TUTORIAL / PRACTICAL No.

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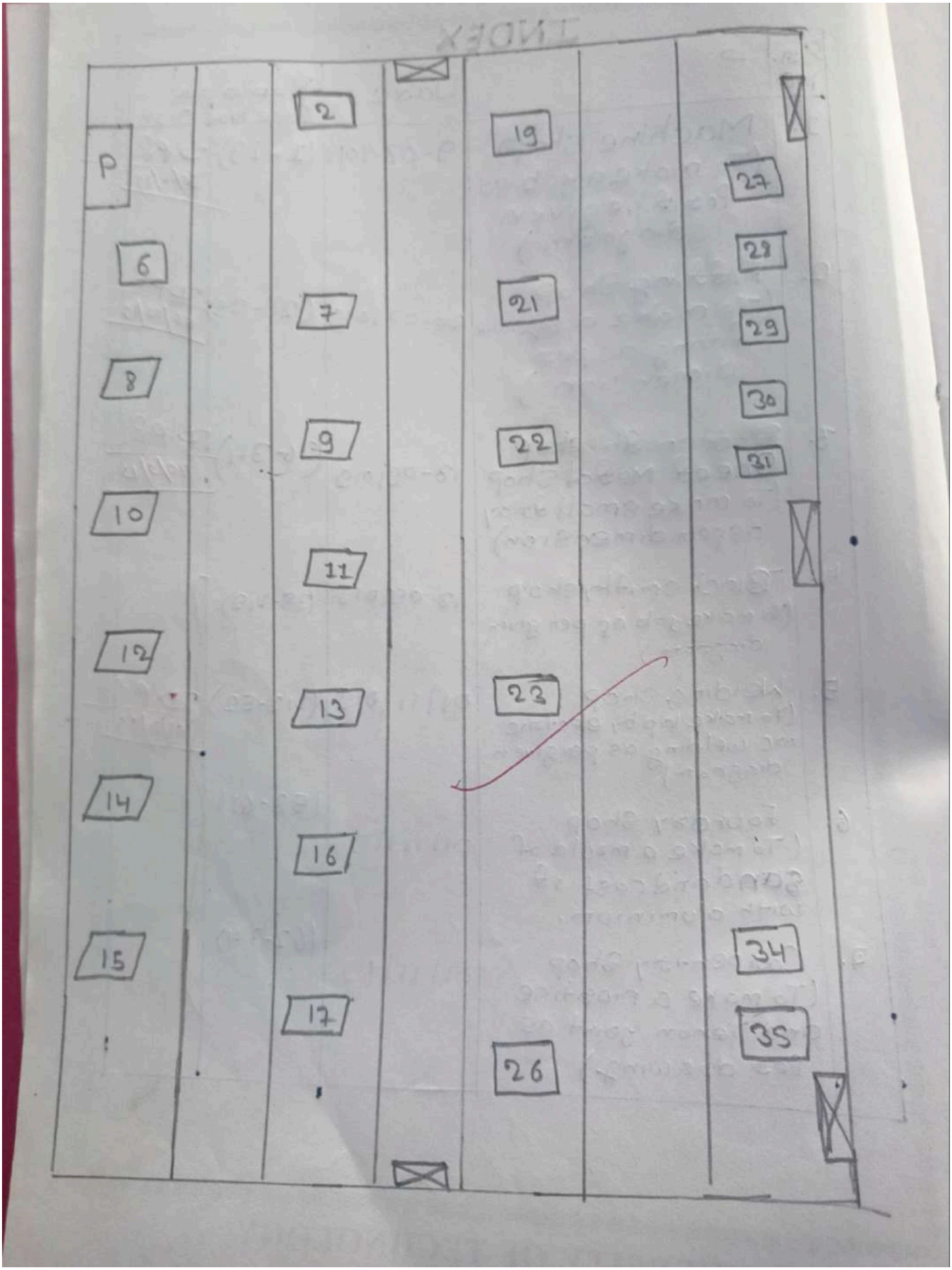
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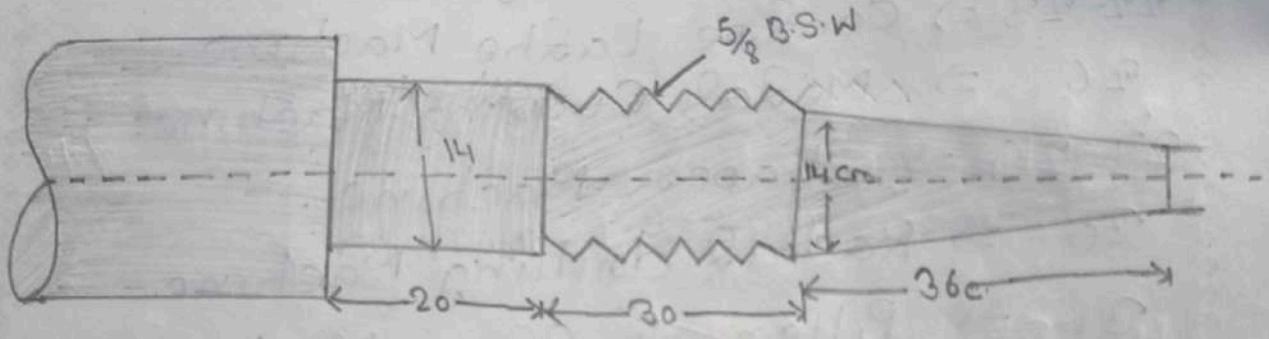
TUTORIAL / PRACTICAL NO.

Machine Shop Layout

02 ⇒ Universal milling Machine.
06 ⇒ Carbide tripped tool gathering Machine.
07-17 ⇒ Centre Lathe Machine.
19 ⇒ Universal milling Machine.
21 ⇒ Piller drilling Machine.
22-23 ⇒ Centre Lathe Machine.
26 ⇒ Metal Cutting Machine.
27-29 ⇒ Shaper Machine.
30 ⇒ Radial drilling Machine.
31 ⇒ Piller drilling Machine.
34 ⇒ Pedestal grinding Machine.
35 ⇒ Power hacksaw machine.



All dimension are in mm

B-Tech 1st year Experiment

Object ⇒ To make a job as per the given drawing.

Material Used ⇒
Mild steel rod 20 mm dia (MS)

Tools and Experiment
Centre Lathe machine, High Speed steel Cutting tool (V-Shaped) Threading tool Outside caliper (Spring type) Universal Surface gauge, Steel scale 6.

Formula Used ⇒

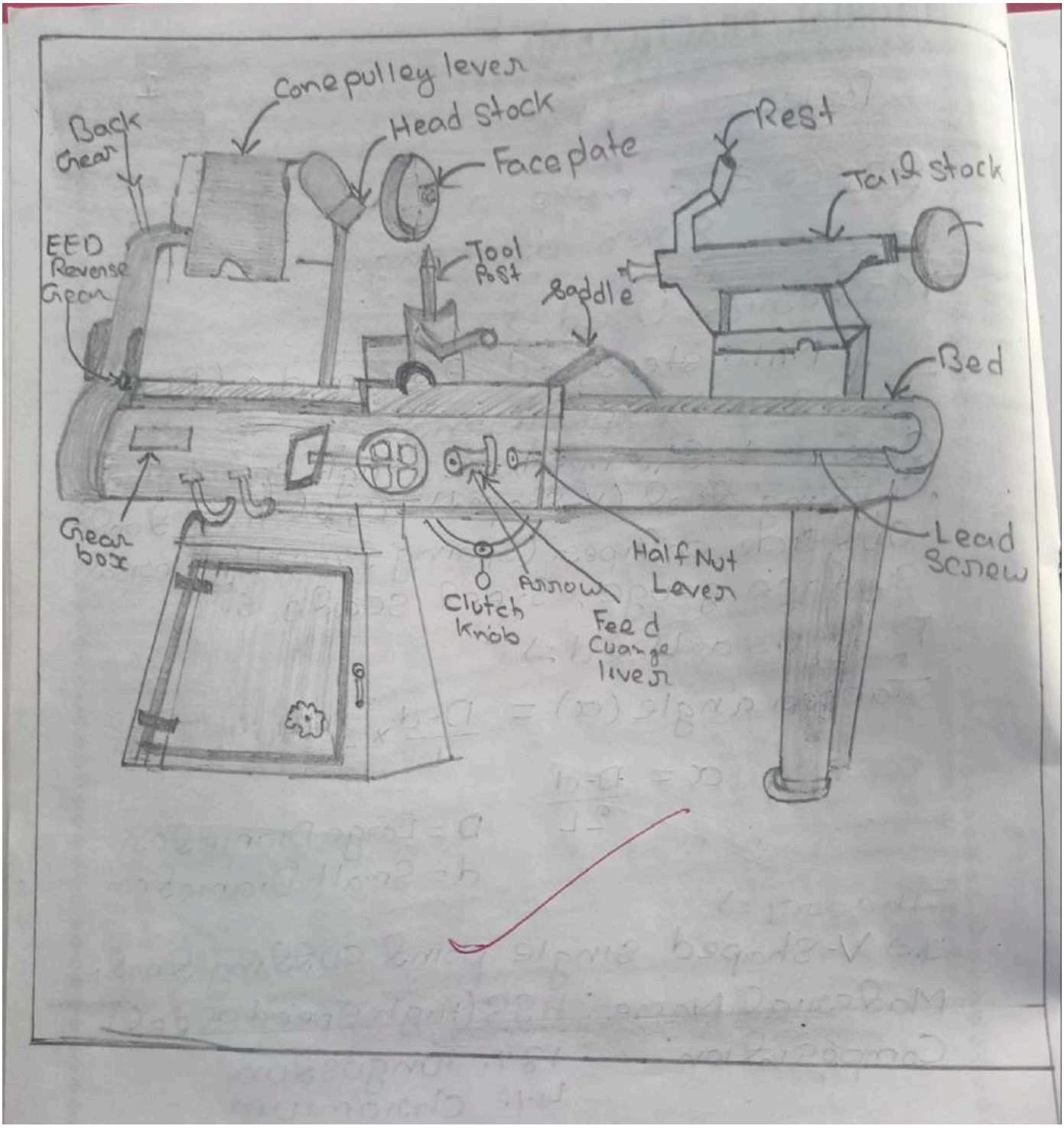
Tapper angle (α) = $\frac{D-d}{L} \times \frac{1.414}{5}$

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

D = Large Diameter
d = Small Diameter

Theory ⇒
1. ⇒ V-Shaped single point cutting tool.
Material Name : HSS (High Speed Steel)
Composition :
18% Tungustun
4% Chromium
1% Vanadium
0.75% Carbon
0.2% Magnese
0.25% Silicon
Rest iron.

2. ⇒ Universal Surface gauge.
Working ⇒ Checking the job surfacing centering and Marking.


Cone pulley lever
Back Gear
Head stock
Faceplate
Rest
Tail stock
FEED Reverse Gear
Tool Post
Saddle
Bed
Gear box
Half Nut Lever
Lead Screw
Clutch Knob
Arrow
Feed Change lever

Main Part ⇒

a.) Scriber
b.) Scriber clamp Nut
c.) Spindle
d.) Spindle clamp Nut
e.) Fine adjusting screw
f.) Guide Pin
g.) Body or Base

3) Centre Lathe Machine

Lathe

Lathe can be ~~divided~~ defined as Machine tool which hold the work between two rigid and strong supports (called centre) or in chuck or face plate.

Types of Lathe Machine

According to their construction and design we can broadly classify lathe as follow.

(a) Bench Lathe
(b) Speed Lathe
(c) Centre Lathe (engine lathe)
(d) Tool room lathe
(e) Capstan and turret lathe
(f) Automatic lathe
(g) Special purpose lathe.

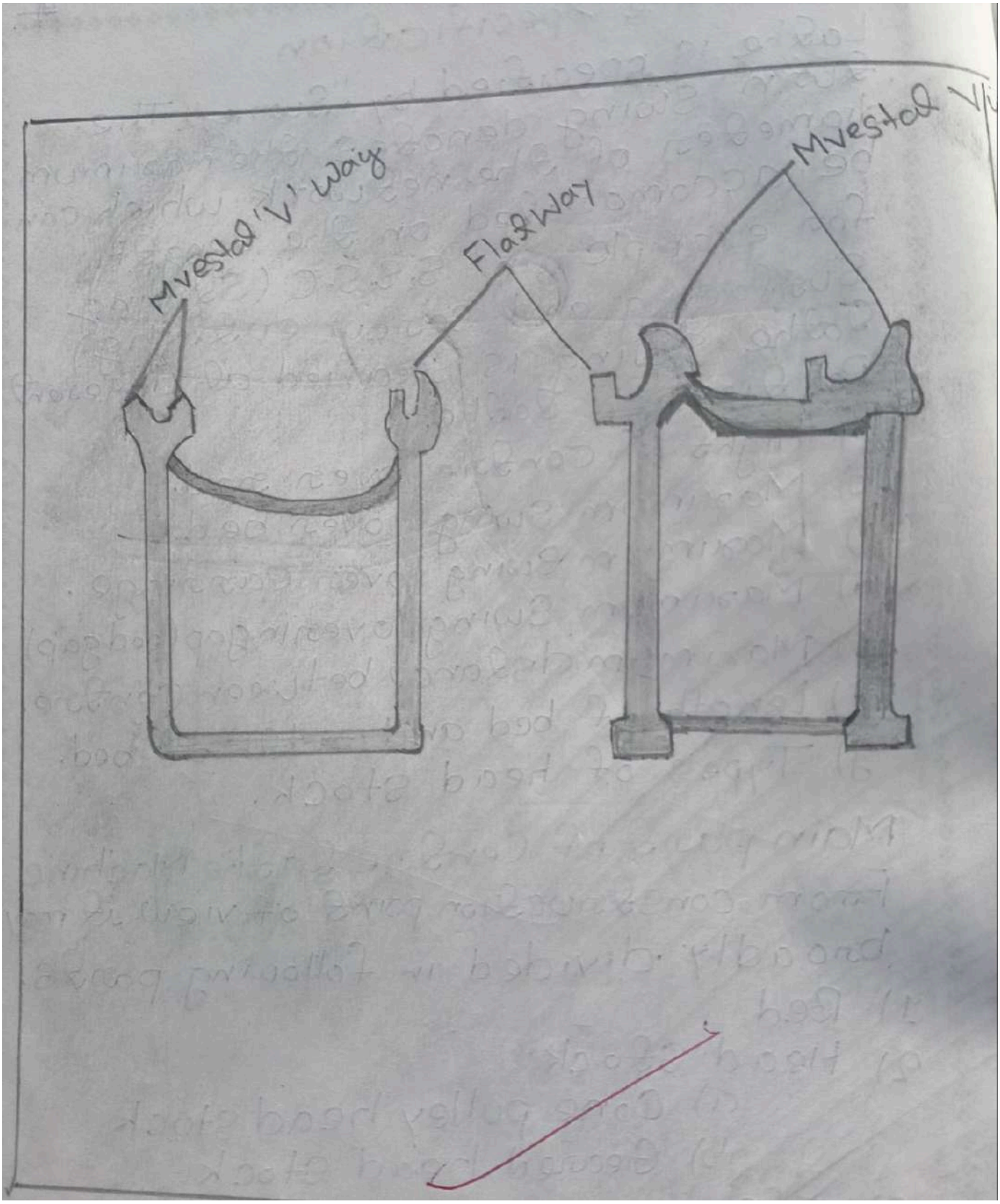
3. Lathe Specification

Lathe is specified by "Swing". The term swing denotes the maximum diameter of the network which can be accomodated on the length for example an S.S.S.C (Sliding Surfacing and screw cutting) Lathe swing is specified at different position on lathe.

a) Height of centre over rod.
b) Maximum Swing over bed.
c) Maximum Swing over carriage.
d) Maximum Swing ~~over~~ in gap (bed gap)
e) Maximum distance between centre.
f) Length of bed and width of bed.
g) Types of head stock.

Main parts of Centre lathe Machine From construction point of view it may broadly divided in following parts.

1) Bed
2) Head Stock
   a) Cone pulley head stock
   b) Geared head stock
3) Tail Stock
4) Carriage
5) Feed Machine
6) Leg.


Mvestal 'V' Way
Flaaway
Mvestal V

Bed :-

It is heavy structure made up of cast iron in single piece or single piece casting of semisteel (i.e toughned Cast iron) with the addition of small quantity of steel scrap to the cast iron during melting. Single casted bed is used in small machine and large machine. Split bed is usually split in two pieces Commonly the bed casting consist of fine grained structure with 200 ± 10 % B.H.N. It usually works as supporting and guiding base for carriage head stock and tail stock etc.

Head stock :-

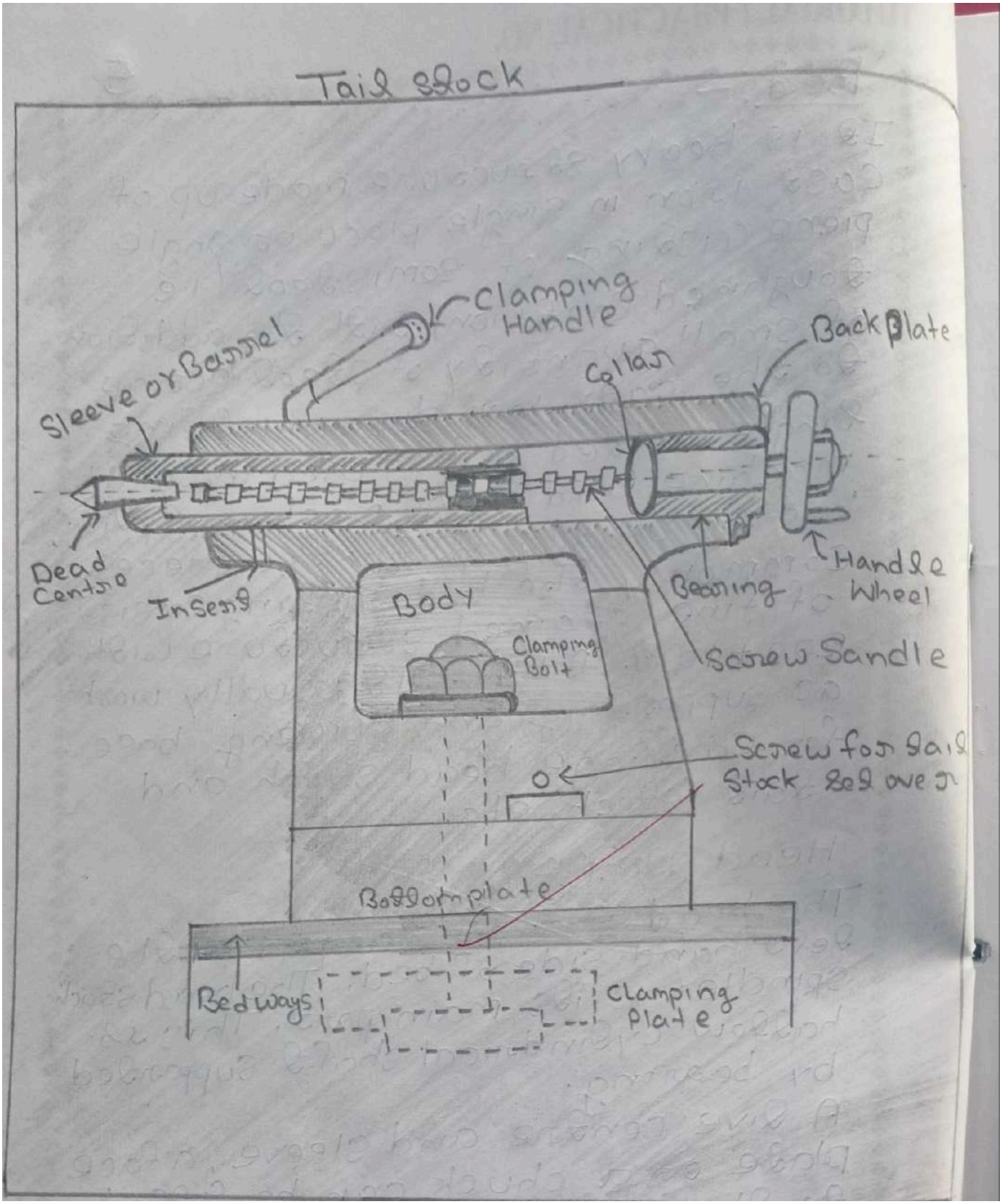
The head stock is clamped on the left hand side of bed. The headstock spindle is its main part. This is hallow cylindrical shaft supported by bearing.

