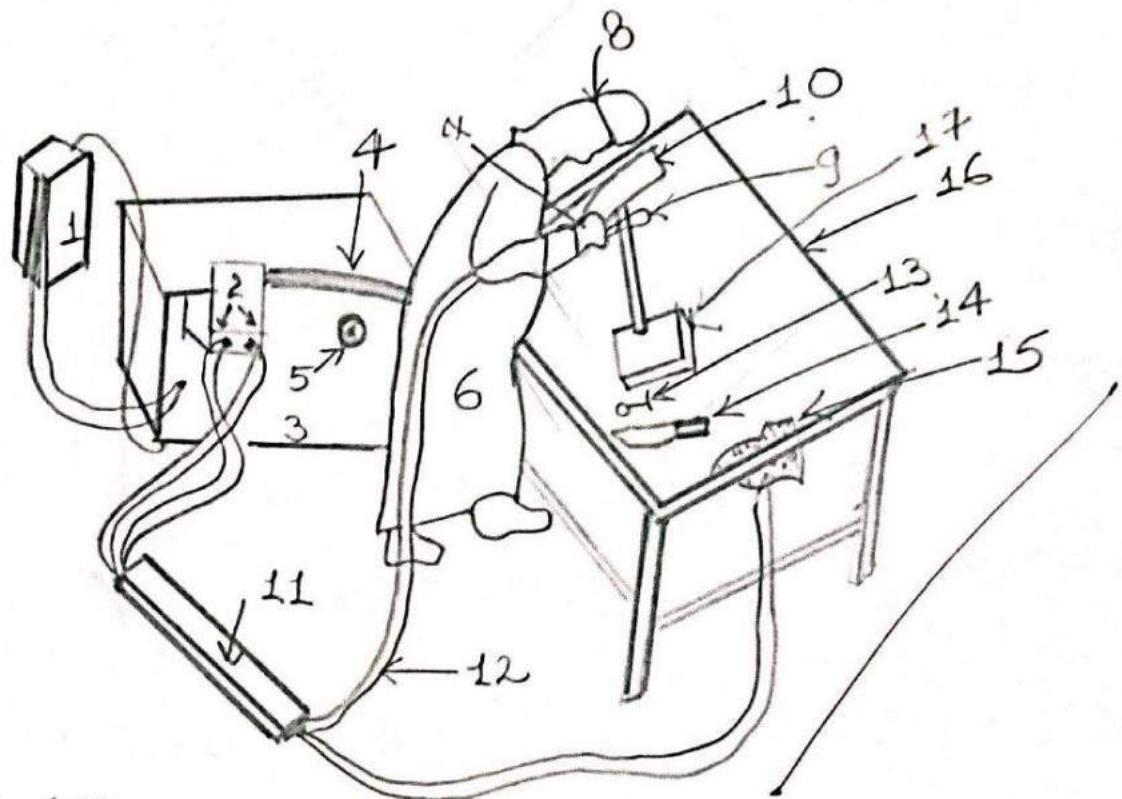
(a) A.C. Arc welding step down transformer set : The A.C. Arc welding step down transformer built in with the welding plant and help in reducing the voltage from 440 volt to about 80 volt. The transformer of the welding plant may be of single phase type or multiphase type depending on the main power supply available. Generally for small fabrication jobs or repair jobs, a single phase transformer welding set is preferred but for higher working load a three phase transformer welding plant is used. It has no moving parts and hence possess low maintenance cost and low installation cost.