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

There are two types of headstock.

a) Compound type
b) Simple type.

Tail stock


Clamping Handle
Back plate
Collar
Sleeve or Barrel
Dead Centre
Inserts
Body
Clamping Bolt
Bearing
Handle Wheel
Screw Sandle
Screw for tail Stock set over
Bottom plate
Bed ways
Clamping Plate

a) Cone pulley head stock
b) Geared head stock

Main part of head stock.

1) Cone pulley
2) Back gear and back pulley
3) Main spindle or head stock spindle
4) Live centre
5) Feed reverse
6) Gear train
   a) Compound type
   b) Simple type
7) Reverse gear lever
8) Belt tension lever

Tail stock :-

It is a casted structure mounted at other end of bed. It provides housing for dead centre, tapered shank drill, drill chuck and reamers etc. Tail stock can slide over V-shaped guide ways provided over bed surface.

The main function of the tail stock is to provide bearing support to the job which is being worked between centres.

The main part of tail stock are :-

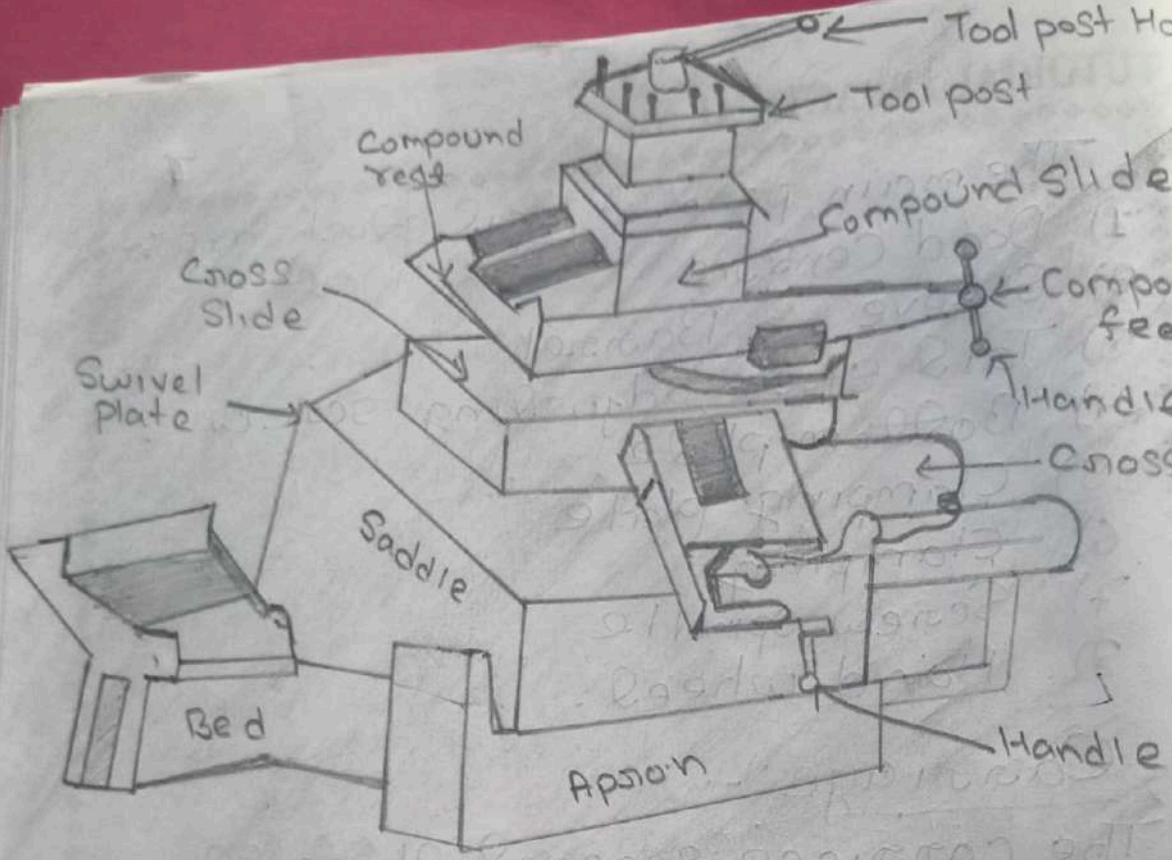
1) Dead Centre
2) Sleeve or Barrel
3) Tail stock adjusting screw
4) Bottom plate
5) Clamping plate
6) Clamping
7) Screw spindle
8) Hand wheel.

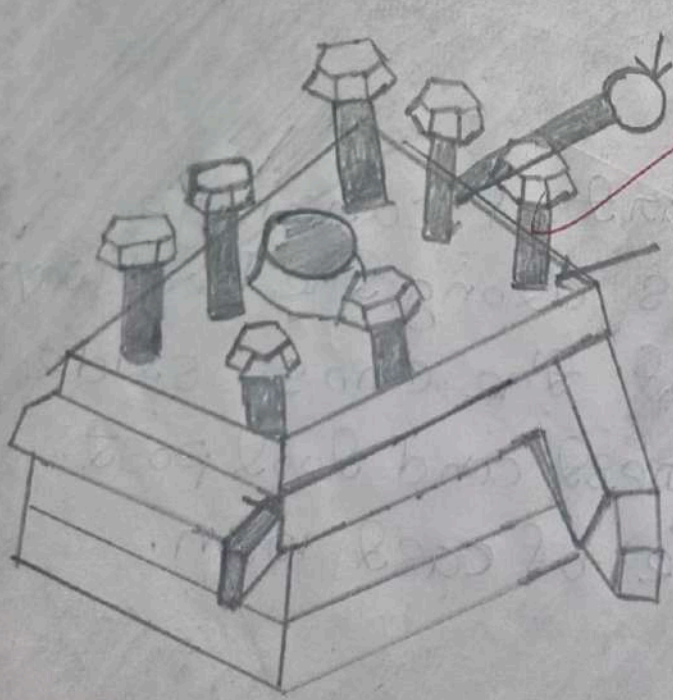
Carriage :-

The carriage support the cutting tool and used to move it along the bed of lathe for turning operation. It consist of following main parts.

(a) Saddle

It is the part of carriage which slides along the bed ways and support the cross slide Compound rest and tool post. It is made of cast iron.


Tool post Handle
Tool post
Compound rest
Compound Slide
Cross Slide
Compound feed
Swivel plate
Handle
Cross Slide
Saddle
Bed
Apron
Handle


Tumbler lock
Four way tool

(b) Cross slide :-

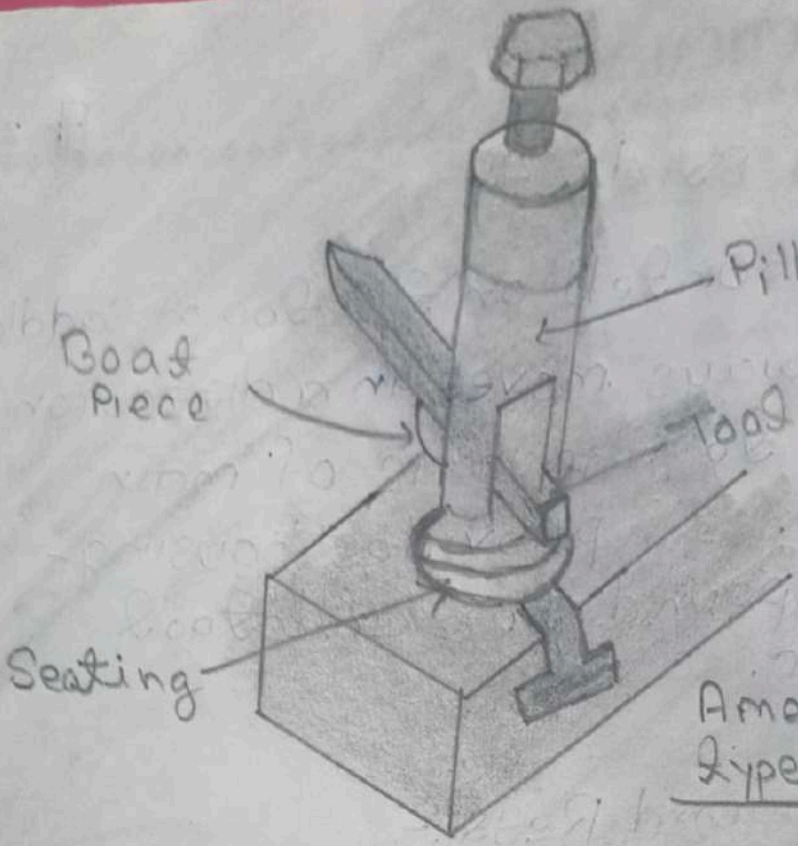
It is mounted on the top of saddle and always moves in a direction normal to the axis of main spindle. It provides housing for compound rest and tool post etc.

(c) Compound Rest :-

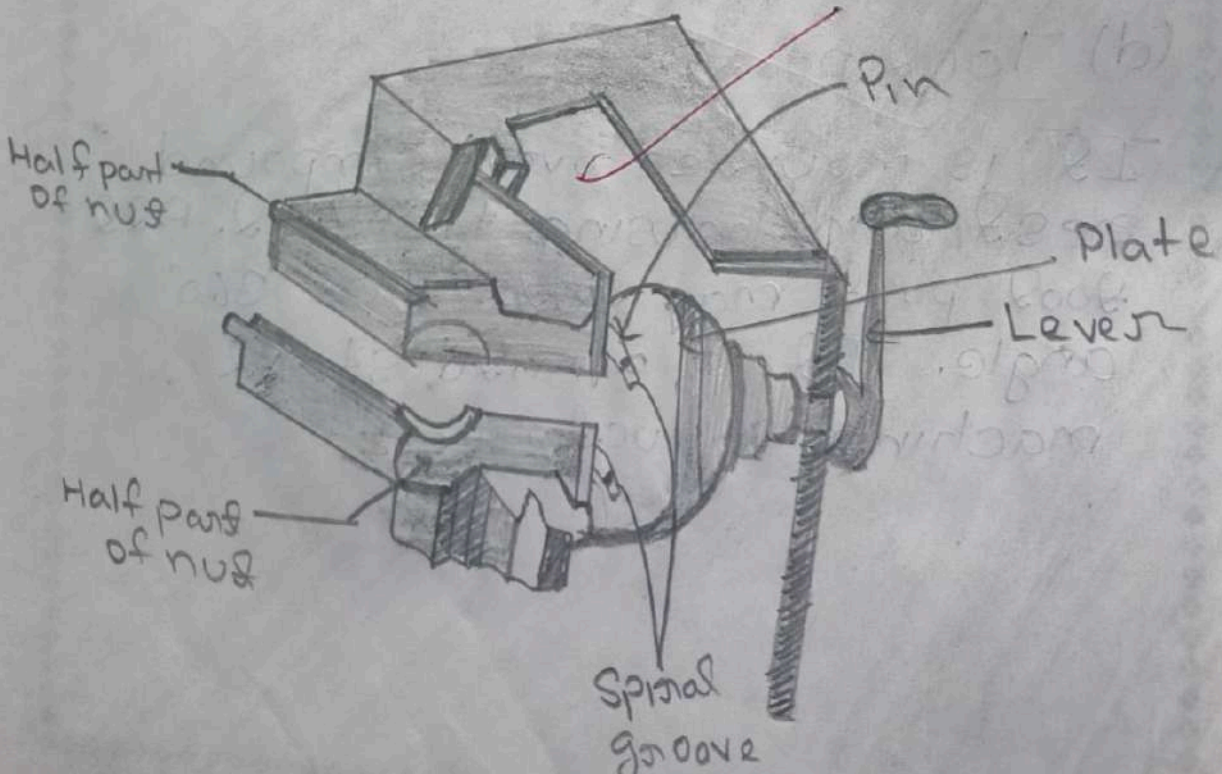
It is mounted on the cross slide with the help of a swivel plate by which it can rotate in horizontal plane. It providing housing for tool post.

(d) Tool post :-

It is mounted over compound rest and housing for tool. All tool post may rotate at 360° angle. It is a mild steel machine structure.



American pillar type tool post



(e) Apron :-

It is a hanging position under the saddle and provides shade for gears and half nut etc.

(f) Half nut lever.

It is consist of lever threaded sleeve splitter in two halves which get engaged by operating half nut lever mounted on apron half nut is employed for thread making process.

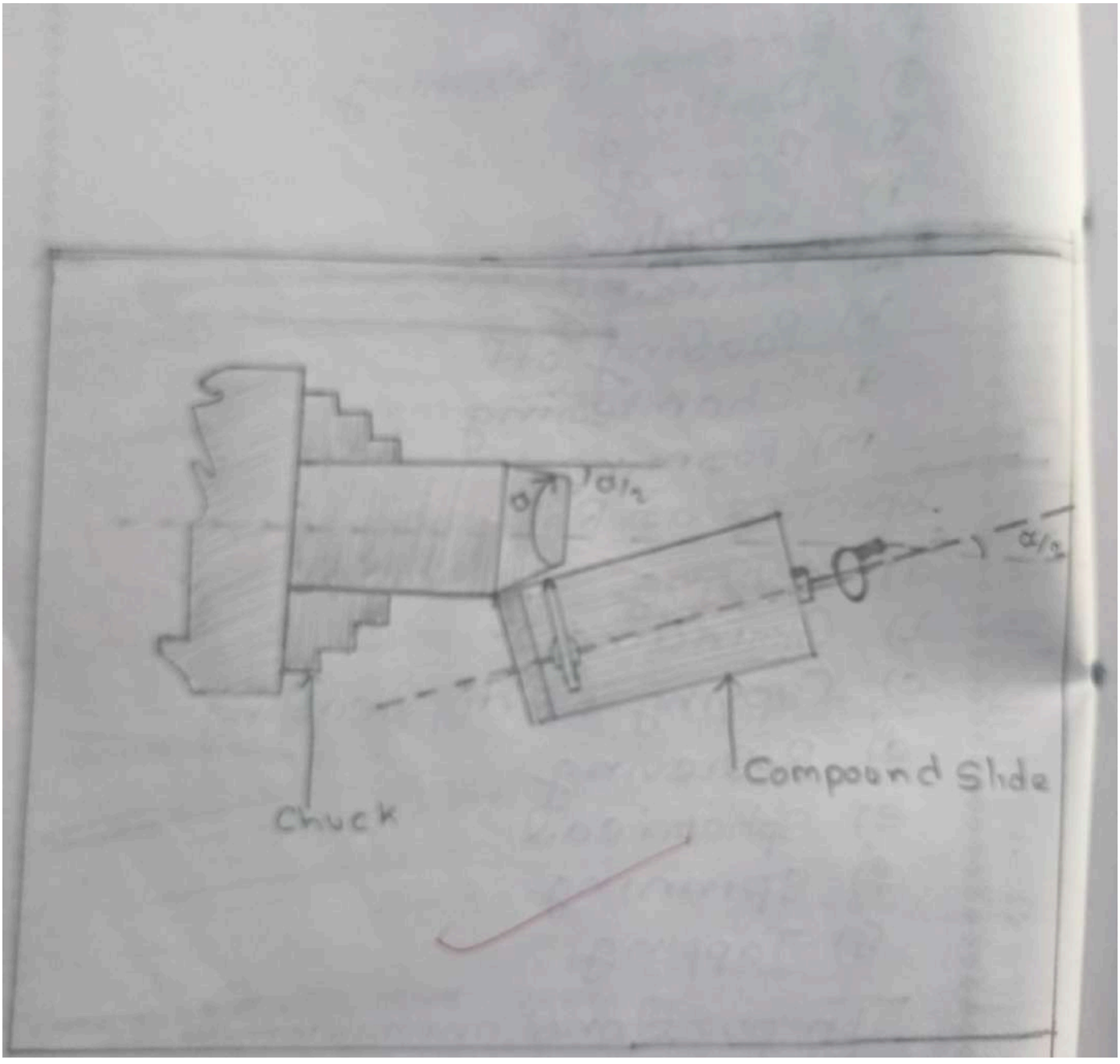
Lathe operation

a) Plane turning
b) Step turning
c) facing
d) Taper turning
e) Threading
f) Eccentric turning
g) Drilling
h) Boring
i) knurling
j) Reaming
k) Parting off
l) Chamfering
m) Forming.

Special or Rare operation

a) Milling
b) Grinding
c) Copying or duplicating
d) Relieving
e) Spherical
f) Spinning
g) Tapping

Important operation :-


α/2
α/2
Compound Slide
Chuck

(a) Facing Turning

Facing involves to make front side work metal to be uniform by turning. In this process tool feeding is done by cross slide.

(b) Plane Turning :-

In plane turning, diameter of work metal is reduced. In this operation tool feeding is done by star wheel or moving toward chuck etc.

(c) Step Turning :-

By using plain turning process the diameter of job is reduced in step by step. Depth of cut Cross-slide feed by longitudinal wheel.

d) Taper Turning :-

Taper turning is associated with turning operation in which the diameter of work metal is gradually reduced along with turning process. Depth of cut given by cross-slide and cutting feed is given by compound slide.

(e) Threading :-

The process involves thread making on work metal at desired ~~metal~~ angle and depth.