(iv) D.C. Arc welding Motor generator set : The D.C. welding machine are either (a) motor generator type or (b) AC-DC transformer rectifier type. One of the big advantage of a DC welding set is that either straight or reverse polarity can be used. Polarity indicates the direction of current flow. Polarity can be changed by a switch on the welding machine or by changing



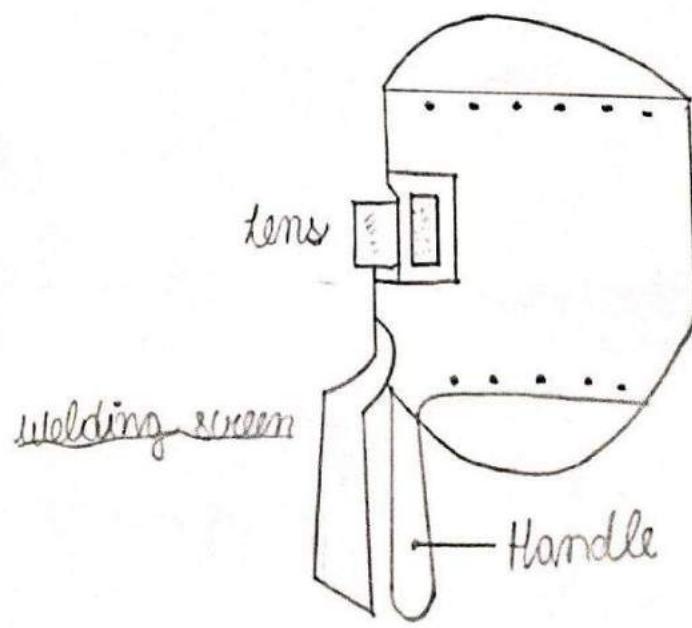
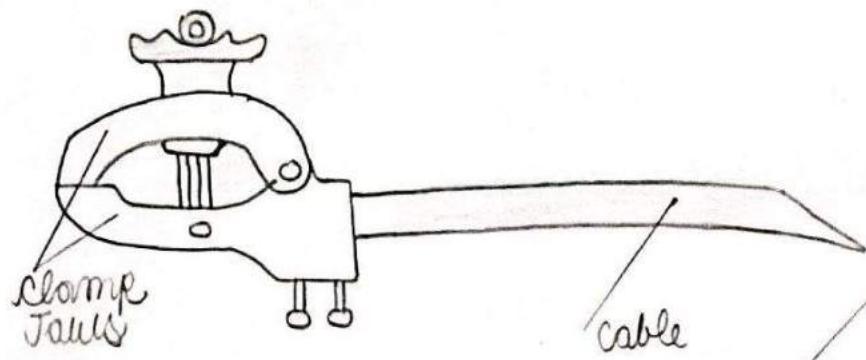
shikhar .srivastava
Biochemical (1st)

Working Table



- 1> switch box , 2> Secondary terminals , 3> welding machine
- 4> current reading scale , 5> current regulating hand wheel , 6> leather apron , 7> leather hand gloves ,
- 8> Protective glasses strap , 9> Electrode holder ,
- 10> Hand shield , 11> channel for cable protection
- 12> Welding cable , 13> chipping hammer , 14> wire brush , 15> Earth clamp , 16> welding table (metall)
- 17> Job

Earthing clamp



shikhar sriuastava
Biochemical (1st)

the cable connections. Most of the heat is liberated in the positive side of the arc.

- 5) Electrode Holder : It is used to hold electrodes during welding. The welding cable passes through the hollow insulated handle. The electrode is held between two spring loaded jaws. Electrode holders are also rated in terms of current carrying capacity.
- 6) (a) Working Table : It is made of mild steel and the job is placed on the working table during welding. The earthing clamp is clamped in working table.
- (b) Earthing clamp : It connects the earthing cable to work-piece either directly or through the welding table on which work piece is placed.
- 7) (a) Welding screen : It is used to protect eye and face from spark and ultraviolet and infrared rays emerging from the arc during welding. It is made up of fibre sheet and black glass are fitted to look at weld.

- (iv) Leather Apron : Aprons are made up of chrome leather they are used for protection against spatter and spark.
- (c) Leather Gloves : These are made of chrome leather and protects the hand from spark and scattering of metal during welding.

Procedure :-

Cut the two pieces of required length from M-S Flat of required width and thickness by means of hacksaw.

Connect the earthing plug with welding table consisting iron top and three side cabin like structures to escape dispersion of committed rays and light etc. out of work place.

Set current (90 - 120 Amp.) and voltage (20 volt) according to the thickness of job.