Types of threading

(a) External threading

(b) Internal threading

As per direction two types of threading are-

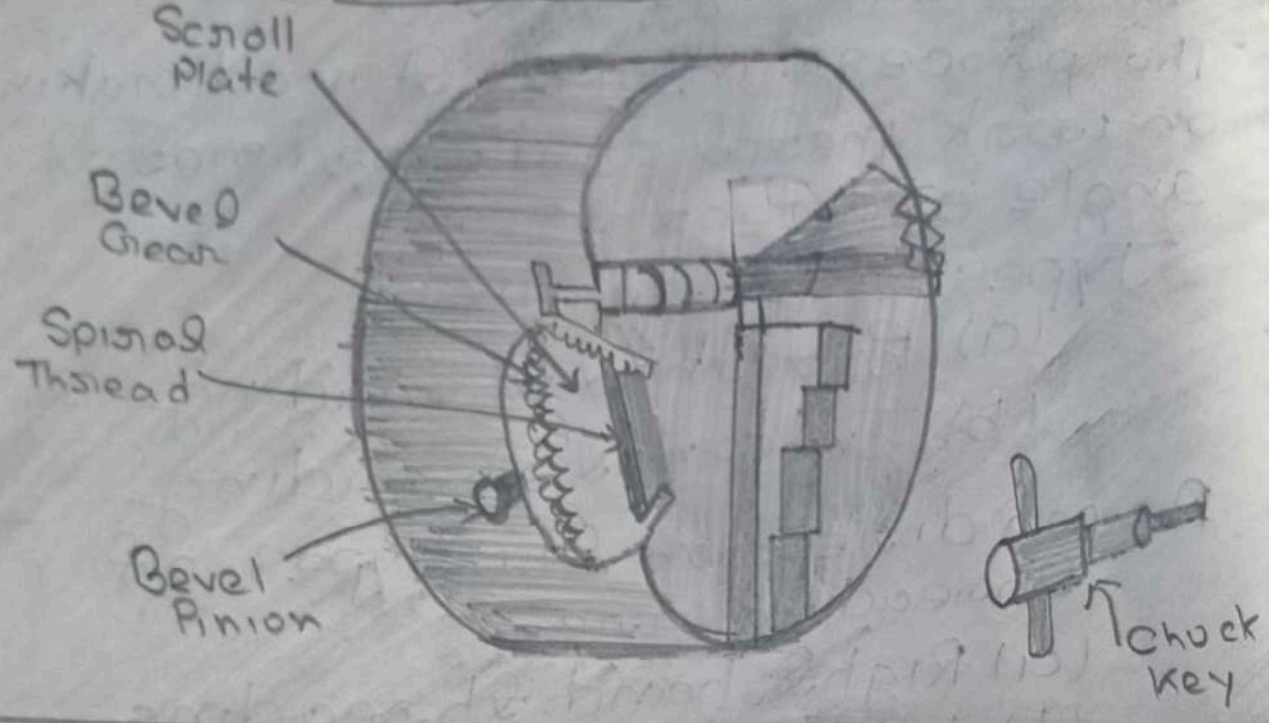
(a) Right hand threading

(b) Left hand threading

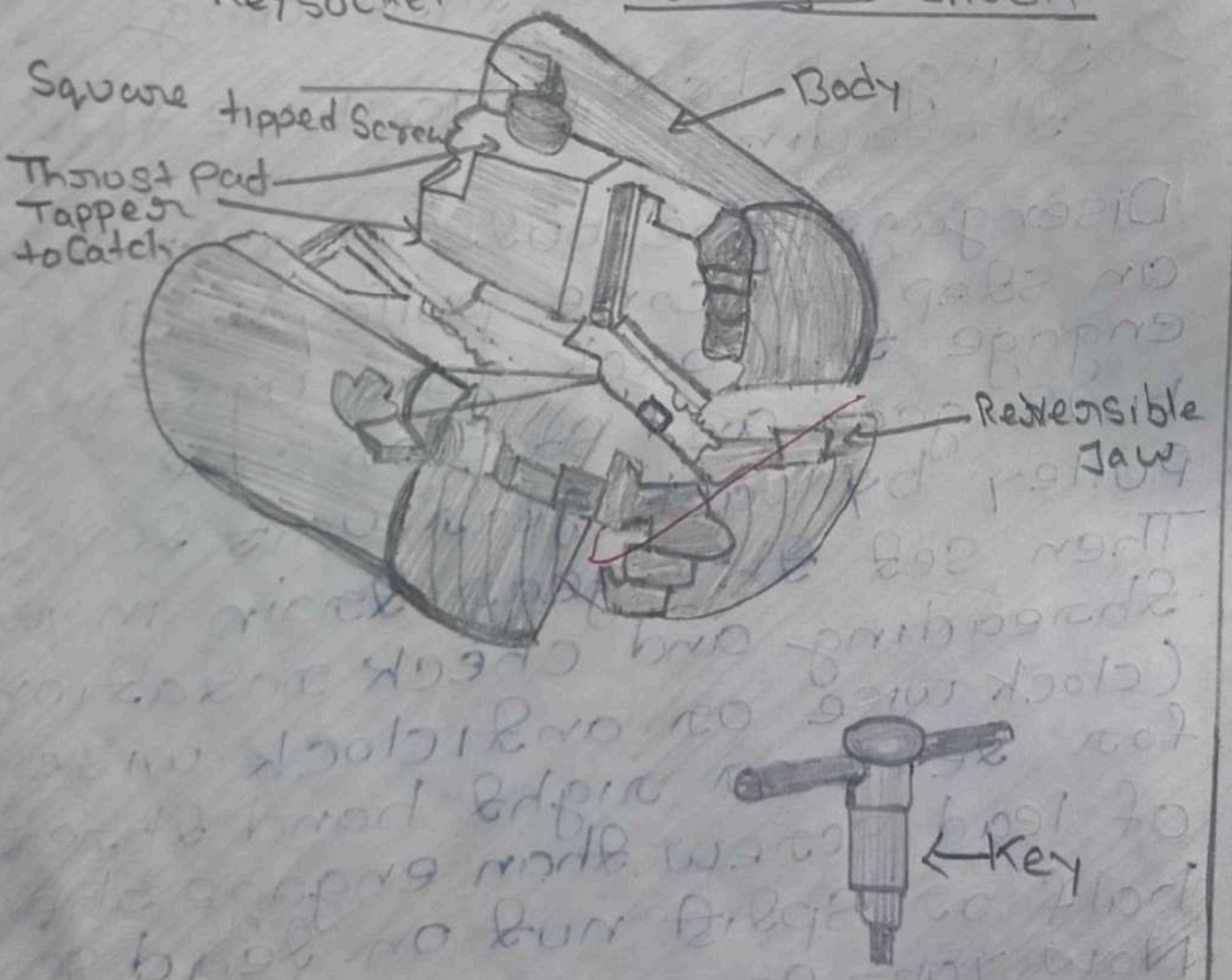
Setting of Lathe Machine for threading :-

Disengage the bull gear pin on step or cone pulley and engage the back gear unit in bull gear and step or cone pulley by back gear unit level. Then set the gear train in your threading and check rotation (clock wise or anticlock wise for left or right hand thread) of lead screw than engage the half or split nut on lead screw. Now your carriage engages the automatic move for thread

Three Jaw chuck



Four jaw chuck



Accessories of lathe Machine:-

This devices employed for holding and supporting the work and tool on the lathe are called its accessories. Their detailed description will follow now.

Chuck:-

It is used for holding/gripping work piece. It is mounted at one end of the spindle. According to construction and application these may be devided into following types.

(1) Three jaw chuck
(2) Four jaw chuck or dog chuck
(3) Magnetic chuck
(4) Combination chuck
(5) Air or hydraulic chuck
(6) Collet chuck

Face plate:-

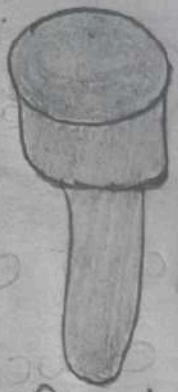
It is a circular disc shaped structure with different holes and slots etc and mounted on spindle in place of chuck. It is mostly used to support the job

Bent dog

Straight dog

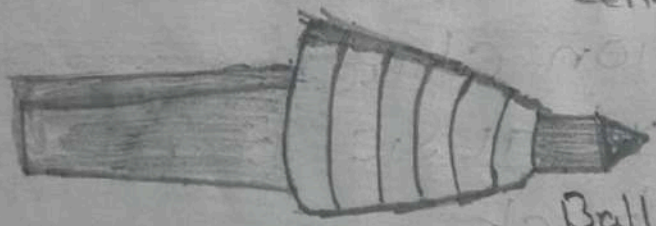
Male Centre

Half male Centre

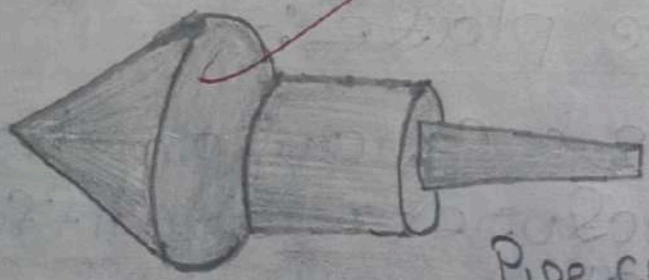


female Centre

V-Centre



Ball bearing live centre



Pipe centre

Self driving Centre

with the help of different accessories.

Angle plate :—

It is used for gripping work metal in cooperation with face plate.

Lathe carriers or dogs :-

These are used with conjuction of driving plate and usually used for revolving jobs along with driving plate. These are made by cast iron or drop forged steel.

Centres :-

These are made up of high carbon steel followed by proper hardening and tempering.

These are divided into two types.

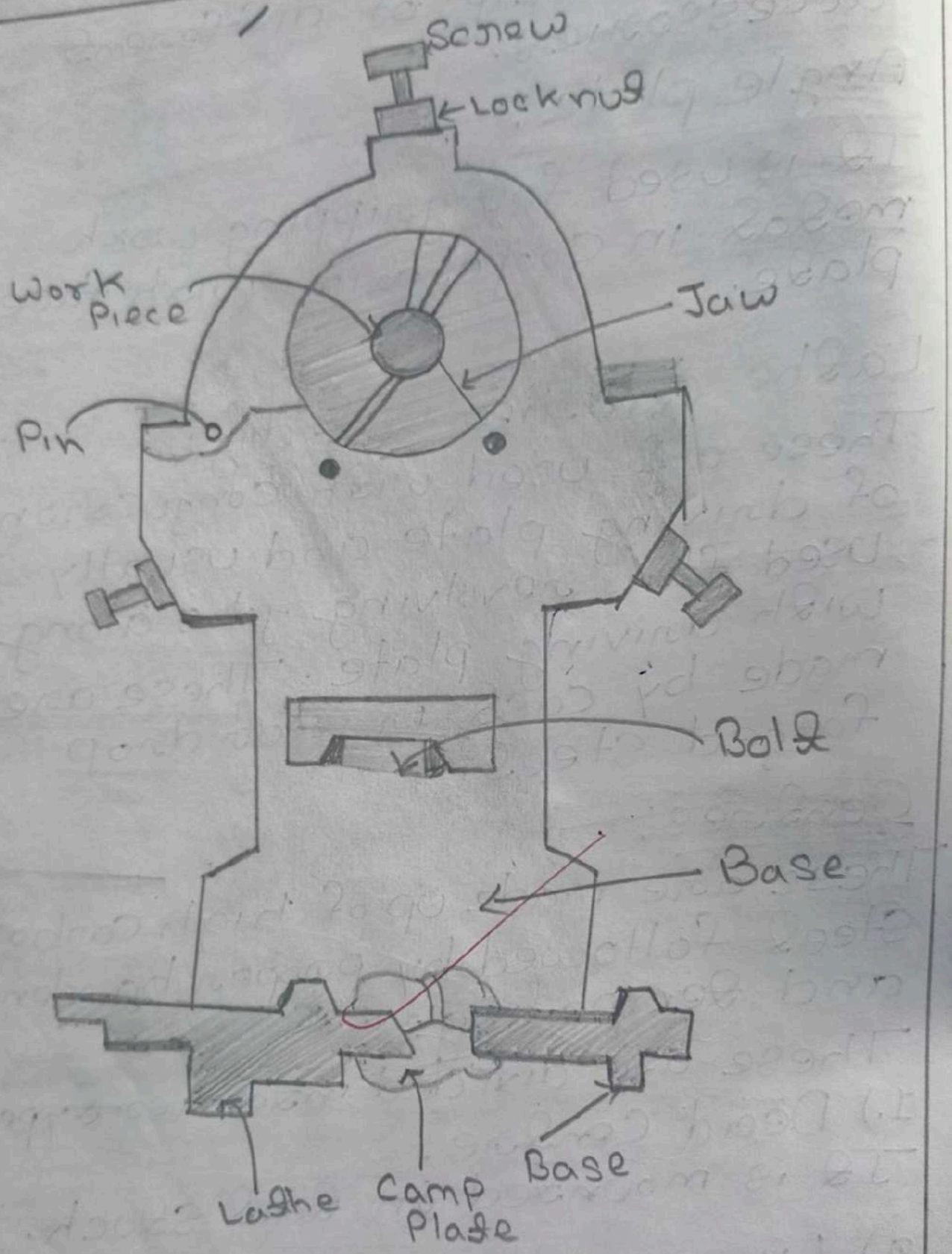
1.) Dead Centre.

It is mounted in tail stock.

2) Live centre :-

It is mounted in spindle housed in head stock

Steady Rest


Screw
Lock nut
Work Piece
Jaw
Pin
Bolt
Base
Lathe
Camp Plate
Base

On the basis of construction these are of two types —
(I) Fixed type
(II) Revolving type.

Driving plate :-

It is a circular disc type structure generally used for mounting jobs in conjunction with lathe carriers or dogs.

Rest :-

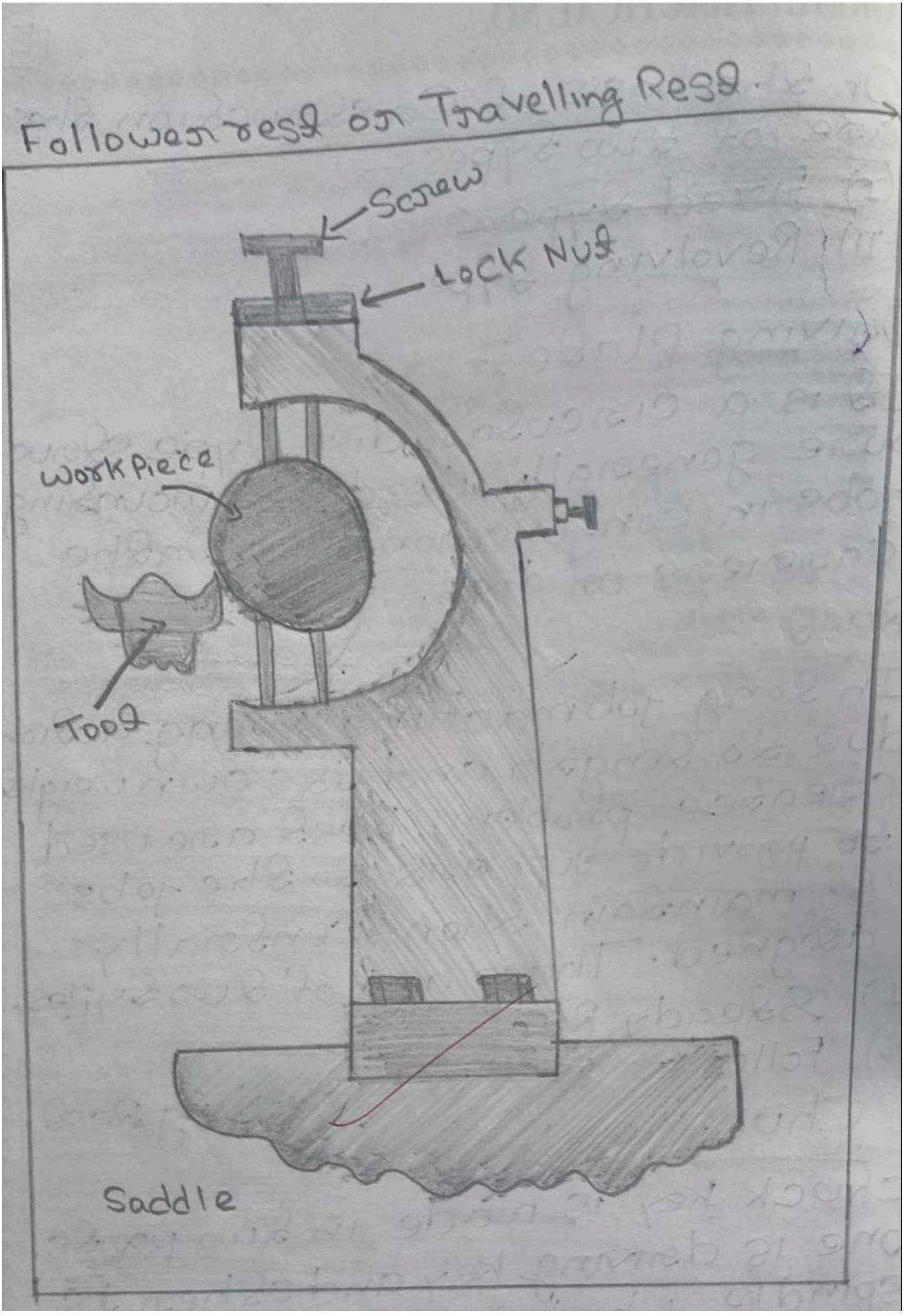
In long job machine spring action due to length and its own weight creates problem. Rest are used to provide support to the jobs to maintain them centrally aligned. These are of two types.

1) Steady Rest
2) Follower Rest or Travelling Rest.

Chuck key :-

Chuck key is made in two parts, one is driving key and other is spindle which helps in rotating key. It is used for operation jobs of chuck by operating opnion.

Follower rest or Travelling Rest.



Tool post key:-

It is hardened and tempered flat strip of comparatively good thickness and consist a square hole inside it. Another end is used as a handle for gripping purpose.

Classification of Cutting Tool.

Cutting tools are classified on the basis of cutting points or edges.

(I) Single point cutting tool:-
These cutting tool consist of only one cutting point/edges.
e.g.⇒ Turning, parting and grooving tools for lathe machine, Shaper tools and planer tool etc.

(II) Multi Cutting tool:-
These cutting tool contain more than one cutting points/edge. e.g Drill bit, broach and milling Cutter.

High speed steel

It is most commonly known cutting material. It contans 18% Tungustun 4% Vanadium and 2-15% Cobalt to increase its red hot.

High Carbon Steel

In high Carbon steel, Carbon percentage 0.6-1.5% normally. It shows BHN hardness from 400-750 with different percentage of carbon. But high carbon steel starts loosing their hardness above 200°C So it can be used is slow operation and wood working machine tool for ex.- hammers, cold chisel, files anvil, saws, screw drivers, center punch, broaches, shear blades etc.

Chips :-

Chips may be defined as the thin metal strips removed from work metal surface during any machining operation like turning, shaping etc.

Classification of Chips -

These are of three types

(1) Continuous chips
(2) Discontinuous chips
(3) Continuous chips with built up edges

Cutting speed

The cutting speed can be defined as the relative surface speed between the tool and the job. It is expressed in metre per minute (MPM)

Selection of Cutting Speed :-

The cutting speed to be used will depend upon the following factors

a) Work Material
b) Cutting tool material
c) The depth of cut and feed
d) Desired Cutting tool life
e) Rigidity and conditions of the machine and the rigidity of the work.

Selection of feed :-

a) Smoothness of finish required
b) Power available, condition of the machine and its drive
c) Type of cut
d) Tool life.

Depth of Cut :-

The depth of cut is the thickness of the layer of metal removed in one cut or pass measured in a direction perpendicular to the surface. The depth of cut is always perpendicular to the direction of feed motion.

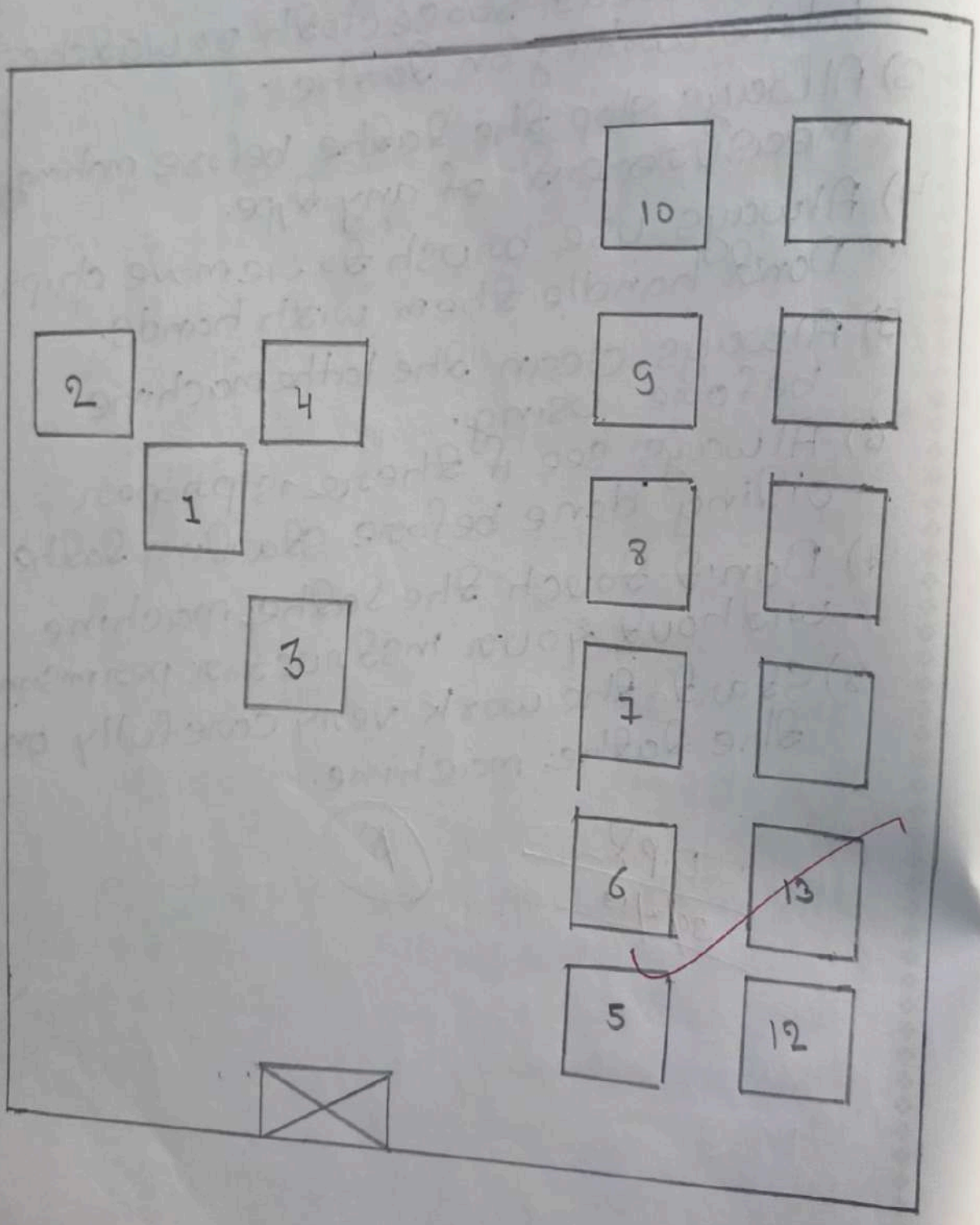
Safety and Precaution :-

1) Never attempt to run a lathe until you are familiar with the operations.
2) Never wear loose cloth or watches while working on lathe.
3) Always stop the lathe before making measurement of any type.
4) Always use brush to remove chips. Don't handle them with hands.
5) Always clean the lathe machine before using.
6) Always see if there is proper oiling done before starting lathe.
7) Don't touch the lathe machine without your instructor permision.
8) Start the work very carefully on the lathe machine.

D.P.Sir
30/9/19

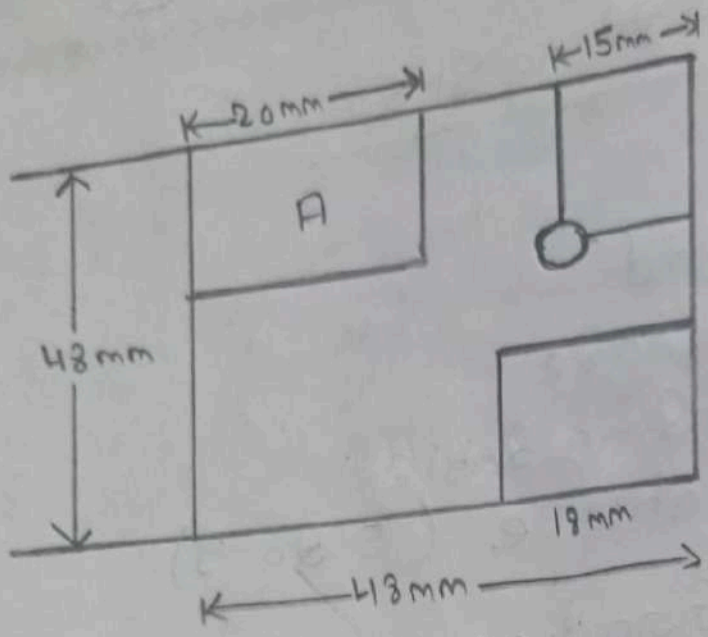
A+

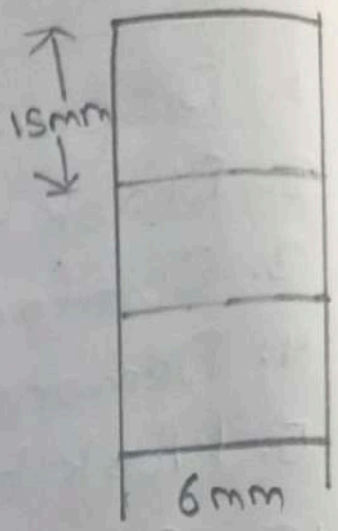
FITING SHOP



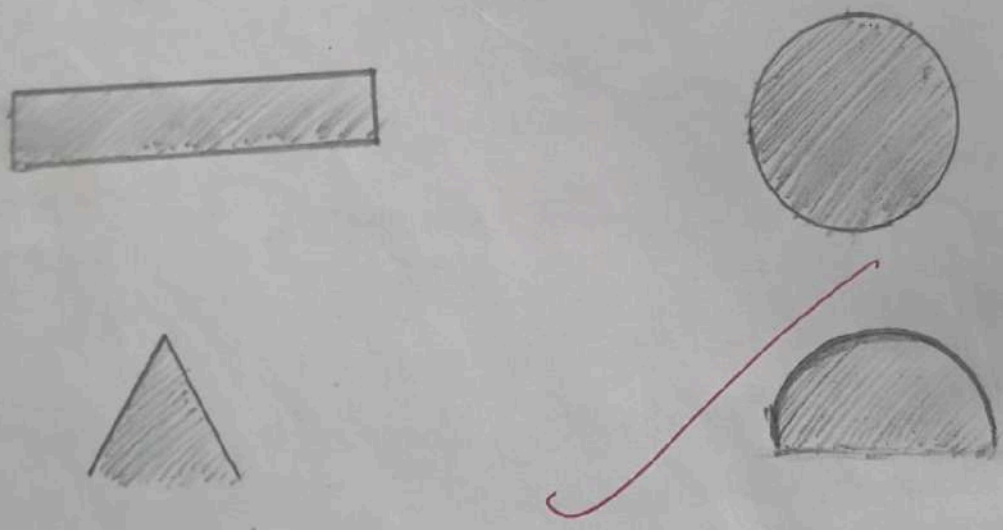
Layout of fitting Shop

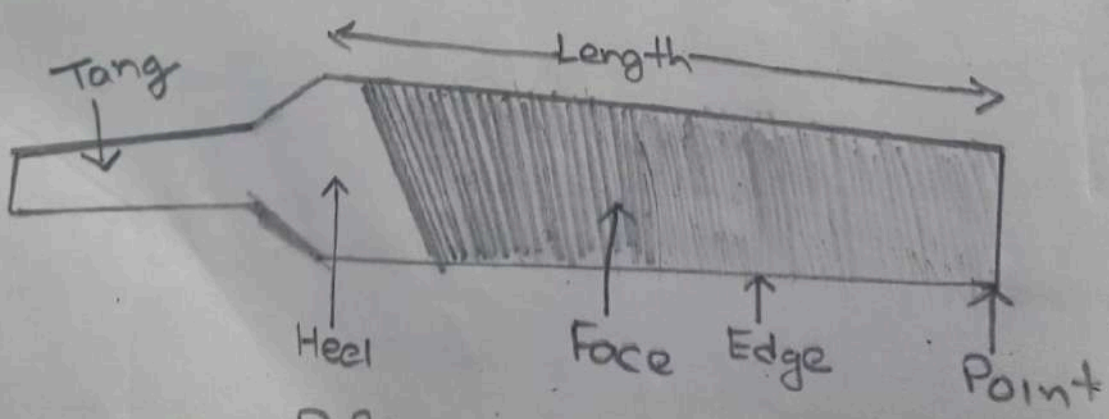
1. Display
2. Black board
3. Surface plate
4. Demonstrating table
5. Work benchwise (5 to 9)
10. Bench Grading.
11. Drilling Machine





Square Fitting





Different types of files-

TUTORIAL / PRACTICAL NO. ⇒ 1

Object :-

To make a square fitting as per dimension.

Material used :-

M.S flat use $48*48*6\ mm^3$

Tools and Equipment Required.

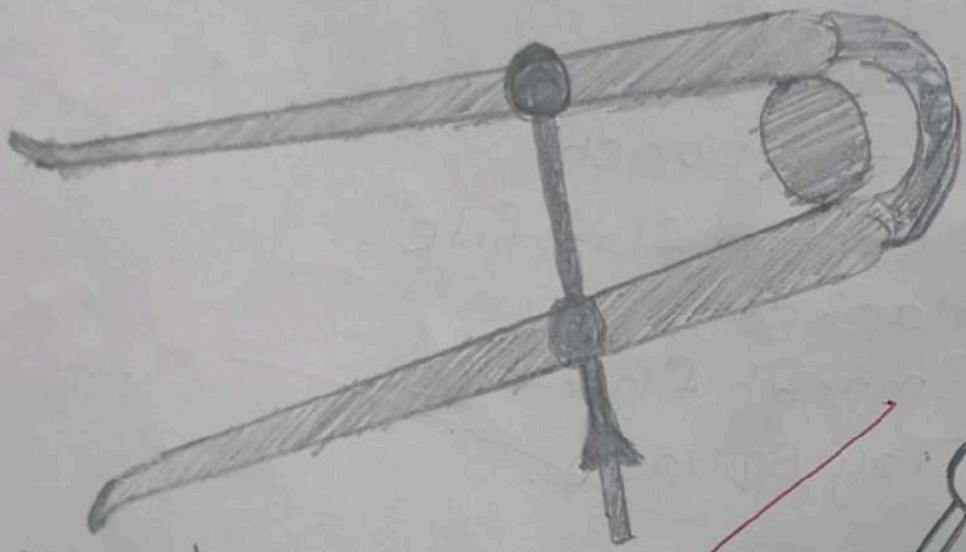
1.) Bench vice
2.) Steel Scale
3.) Work Bench
4.) Scriber
5.) Centre punch
6.) Bastered flat file
7.) Hacksaw
8.) Smooth flat file
9.) Try Square.

Theory A. Holding Tools-

(I) Bench vice.

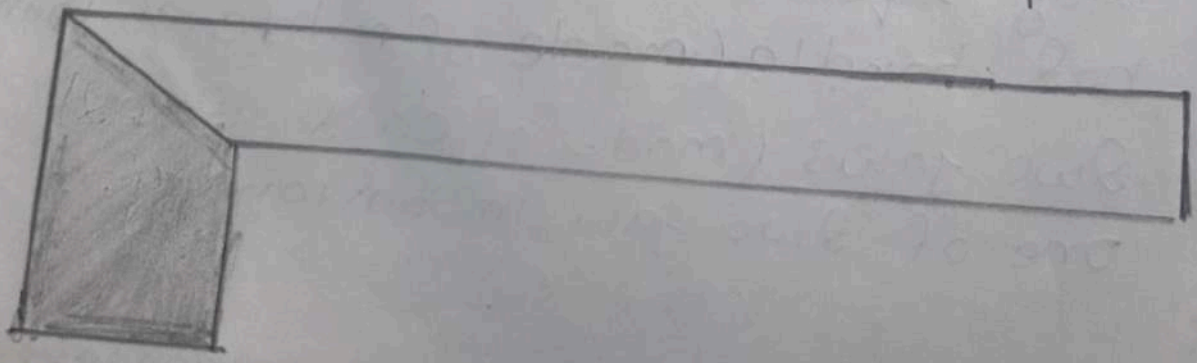
It is used for holding the working tools firmly fixed to iron or steel body. Square threaded screw nut handle (made of mild cast iron) two jaws (made of cast steel) one of two jaw in stationary.

Hack Saw



Inside call.

Outside Callipers



(B) STRIKING TOOLS :-

Hammer consist of feed striking face shaft or handle. The hammer is made from plane steel of about 0.1. carbon and are shaped by stamping and forging. The end must be (face and pen) and tampered and two centre of the head with the eye in the left shaft. The eye is oval though enlarged to accomodate the ends of the shaft which are secured by a head.

(C) FILE

Files are generally forged out of high carbon steel or triangular steel followed by cutting of teeth hoarding and tempering etc.

(D). VICE

Vice are most suitable and widely used tool for gripping different job in position during various operation carried out in a fitting shop. The parallel jaw vice is most commonly used. It is made up of grey cast iron.

(E). TRY SQUARE :-

It is better known as engineering square and it is very commonly used tool for drawing straight line at 90° to a true surface or testing the trueness of mutually normal surface.

(F.). HACK SAW :-

Desired length of hack saw rods, rubber iron flat. metal shut are always required to cut in fitting shop.

(G). PUNCH :-

Punch is primary working tool used in bench vice and known as centre punch.

(H) TAPE :-

A tool used for internal ~~cutting~~ thread in hole.

(I) DIA :-

A tool used for cutting external thread and tow or tables is called Dia.

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(J). HEMEPHRODITE CALIPPERS:-

It is made up of steel strapped spring which linked between washes at one end and it is used to scribble line parallel to straight line edge or for taking distance.

(K). DRILLS:-

Drill is an important operation carried out in a fitting shop different type and of hole in different type and of hole in different material.

(L). CALLIPERS

Callipers are the device used for measuring the inside and outside dimensions of component callipers contain two bent legs connected togather at one end.

Outside and inside callipers:-

In these two legs carry a curved spring at the top of which the two ends are in nothes made in legs. A screew is filled/fixed in the one leg and made two pass through the other.

Observation Involved

Marking Drilling Filing, Hack sawing, finishing etc.

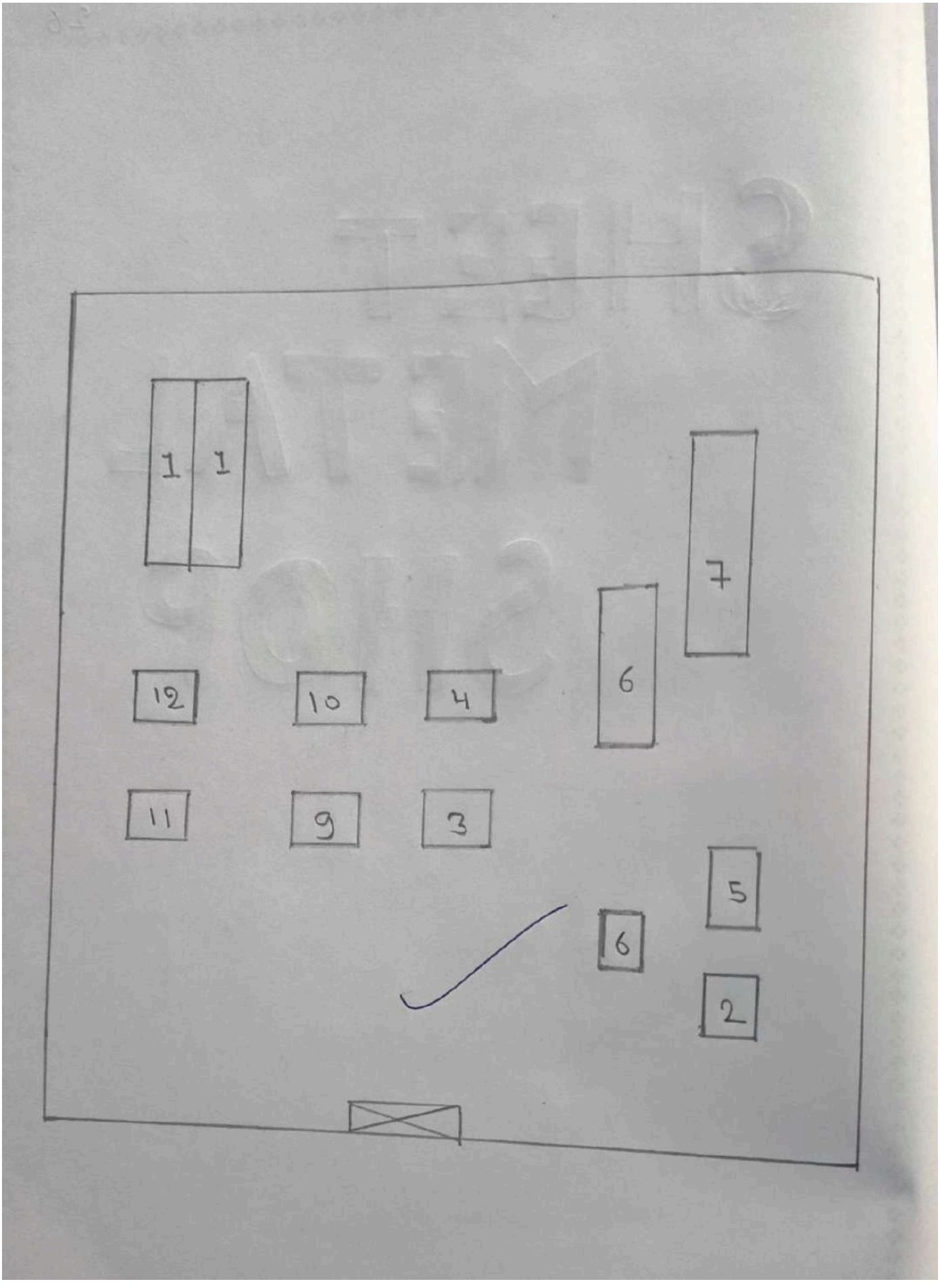
Precautions :-

1) Use paper tool for proper use.
2) Keep proper tension to the blade
3) Give cutting force during forward stroke, during hackswing and filing.
4) Do not use clagged file.

D.P.R
06/09/19

AT

SHEET METAL SHOP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Layout of Sheet Metal Shop

(1). Work bench
(2). Press bending Machine
(3). Edge folding Machine
(4). Circular cutting Machine
(5). Power press
(6). Different types of stakes
(7). Bench vice
(9). Demonstrating table
(10). Black board
(11). Big Almirah
(12). Small Almirah

Introduction

The sheet metal shop is also very important shop for every engineering concern. It deals with the working of metal sheets. It requires a through knowledge of projective geometry particularly the development of surface because the laying out of pattern and cutting of metal sheets to correct size and shapes. The various operation performed in a sheet metal shop are cutting, bending, soldering, forming, edge folding etc.