Place the mild steel job on working table in proper position after making it clean with the help of wire brush.

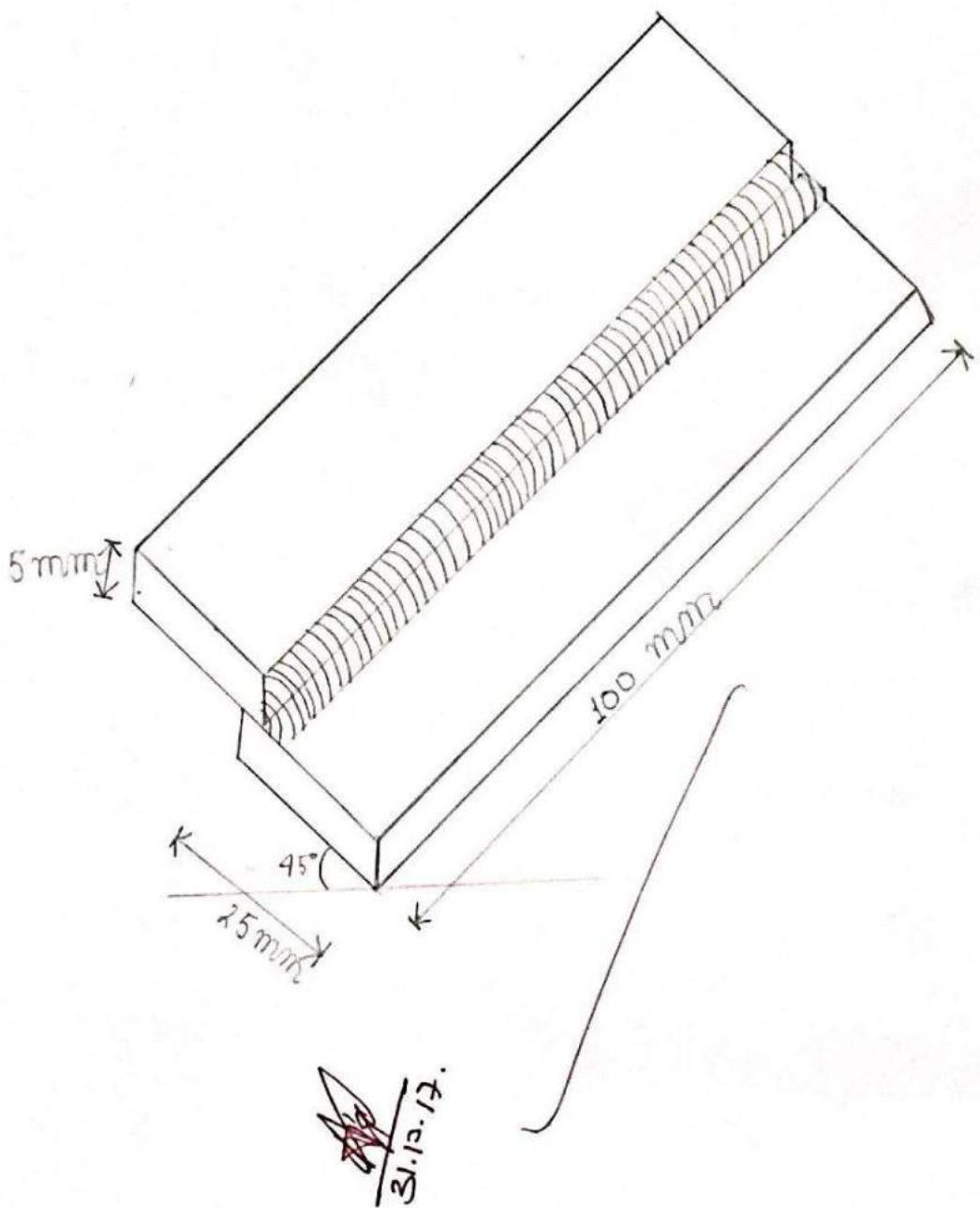
Hold the electrode in electrode holder.