Metals Used in Sheet Metal Shop

(1.) Black iron sheet.
(2.) Galvanised iron sheet
(3.) Copper sheet
(4.) Aluminium sheet
(5.) Stainless steel sheet

Galvanised iron sheet -

It is soft steel coated with molten zinc. The zinc coating resists rust, improved the appearance of the metal and permit it to be soldering with greater ease. The galvanised

Iron sheet is used extensively in fabricated iron sheet product such as buckets, furnance heading ducts, cabinets and many other articles.

Tools used in Sheet Metal Shop

(A) MARKING AND MEASURING TOOL

(1) Scratch akls or Scribbers :-

They are used to scribe or mark lines on a metal surface for a variety of purpose in laying out patterns. The following are the three common types of scratch awls.

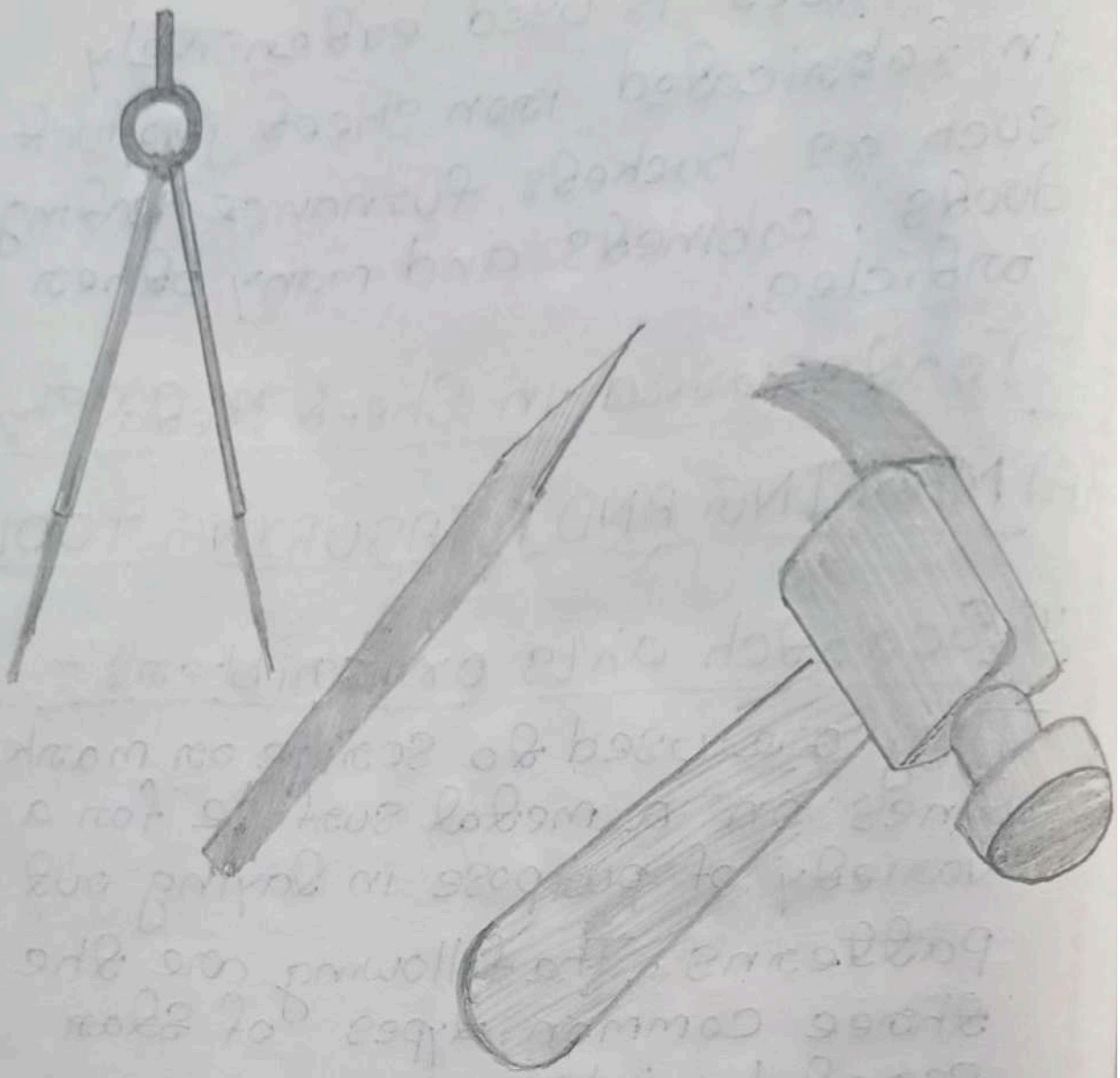
a) Ring scratch awls
b) Socket scratch awls
c) Shank types scratch awls.

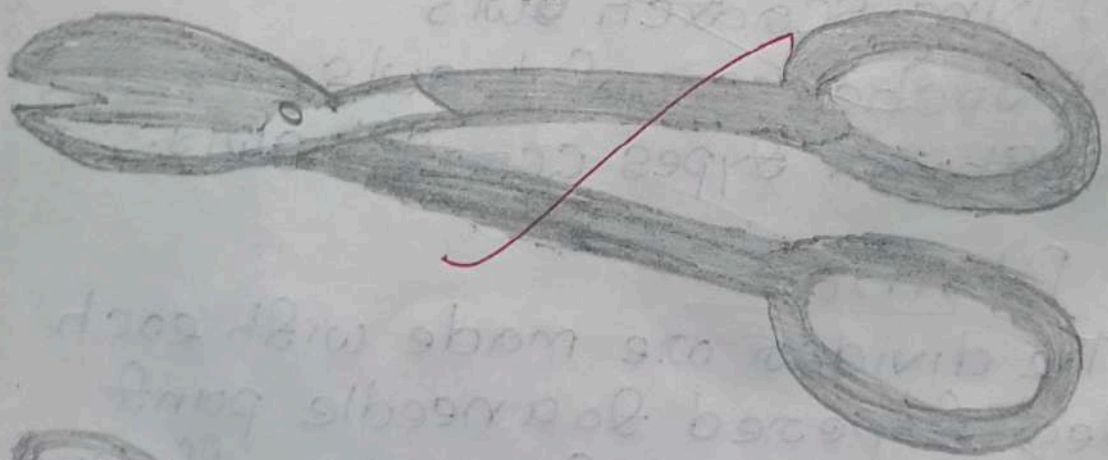
(2) DIVIDER

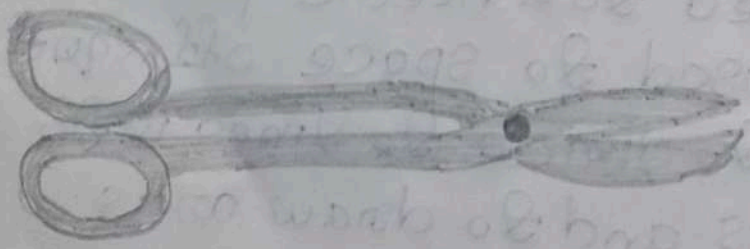
The dividers are made with each leg tapered to a needle point these are used to space off equal distance to divide lines into equal parts and to draw arcs and circles.

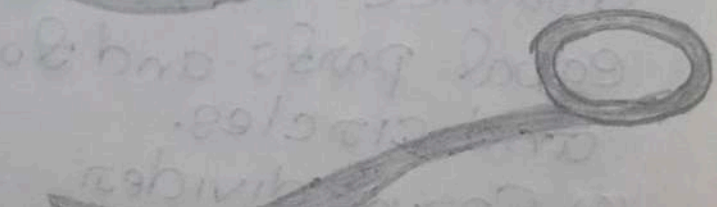
(a) Spring divider (b) Wing divider

Types of Simple









(3) Steel rule

The steel rule is particularly useful in measuring and laying out small work. The rules available in a variety of length each of which is designed for measuring work.

(B) CUTTING TOOT

(1) Snips:

The snips are somewhat similar to a pair of scissors but are considerably heavier.

(2) Straight Snips:-

The straight snips have straight blades for straight line cutting It blades are carbon steels.

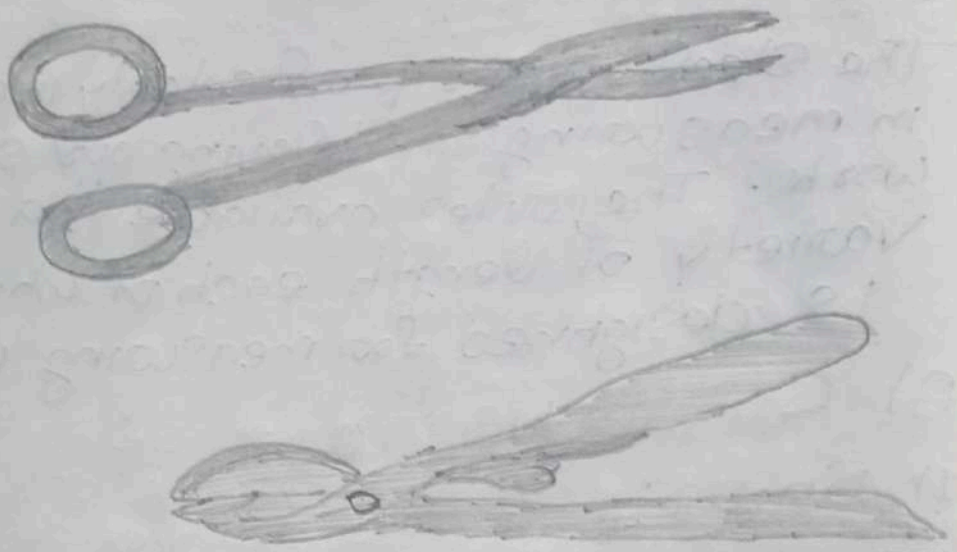
(3) Curved Snips:-

The curved snips have curved blades for making circular cuts. They are available for either right hand or left hand cuts.

(C) STRIKING TOOLS

(1) Hammer:-

The hammer in sheet metal sheet work are used for riveting, forming



Types of Snips :-

hollowing, raising streching or throughing off process. These are of many types.

(a) Reveting hammer
(b) Setting hammer

(2) Mallets:-

The mallet may be made from hide fibre or wood. The best size of a mallet is 5 mm diameter. These may be obtained in various shapes special work. It is used for smoothing of sheet.

(1). Flat peen mallet
(2). Straight peen mallet.
(3). Cross peen mallet.

(D) SUPPORTING TOOLS:-

(1) Stakes:-

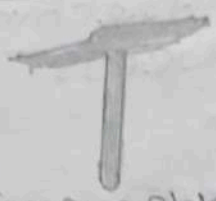
The stakes are steel anvils used to supporting sheet in operation like bending, seaming, forming reveting, punches etc.

Some commonly used stakes are:

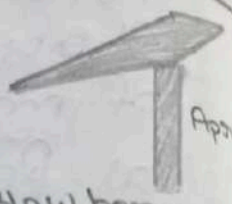
(a) Halfmoon Stakes
(b) Square head stakes
(c) Creasing Stakes
(d) Funnel Stakes

* Types of Stakes

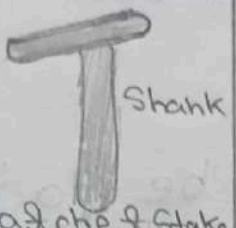

Beaxhorn Stake


Creasing Stake with Horn


Copper Smith Square Stake


Blow horn Stake


Common Square Stake

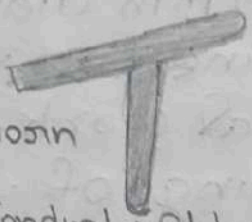


Hatchet Stake

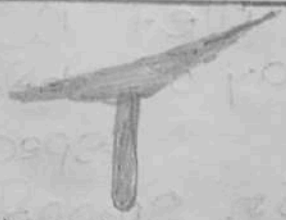

Bottom Stake

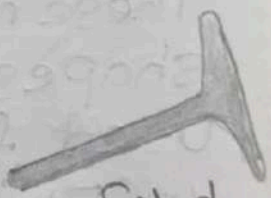

Bevel edge Square Stake


Candelmond Stake

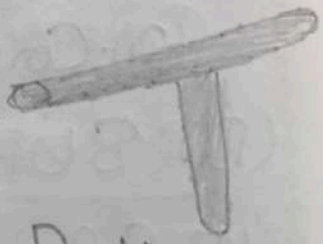


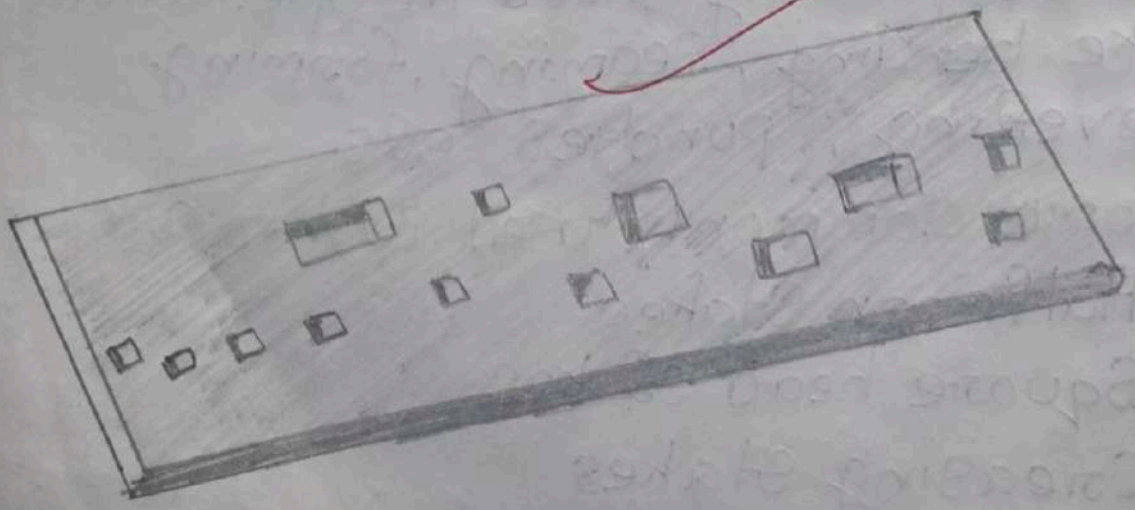
Conductor Stake


Needle edge Stake


Solid Mandrel Stake


Hallow Mandrel Stake


Double Seaming Stake



(e) Blow horn stake
(f) Beak horn stake
(g) Tin man horse stake
(h) Round stakes

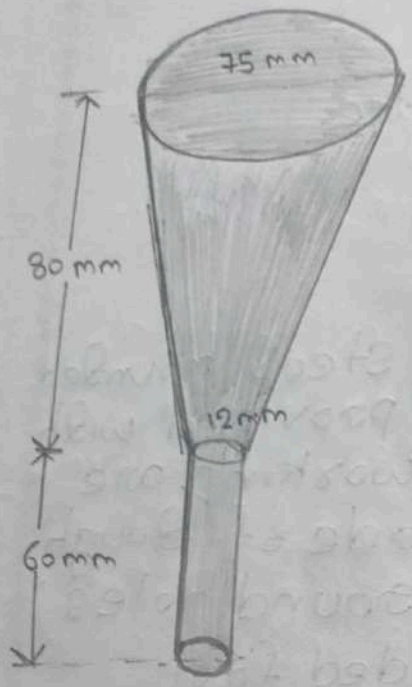
(11) ANVIL

It is made of cast steel mounted on cast iron stand provided with a handle. The top working are cutting face in made of tough steel square and round holes are holes are provided for ending operations.

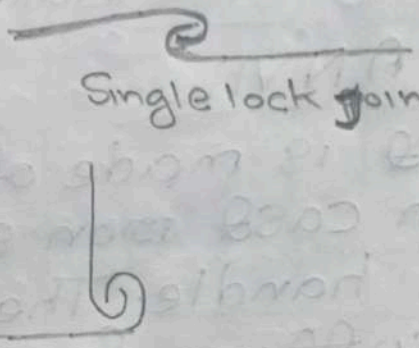
OPERATON ON SHEET METAL

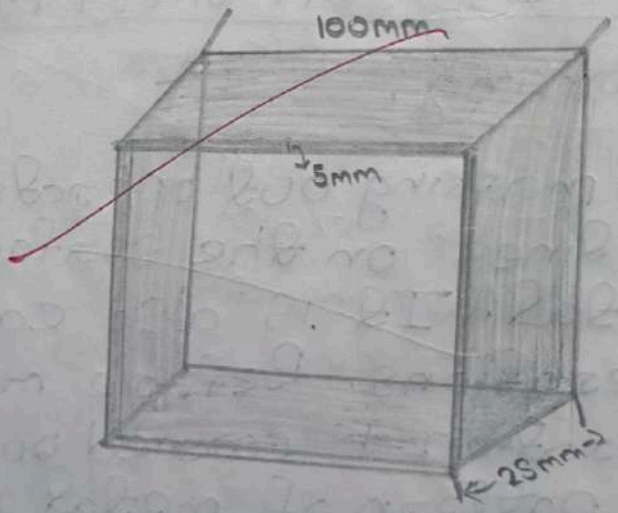
Marking:

The marking out operations consist of lines on the surface of sheet metal. It is also called scribing operations. Before marking operation is carried out the paper or pattern of metal of the object is prepared. A sharp pointed pencil is used to make outline of paper Pattern. When a pattern is to be traced on aluminium and stainless steel sheets.



Funnel





Small Tray

JOB-1

Object :-

(a) To make a single and double lock joint.

(b) To make a small tray as per dimension.

(c) To make funnel as per dimension

Tool and equipments used

Steel scale, Scriber, divider, Straight snips, Bent snips, Mallets, square stakes, Try square etc.

Operation Involved

Making, Cutting, Folding, Bending etc.

Procedure :-

The size of given sheet metal is checked Marking operation is carried out using Scriber and scale by given dimension How sheet is cut using snips and the body is making according the dimensions. After ↓ bending operation is done
completing

Result :-

The G.I sheet single lock and double lock joint having section is manufactured using the above procedure

Precautions :-

(1.) Use proper tool for proper work
(2.) Do not play with tools
(3.) Proper cleaning should be done.

D.P.R
29/9/19

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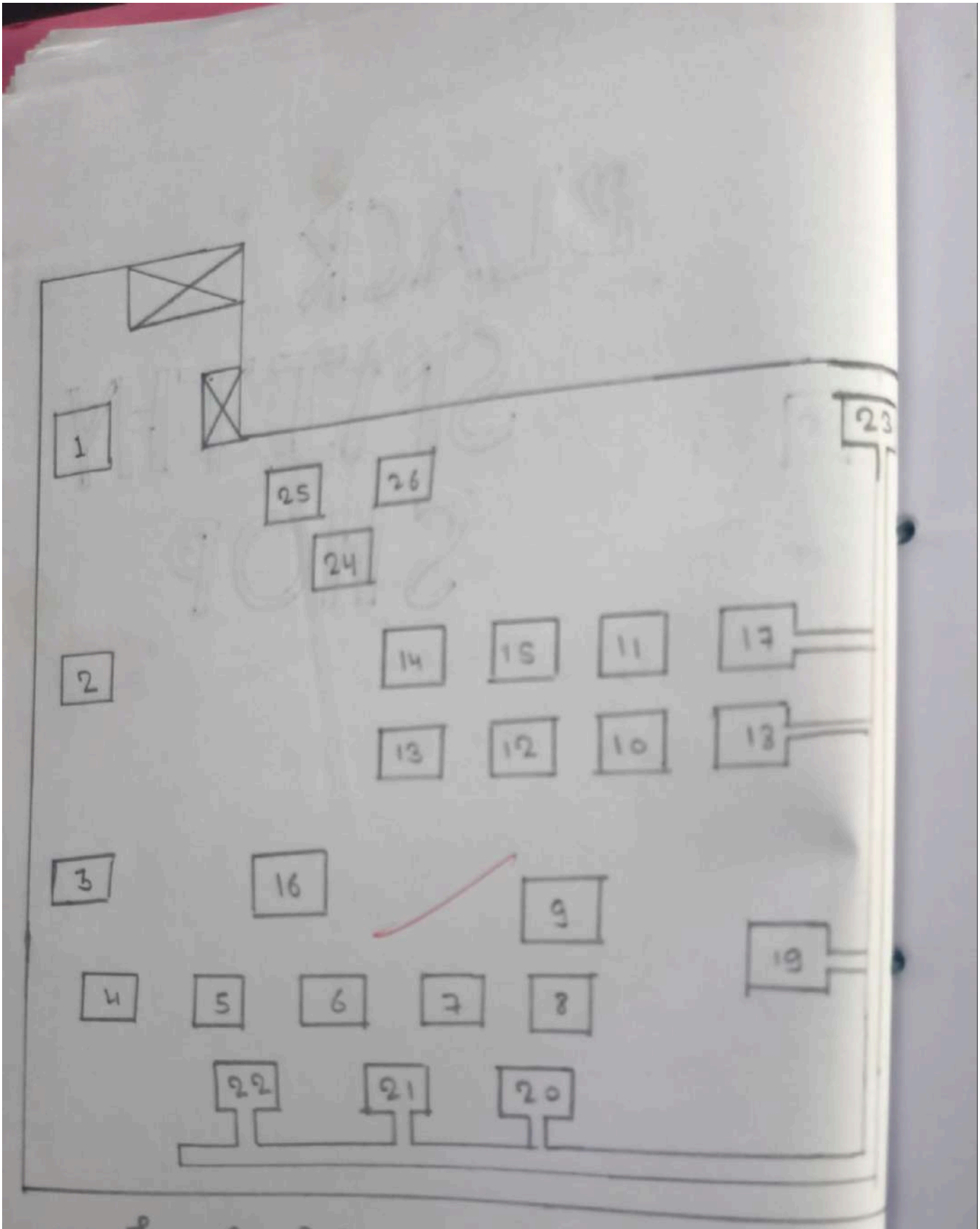
TUTORIAL / PRACTICAL NO.

BLACK SMITHY SHOP



* Layout of Blacksmithy Shop.

1 → Black board

2 → Grinder Machine

3 → Power Hammer

4 – 11 → Anvil with Stand

12 – 15 → Swag Block with Stand

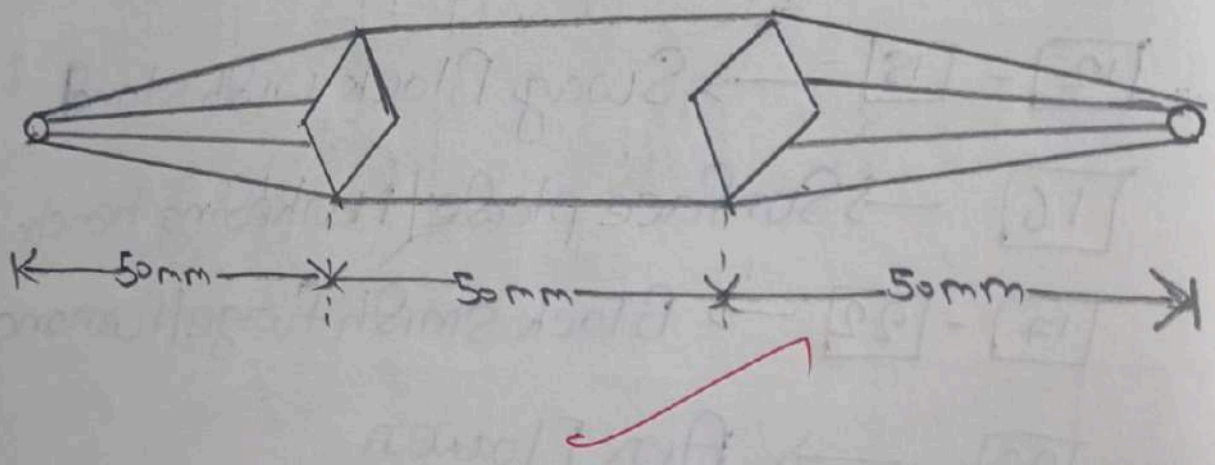
16 → Surface plate / Marketing bench

17 – 22 → Black smith forge / furnance

23 → Air Flower

24 → Instruction Table

25 – 26 → Tool Almirah


50mm
50mm
50mm

TUTORIAL / PRACTICAL NO.

Object :- To make job as per given diagram.

Material Used

Mild steel rod 12mm dia x 120mm length.

Tools and Equipment Used

Smithy forge, Anvil, Hand hammer, Tongs, hot chisel flatter, Swag Top and Bottom, Surface plate Blower, Swag Block etc.

Operation Involved :-

Forging, Drawing Down, Swaging Marking and Finishing.

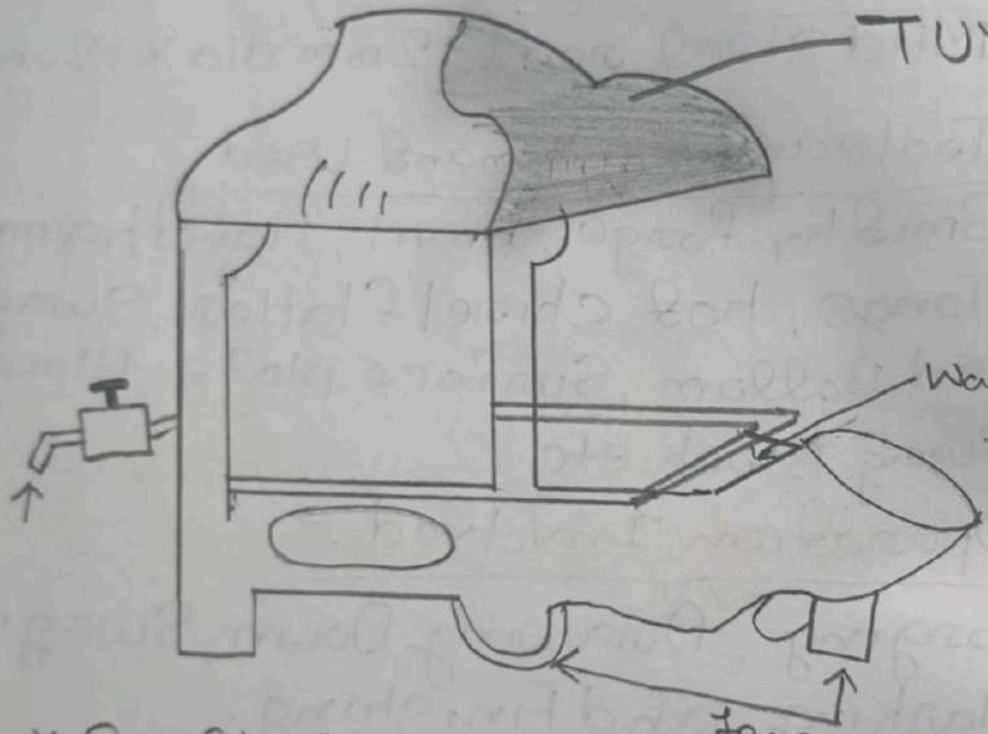
Procedure :-

(I) We take one MS rod of length 120mm and dia 12mm.

(II) Then rod is heated to a proper temp. i.e. if turns red hot and the heated rod is hammered on anvil. The hammering continues till the length increases to 150 and become square.

(III) Then again the rod is heated and 50mm length of rod is hammered in such a way that its shape turn circular.

(IV) Then after heating the rod again it is hammered to convert the other



* Smith forge or Hearth

portion of 50mm into octagonal shape the middle portion of 50mm length is made in same square shape.

Theory :-

Blacksmithy is the process of heating metal piece up to its plastics state and with the application of external Pressure on metal piece to aquire desired shape and size.

Advantage of forging :

(1) It is more economic process than any other process as there is no material loss.

(2) It increases metal strength by getting the direction of gain and refining structure of metal.

Smith ~~forge~~ or Hearth :-

The furnance desired for heating Purpose to metal job is known as hearth or smith forge ; It may be classified as follow —

(I) Open hearth forge

(II) Closed hearth forge

Tools and Acessories used with forge.

(A) Blower :- It is used for providing flesh air for combustion of coal, these are manually operated and power

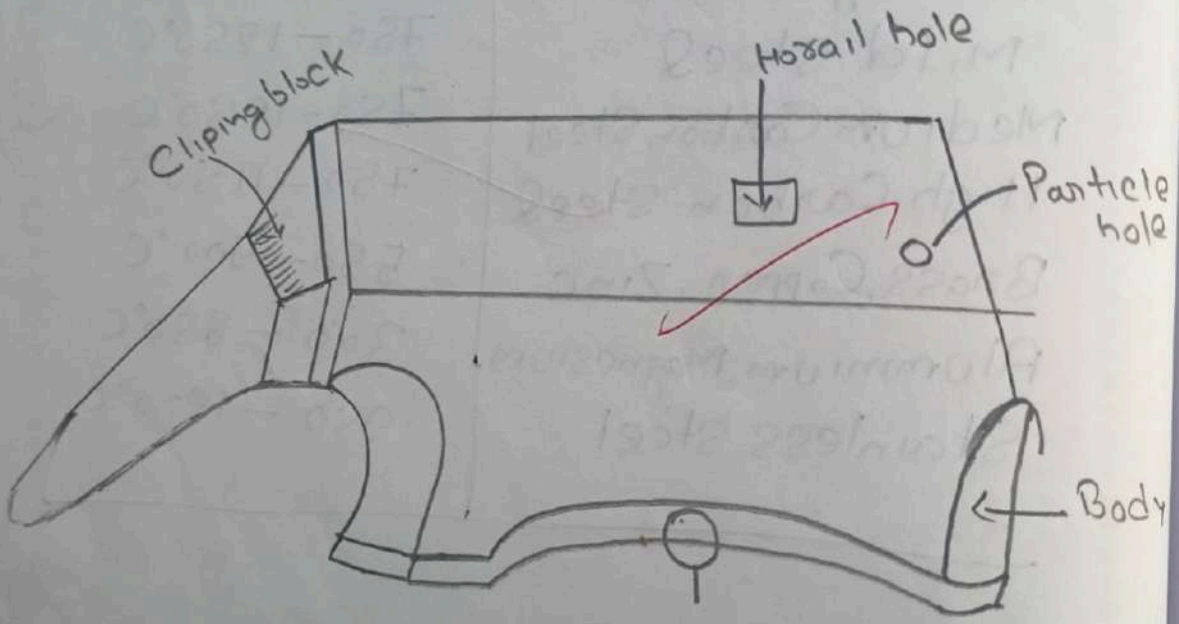
operated both are used as per the capacity of forge, normally air pressure to the forge should be 15-20 cm of Hg.

(B) Sowel :- It consist of flat M.S sheet joint at one end of a wooden handle or MS pipe it is used for changing also from forge.

(C) Poker :- It is MS rod pointed and bent at one end. It is used to remove clinked and to adjust heat at proper place by adjusting the position of burning fools.

Forging Temperature :-

Metal	Temperature
Wrought iron	800 – 1300°C
Mild steel	750 – 1250°C
Medium Carbon Steel	750 – 1250°C
High Carbon Steel	750 – 1150°C
Brass, Copper, Zinc	550 – 900°C
Aluminium, Magnesium	300 – 850°C
Stainless steel	950 – 1200°C



Anvil -

Temperature Measurement :-

Temperature Measurement is very useful in Smith work because if low/high of forging operation are forwarded many defects may arise in the material of job-

Temperature determination can be done by —

(a) Temper Colour
(b) Thermo electric

Temperature determination by change of Colour -

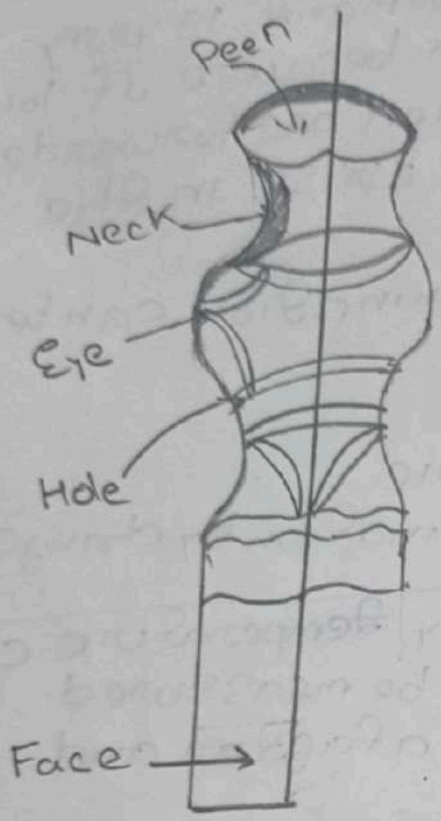
By this method only temperature can assumed. It can not be measured accurately. It is a faster and cheaper method.

Colour	Temperature
Dark red Colour	650 – 700°C
Cherr red Colour	800 – 900°C
Light cherry red Colour	900 – 1000°C
Orange Colour	900 – 1250°C
White Colour	1250 – 1500°C

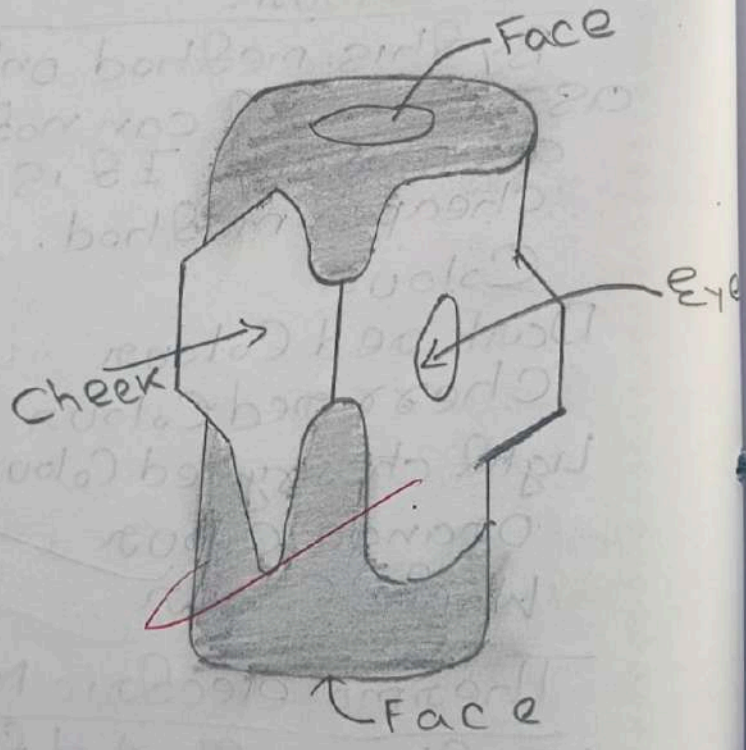
Thermo electric Method :-

In this method different parameter are used to determine the temperature of steel.

(A) Optical Parameter :- These are portable and used for 100°C to 1800°C temp. for short time measurement.



* Ball peen Hammer



* Power Hammer

(B) Thermo Couples :- These are durable and preferred for long time and used for 200 to 1300°C.

(C) Radiation Pyrometer :- These are used for high temperature measurment.

Tools and Equipments

(I) Holding and Supporting Tools :-

These tools are used in Smithy tool work for holding and supporting purpose.

(A) Anvil :

It is used for supporting the work while it is struck with hammer. Its body is made up to mild steel to which a piece of high carbon steel (2-2.5cm) thick is welded on top giving hard to place commonly its mass is 150kg.

(B) Swage Block :- It is made up of cast iron and has round, square, rectangular and half round grooves and are used for holding bore.

(C) Tongs :- It is a holding desired to used to handle job while some operation are used to be carried out. It is made up of mild steel and is specified by its length and mouth of shaped.

(2) Striking Tools:- Hammer is the best hand tool to provide blow or impact load on job to acquire desired shape and size. They are made up of high carbon steel / tool steel by forging. It is specified by its weight excluding the handle.

(1) Hand Hammer
(2) Sledge Hammer
(3) Power Hammer

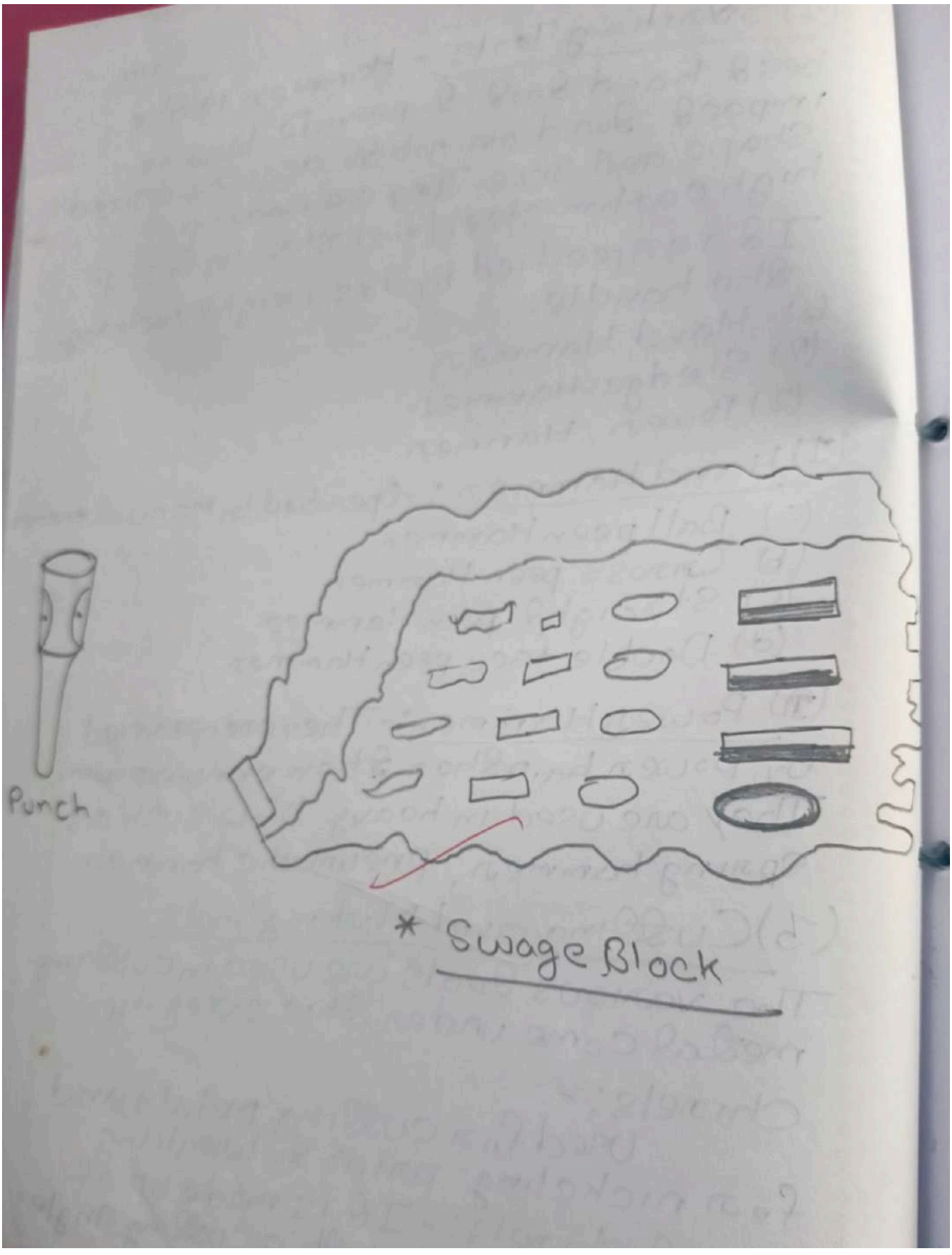
(I) Hand Hammer:- Operated by Manual energy.
(a) Ball peen Hammer.
(b) Cross peen Hammer
(c) Straight peen Hammer
(d) Double face peen Hammer.