Start the welding from upper side to lower side at a uniform speed.

Remove the slag and spatters etc. with the help of chipping hammer and steel wire brush.

Precautions :-

1. Check all the connections before starting the welding.
2. Use suitable current and voltage values for welding.
3. Always adopt right tool and right procedure for every operation in welding shop.
4. Always use leather apron, gloves and welding screen during welding operation. Welding should never be seen with naked eyes during welding.
5. Avoid stacking electrode at job in arc welding.
6. Avoid chatting with others while doing welding.
7. Always select correct electrode size for welding.
8. Always use tongs to hold the hot work piece.
9. Switch off the main switch when the work of day is over. This is done in order to avoid any short circuit, sparking etc.



shikhar sinhastava
Biochemical (1st year)



HARCOURT BUTLER TECHNOLOGICAL UNIVERSITY
KANPUR
WORKSHOP PRACTICE - 2

FULL NAME SHIKHAR SRIVASTAVA
SHOP WELDINGI SHOP

CLASS 1st
BE
DATE
4/10/17

Practice 2.

Object :- To make a single lap joint by oxy-acetylene gas welding process as per given drawing.

Date of starting :- 04/10/17

Date of finishing :- 04/10/17

Material Required :- M.S. Flat 100 mm x 25 mm x 5 mm - 2 Nos

M.S. bare electrode Ø 3 mm

Tools and Equipments used :-

1) Holding tools:

(a) Flat tong

2) Cutting tools:

(a) Hacksaw

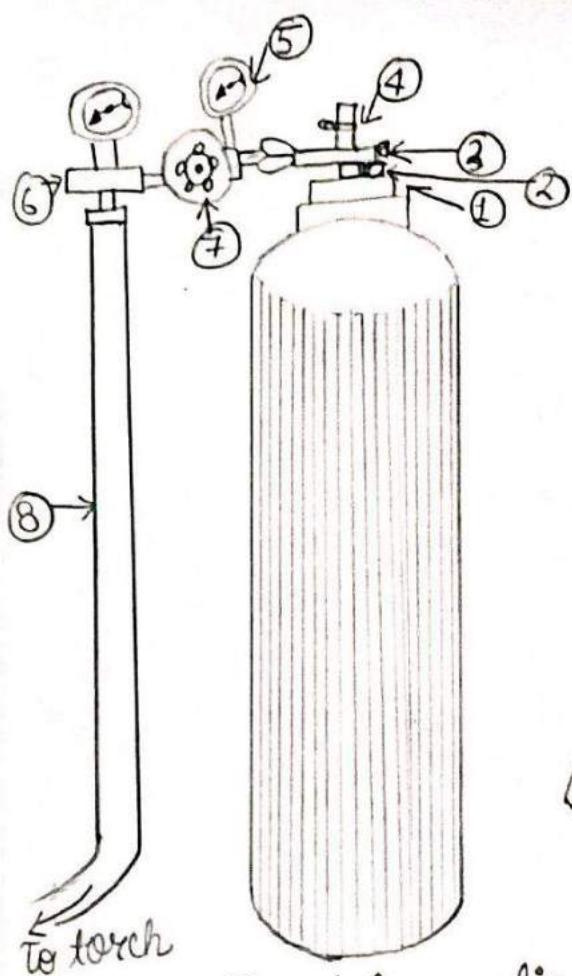
3) Slag and Spotter Removing tools:

(a) Chipping Hammer

(b) Steel wire brush

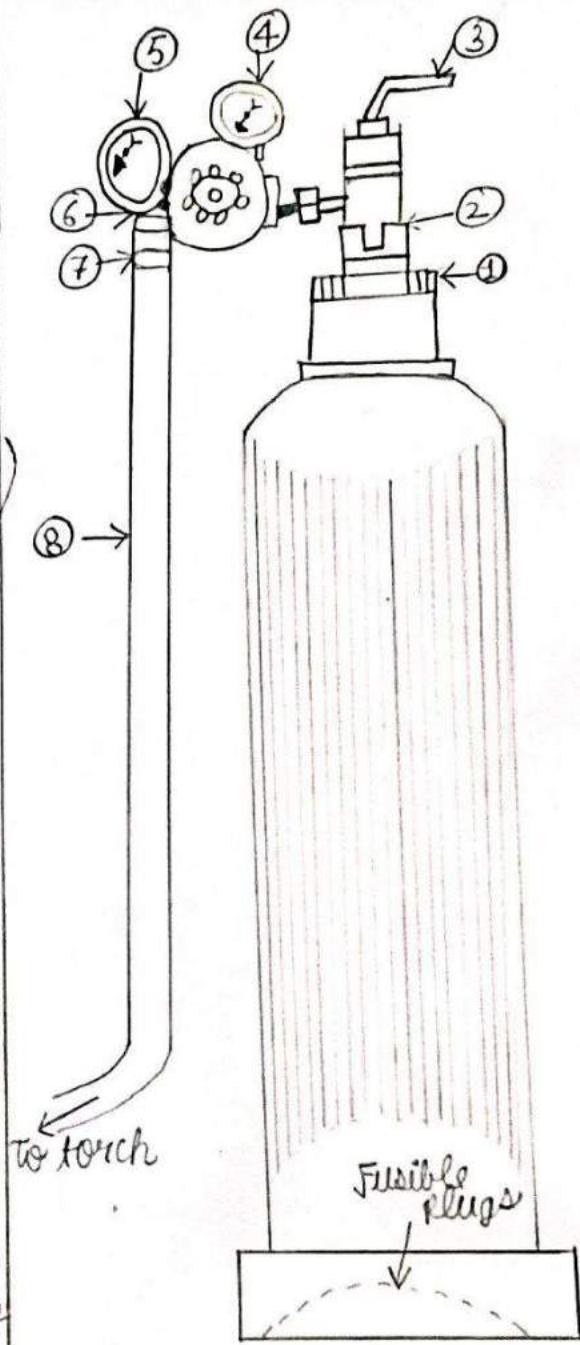
4) Welding and safety equipments:

(a) Oxygen gas cylinder



(1) Acetylene cylinder

1. Fusible plugs, 2. Acetylene cylinder, value
3. Valve wrench, 4. Cylinder pressure gauge
5. Regulator outlet pressure gauge
6. Acetylene regulator, 7. Adjusting screw
8. Acetylene hose to torch