(II) Power Hammer:- They are operated by power other than manual power. They are used in heavy blow such as spring hammer, pneumatic hammer.

(3) Cutting and Marking Tools:-
The various tools are used in cutting metal come under this category.

Chisels:-
Used for cutting Metals and for nickeling prior to breaking.

(a) Hot chisels:- It is made up of high carbon steel with a cutting angle of about 30°.



* Swage Block

(b) Cold Chisel :- It is made up of high carbon steel with a cutting angle of about 60° and its effect is hardened and Tempered.

(c) Hardie chisel :- It has a square shank and fits in the square hardie hole in anvil face.

Operation performed :-

(1) Heading :- It is used as most important operation carried out in Smithy shop for heading a metal shows its plastic nature and can be shaped as required.

(2) Cutting :

(a) Cold Cutting :- A metal piece is supported over anvil and chisel is kept perpendicular to job, followed by hammer blow above 180° C. This is required to be repeated till the metal is cut off.

(b) Hot Cutting :- It is similar to cold cutting except that metal and chisel is heated.

(c) Drawing Down :- In this the length of any metal is increased at the cost of its width.

(4) Upseting :- In this the cross section of metal piece is increased at the cost of its length by heating the metal to its plastic state and providing blow of hammer supporting the job on anvil. It is classified into -

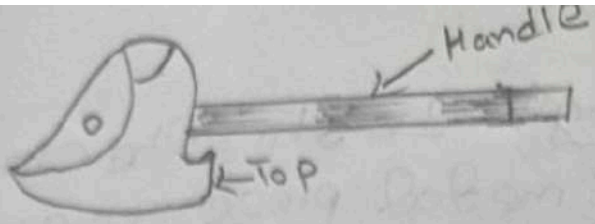
(I) full upsetting
(II) Head upsetting
(III) Centre upsetting

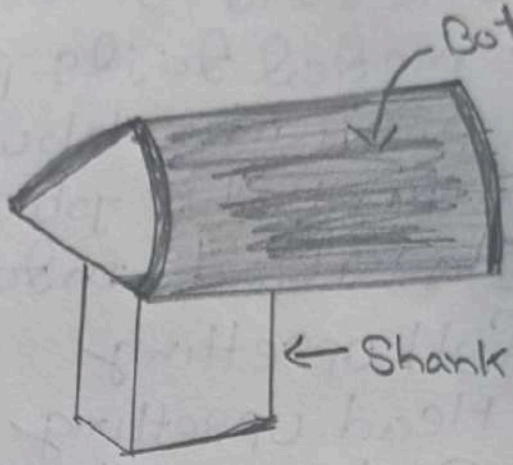
(5) Swaging :- In this process metal is shaped into cylindrical, square triangular and other shape with the help of suitable swage.

Miscellaneous Tools :-

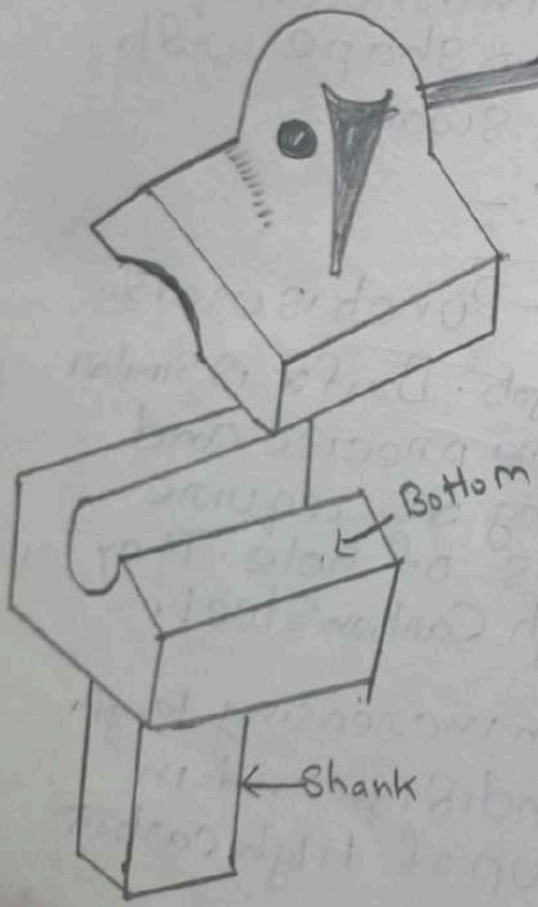
(a) Puch and Drift :- Punch is used to make hole in metal job. Drift is similar in shape but is more precise and used after punching to acquire accurate dimensions of hole. They are made up of high Carbon Steel.

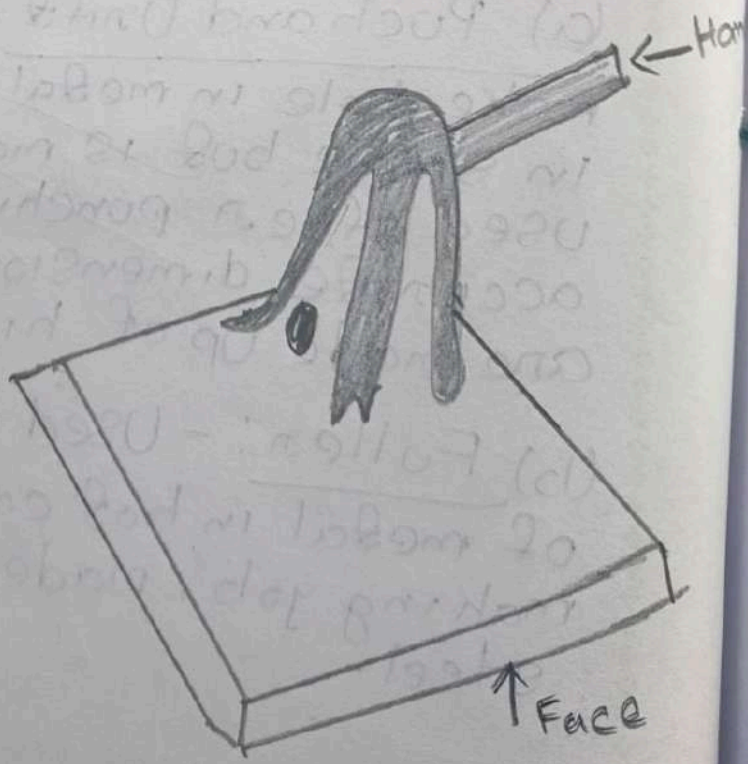
(b) Fuller :- Used in increasing length of metal in hot condition and in making job, made up of high carbon steel.





*A pair of Swing





* Flatter

Flatter and Smoother:- Made up of hardened high carbon steel, it has a flat surface and noded handle. It is used in making surface more flat and smooth.

(d) Set Hammers:- Made up of hardended high carbon steel, it is similar to flatter but it has no extra flat surface outside the body and it is (useds) where flatter is difficult to use in making job edge above 90°.

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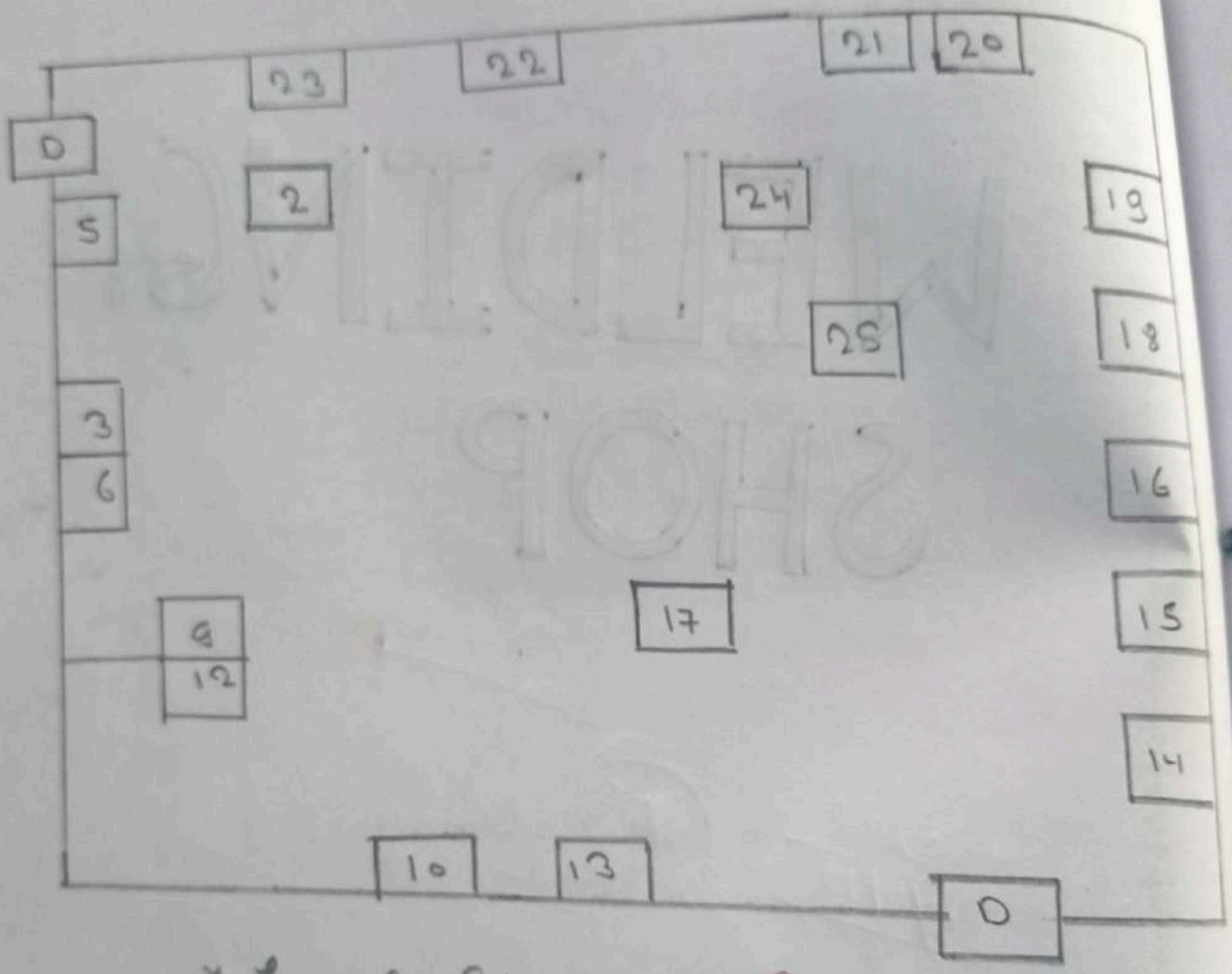
TUTORIAL / PRACTICAL NO.

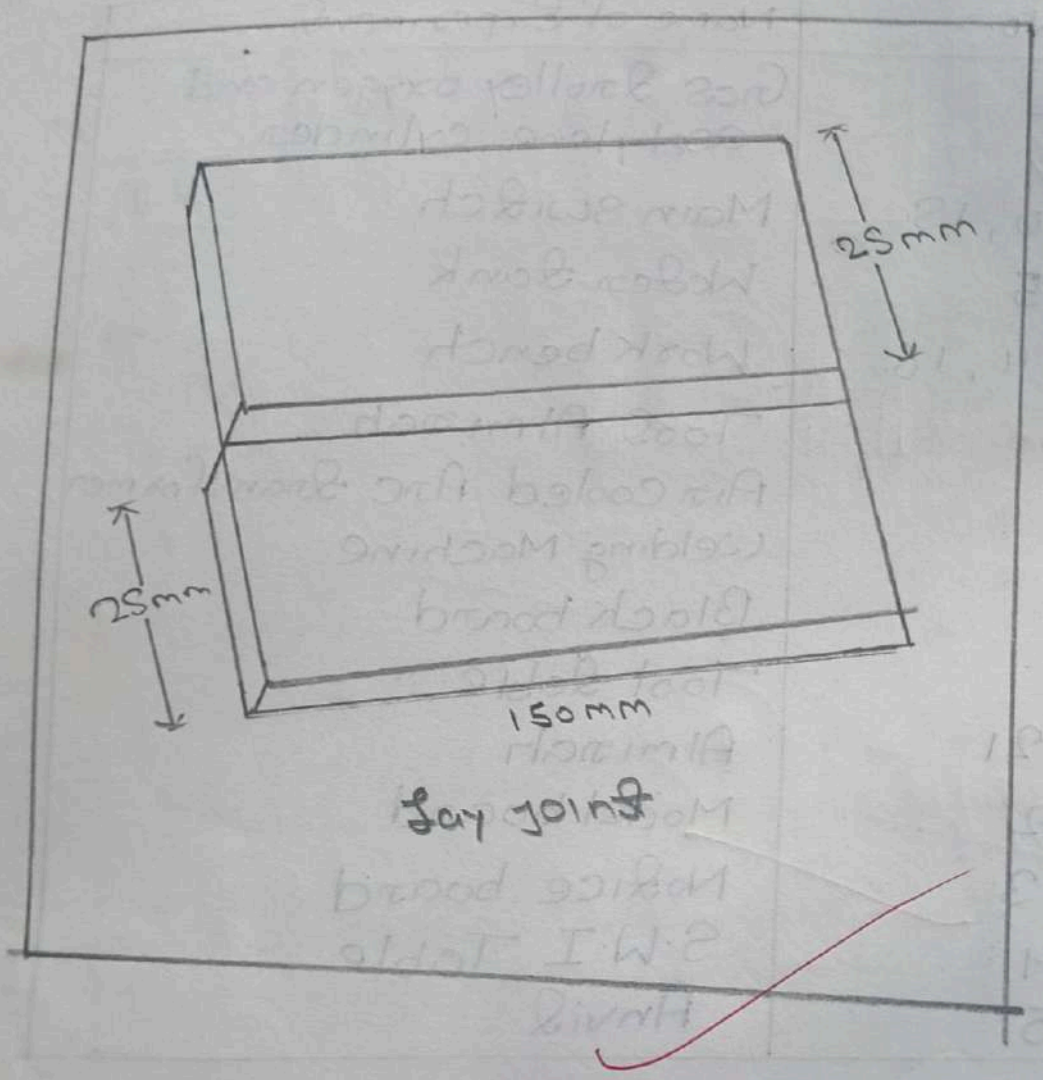
WELDING SHOP



* Layout of Welding Shop-

Description of Layout of Welding shop

S. No.	Name of Experiment
2	Gas Trolley oxygen and acetylene cylinder.
3, 6, 10, 15	Main switch
5	Water tank
9, 12, 14, 16	Work bench
13	Tool Almirah
17	Air Cooled Arc Transformer Welding Machine
18	Black board
19	Tool table
20, 21	Almirah
22	Model board
23	Notice board
24	S.W.I Table
25	Anvil



Lap joint

Experiment-5(a)

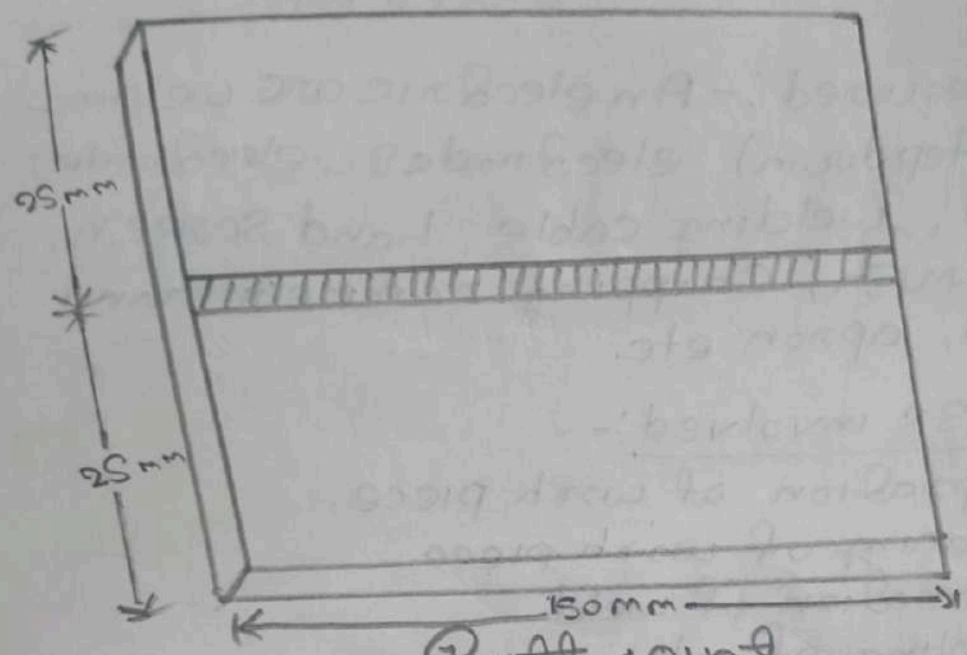
Object:-
To make a lap by electric arc welding as per given drawing.

Material Used:- Two mild steel flat piece 150x25x6 mm³

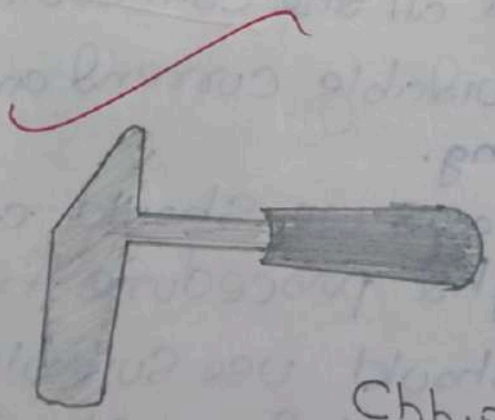
Tools Required:- An electric arc welding set (Step down) electrodes, electrodes holder, welding cable, hand screen, wire brush, chipping hammer, hand gloves, apron etc.

Process involved:-
(I) Preparation of work piece.
(II) Cleaning of work piece.
(III) Formation of weld.
(IV) Cooling of job.

Precaution:-
(1) Check all the connection before welding.
(2) Use suitable current and voltage for welding.
(3). Always we should adopt right tool and right procedure for doing welding.
(4). We should use suitable apron, hand gloves and face shield during welding operation.



Butt joint



Chipping Hammer

Experiment 5(b)

Object:- To make a butt joint by Gas welding (oxy-acetylene arc welding).

Material Required:- Two mild steel flat Piece 150 x 25 x 3 mm³.

Tool and Equipments required:-

Oxygen and acetylene gas, gas cylinder oxygen and acetylene regulation, oxygen and acetylene pipe, welding torch, goggles, hand gloves, chipping hammer wire brush etc.