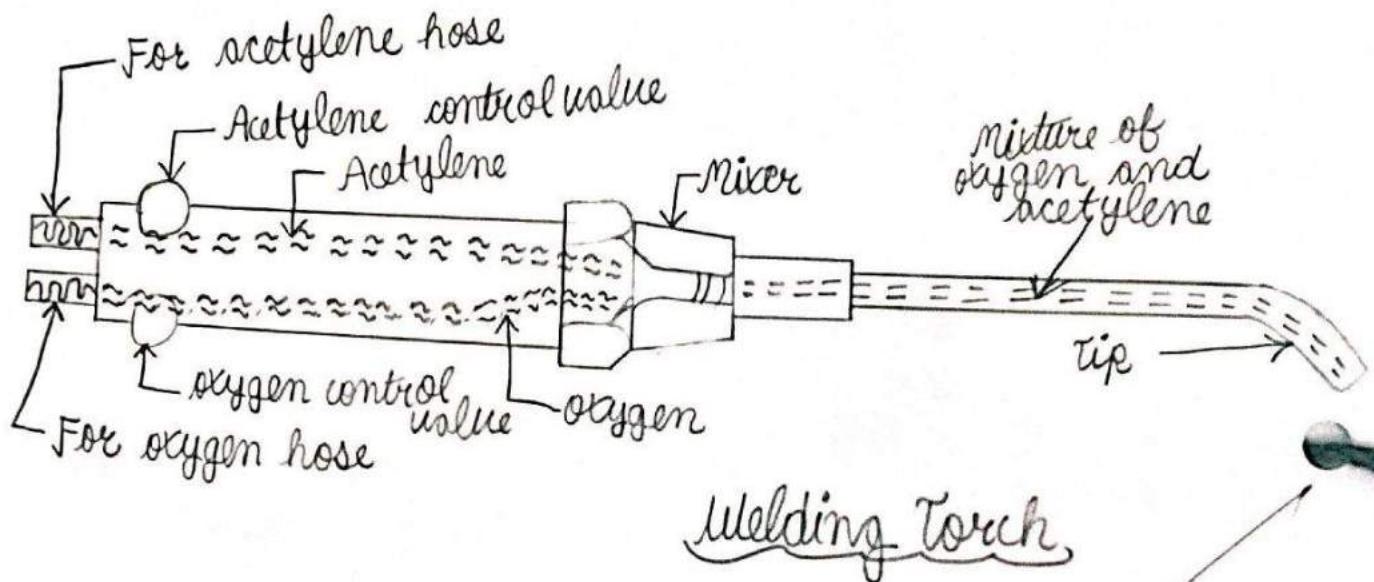
(2) Oxygen cylinder

1. cap, 2. bursting disc, 3. oxygen valve
4. Handwheel, 5. Pressure gauge
6. oxygen regulator, 7. Adjustment screw, 8. oxygen hose to torch

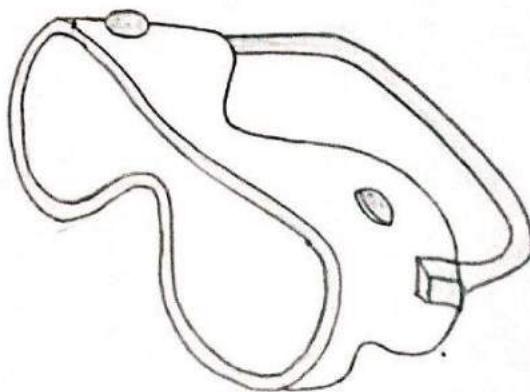
- (v) Acetylene Gas cylinder
- (x) Blow pipe or welding torch
- (d) Pressure Regulator
- (e) Hose pipe and fittings
- (f) Goggles
- (g) Leather Apron
- (h) leather gloves
- (i) Spark lighter

Description of Tools and Equipments :-

4. (a) Oxygen Gas cylinder : Oxygen is filled in solid drawn steel of mild steel or alloys steel cylinders having capacity of 3400 litre, 5200 litre and 6800 litre. The oxygen is filled in cylinders to a pressure of 125 to 140 kg/cm². Volume of oxygen in its cylinder is proportional to its pressure. Oxygen cylinders are painted black and the valve outlets are screwed right handed. A safety nut is provided at the top of cylinder to allow leakage of oxygen at the time when due to increase in temperature, the gas pressure increases beyond safety load of the cylinder the mass of oxygen cylinder is approximately 65 kg when it is full.



31.12.12



Shikhar Srivastava
Biochemical (1st)

(b) Acetylene gas cylinder : The acetylene gas cylinders are painted maroon and their outlet valves are screwed left handed. The cylinder is charged with acetylene to a pressure of about 16-25 kg/cm². The usual sizes of acetylene cylinder are 2800 litre and 5600 litre. An acetylene cylinder has a number of fusible plugs at its bottom which may melt and give away to acetylene to escape out at 104°C if cylinder is exposed to excesses heat or in case of fire. The spindle valve of the cylinder can be opened with a special wrench. Its mass is about 86 kg when it is full.

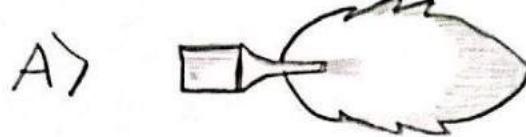
(c) Blow pipe or welding torch : The welding torch is a tool for mixing two gases in the desired proportions and burning the mixture at the end of torch tip. It has a handle to hold it and two inlet connections for two gases at one end such that each inlet has a valve to control the volume of oxygen and acetylene. The two gases from the two paths mix up in the mixer in the torch and the gas mixture that comes out of the tip of torch is ignited to

produce the flame. The welding torches are of two types - (a) High Pressure (Equal pressure type) (b) Low Pressure (Injector type).

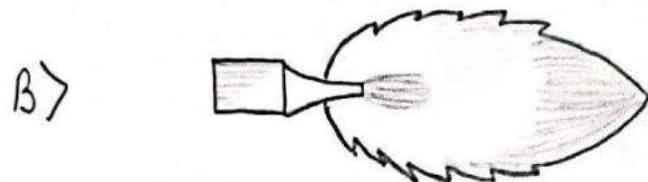
(d) Pressure regulators : Pressure regulator reduces the pressure from the cylinder. It maintains the constant delivery pressure and gas volumetric rate at correct value regardless of the pressure variations at the source. These are also helpful in adjusting the pressure of gas to torch.

(e) Hose pipe and fittings : Hoses are used in two numbers, one for oxygen and other for acetylene. The hose for oxygen supply is coloured black and has right handed thread connections. The acetylene is coloured maroon and has left handed thread connection with chamber or grooves on the nuts. The hose for welding torches should be strong, durable, non-porous, light and flexible.

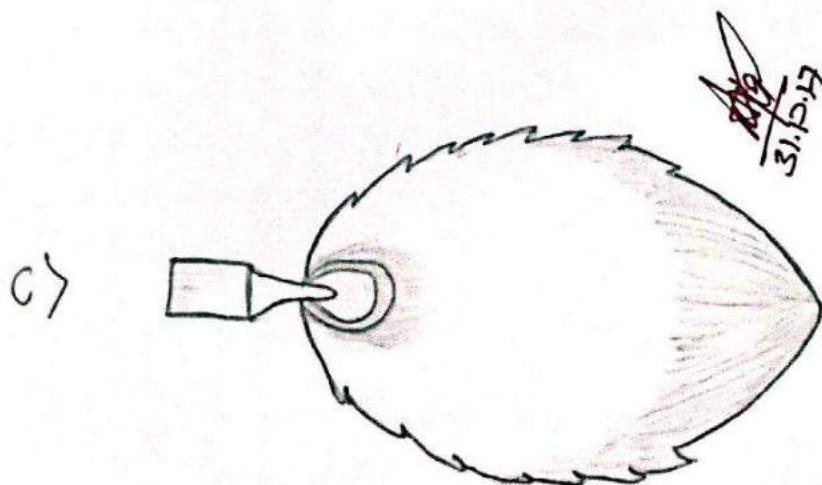
(f) Goggles : It is used to protect eye from flame and ultraviolet and infra red rays emerging from the flame during welding.



Oxidising flame



Neutral flame



Carburizing flame

it is made up of fibre sheet and black glass are fitted to look at weld.

(g) Spark lighter : It provides a convenient and instant means for lightning of welding torch.

Procedure :

1. Cut the two pieces of required length from mild steel flat of required width and thickness by means of hacksaw.
2. Check all connections etc of oxy acetylene gas plant.
3. Clean surface of mild steel flat pieces of work piece.
4. Place carefully the mild steel flat pieces in proper position on the work table.
5. Set properly the welding flame by adjusting the pressure of both gases.
6. Start welding carefully.
7. After welding remove slag from the job by chipping with the help of chipping hammer.
8. Remove fine particles of slag from the job by chipping with the help of chi using steel wire brush.

Precautions :-

1. Always check all the connections before starting the welding.
2. Handling of acetylene and oxygen gas cylinder should be done carefully. Always use trolley for transportation of cylinders.
3. Check carefully of any leakage of both the gases before welding.
4. Set the work pieces according to the welding position.
5. Use properly adjusted pressure value of both gases desired as per the welding flame.
6. Wear leather apron and goggles etc during welding.
7. While starting the gas flow, first open the acetylene valve and then the oxygen valve whereas while stopping the gas supply, close the oxygen valve first and then the acetylene valve.