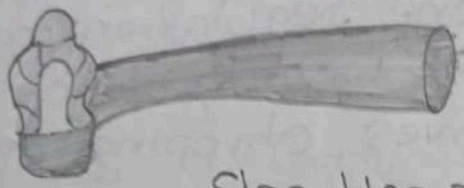
Process Involved:-

(I) Prepration of work piece.
(II) Cleaning of work piece.
(III) Formation of weld
(IV) Cooling of job.

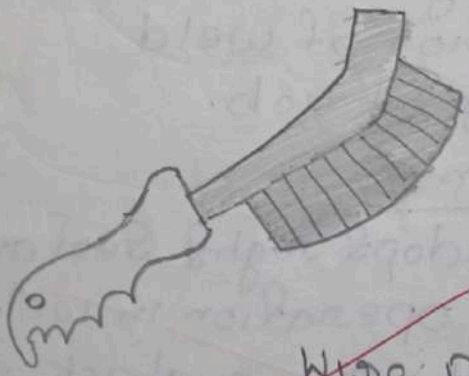
Precautions:-

(1) Always adopt right tool and right procedure for every operation in welding shop.
(2) We should always check carefully all Connection before starting welding.
(3) We should use properly pressure value of both gas desired as per the welding fame.

We should use suitable apron and googgles etc. After welding shop the supply acetylene first and then supply of oxygen.



Slag Hammer



Wire Brush

Welding :- Welding is a process of joining two similar of disimilar material by heating to a suitable temperature with or without the use of filler metal and with or without the application of pressure.

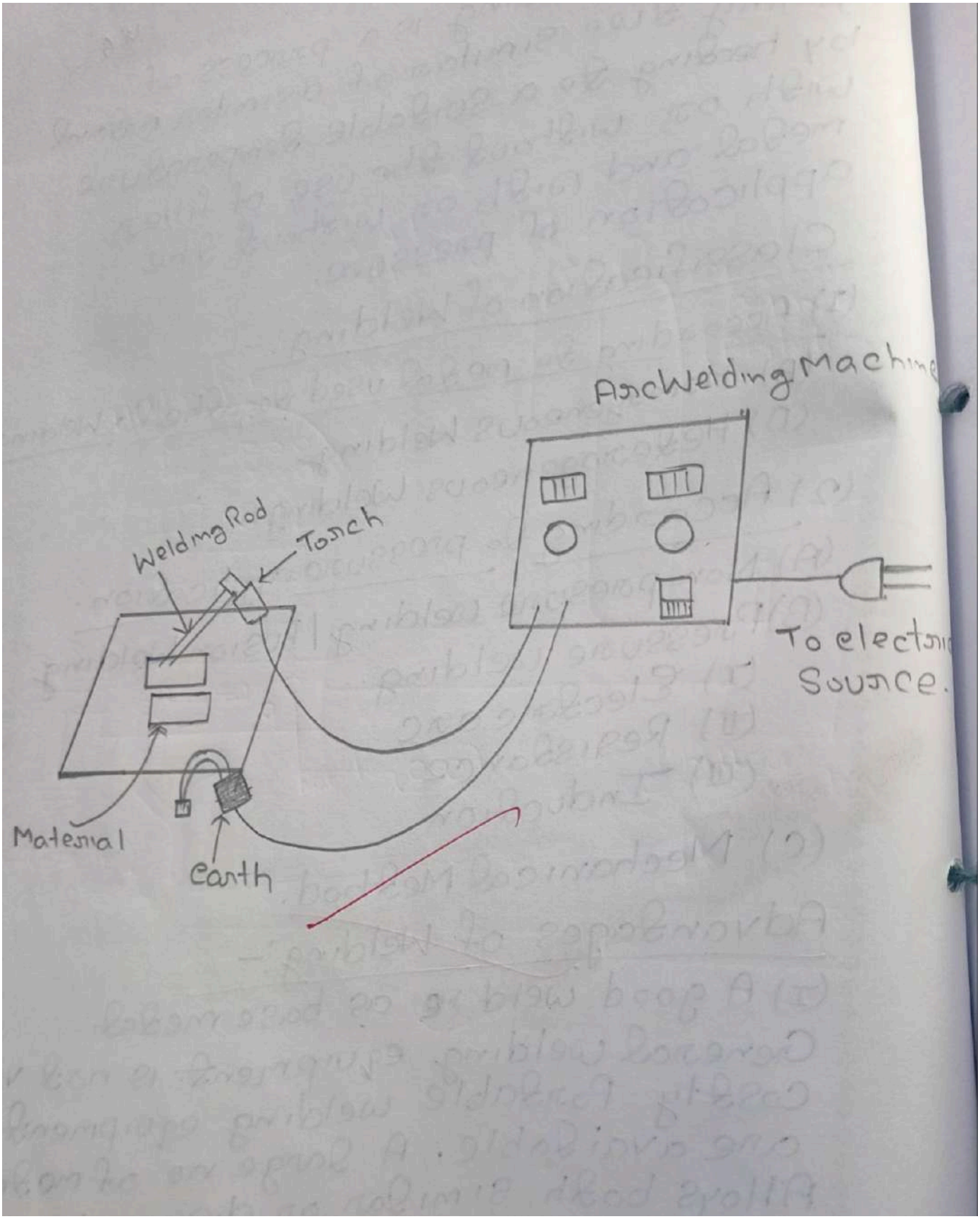
Classification of Welding :-

(1) According to metal used togather for Welding.
- (A) Homogeneous Welding.
- (B) Heterogeneous Welding.

(2) According to pressure application.
- (A) Non-presure welding / Fusion Welding
- (B) Pressure welding.
  - (I) Electric arc
  - (II) Resistance
  - (III) Induction
- (C) Mechanical Method.

Advantages of Welding :-

(I) A good weld is as base metal. General welding equipment is not very costly Portable welding equipment are available. A large no. of metal/ Alloys both similar or dissimilar can be joined by welding.


Arc Welding Machine
Welding Rod
Torch
To electric
Source.
Material
Earth

Electrode :- Electrode or filler metal may be defined as a filler metal rod used to fill up the gap between the joints during welding procedure. Electrode have the same or nearly same chemical composition as the base metal.

Classification of electrodes :-
It may be divided into following types.

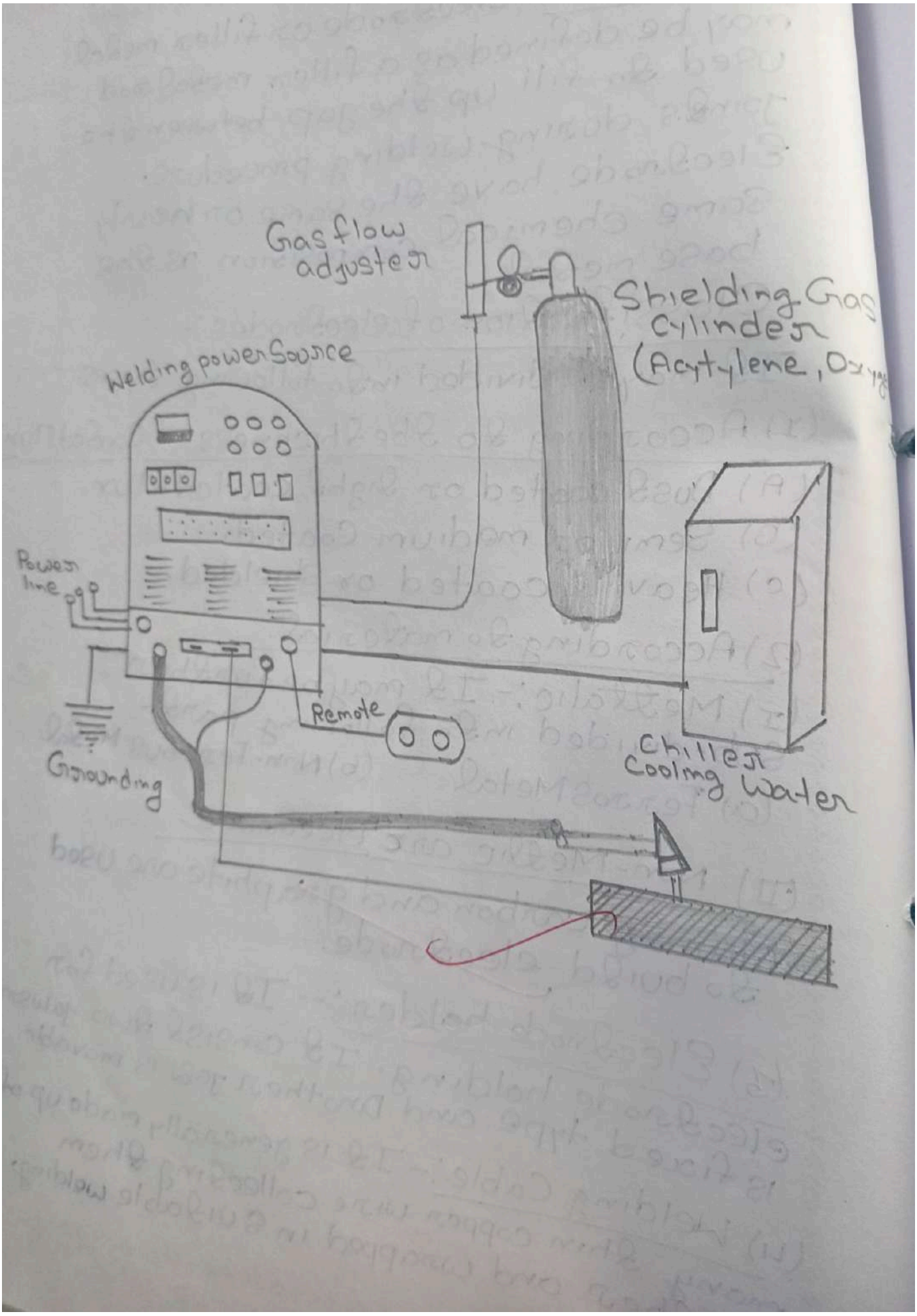
(1) According to the thickness of Coated Flux :-
(A) Dust coated or light coated flux.
(B) Semi or medium Coated.
(C) Heavily coated or Shielded.

(2) According to material.
(I) Metallic :- It may be further sub-divided into following part -
(a) Ferrous Metal (b) Non-Ferrous Metal

(II) Non-Metallic arc electrode -
Mainly carbon and graphite are used to build electrode.

(3) Electrode holder :- It is used for electrode holding. It consist two jaw one is fixed type and another jaw is movable.

(4) Welding Cable :- It is generally made up of many thin copper wire collecting them together and wrapped in suitable welding


Gas flow adjuster
Shielding Gas Cylinder (Acytylene, Oxygen
Welding power Source
Power line
Remote
Grounding
Chiller Cooling Water

(5) Cable Connection / Lug / Thimble :-
It is made up of Al, Cu, Brass and alloys etc. It is used for connection cable with terminal of welding machine.

(6) Earthing Lamp :- These are generally made up M.S, brass and Copper etc. It is used to connect earthing terminal of welding machine ~~which~~ etc with work table etc.

(7) Welding cabin and table :- These are generally made up of iron with iron top and placed in a welding cabin which is made up by any suitable thermal resistant material.

(8) Face mask / Hand shield :- These are used for protection of face and eyes from the scatered ultraviolet rays etc. generated during welding process. It is made up of fibre sheet and black glass are fitted to look at weld.

(9) Face and safety glass :- These are similar as the ordinary google except that these have guardrade the side of glass to provide of safety to eye from side along with the front direction.

(10). Chipping Hammer:- These are hammered having pointed or sharp striking face and used for removing slag on scatler.

(11). Wire brush:- Wire brush are used for removing slags and unwanted material from medal surface in fine way than chipping hammer.

(12). Glass and apron:-
These are used for protection against spatter and spark etc.

(13) Electrode carriers:-
These are used for carring number of electrode at welding place the moisture present in ground may humid the electrode placed without electrode carrier.

Gas Welding:- Gas welding is fusion welding process. It joints metals using the head of combustion of any oxygen and fuel gas (i.e acetylene, hydrogen, propene or butane) mixture. It consist of a flow of any suitable gas under specific pressure which give a flame after burning in pressure of oxygen etc.

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Tools and Equipment :-

(1) Oxygen gas Cylinder :- Orgen cylinder are painted black and the valve outlets are screwed right handed. It is a drawn cylinder out of mild steel or alloy steel.

(2) ~~ASte~~ Acetylene gas Cylinder :-
The acetylene cylinder is painted maroon out of mild and the values are screwed left handed. It is chamfered or grooved. It is solid drawn steel cylinder.

(3) Oxygen and acytelene pressure regulation.
Pressure regulation is fitted with two pressure gauges one indicates the gas pressure in the cylinder and other shows the reduced pressure at which the gas is going out. It is connect b/w the cylinder / generator and have leading to welding torch.

(4) Welding torch ~~or~~ blow pipe.
Oxygen and fuel gas having been reduced in pressure by the gas regulation are fed through suitable hosses to the welding nozzle or tip where the gas mixture is brunt to produce a flame for carrying out the welding operation.

(5) Safety valve :- It is used to provide safety against high pressure of gas when the recommented pressure range.

(6) Gas lighter :- A spark lighter provides a convenient safe means of lighting the torch. Spark lighter are constructed from flint and steel.

(7) Gas cylinder trolley :- It should be capable accomodating one oxygen cylinder and one acetylene cylinder. The gas cylinder are hold in place with chain and supported on the bottom with a steel platform.

(8) Welding table :- It is used for placing jokes during welding operation. It is made up of iron / brick structure along with providing top of fire brick work.

(9) ~~Go~~ Keeding Goggles :- These are very similar to goggles used in electric arc welding process but these are comparatively lighter shade glass.

(10) Gloves and apron :- These are used for protection from spatter.

(11) Wire brush :- Wire brush is used for remaining slag and unwanted material from metal surface.

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Gas used in Gas Welding process:-

(1) Oxygen:- It is stored in metallic cylinder at above 120 kg/cm² in liquified state. It is prepared by flowing methode.

(2). Acetylene:- It produces about 3600°C temperature in flame form It is prepnad by following method

(I) Combination of hydrogen and Carbon
(II) By Calcium carbide.

Flame:- Flame is an important tool of oxygen gas or oxy-acetylene welding. When acetylene is mixed with oxygen in correct proportion in the welding torch and ignited, the flame resulting at the tip of the torch is sufficiently hot to melt and join the parent metal. The oxy-acetylene welding reaches a temp. of about 3200°C.

Types of welding flame:-

(I) Natural flame:- It is achieved when acetylene and oxygen are used in equal quantity. The temp of the neutral flame is the older of 5900°F (3260°C). It is used in gas welding of mild steel stainless steels, cast iron, Copper etc.

(II) Oxidizing flame:- After a neutral flame established, the supply of oxygen gas is further increased the result will be an oxidising flame. It burns with a decided loud roar. Due to excess of oxygen its temperature is higher than neutral flame (6300°F)

(III) Reducing flame:- If the volume of oxygen supplied to the neutral flame is reduced the resulting flame will be a carburishing or reducing flame. Its approximate temp is 5550°F (3039°C) It is used in welding with low alloy steel rods and welding those metals that do not tend to absorb carbon.

Advantage of Gas welding:

1) It is probably the most versatile process.
2) The rate of heating and cooling is relatively slow.
3) The equipment is versatile, low cost, self-sufficient and usually portable.
4) Welder has good control over the temp. of the metal in the weld zone.

Disadvantage of Gas-Welding.

(1) Heavy selection can not be joined economically.

(2) Flame temp. is less than the temp. of arc.

(3) Gas flames take a long time to heat up the metal than arc.

(4) More safety problems are associated with the handling and storing of gases.

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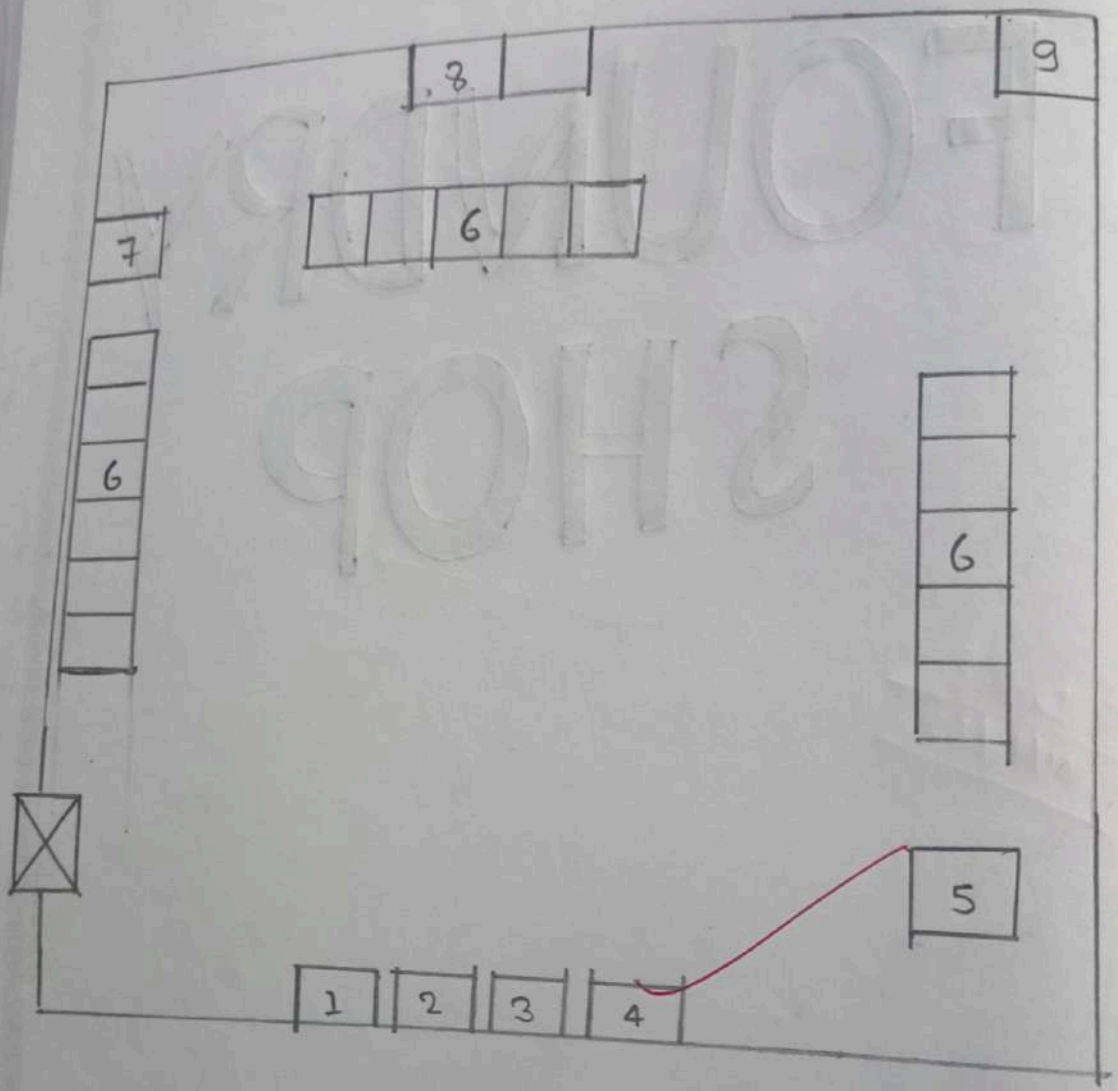
TUTORIAL / PRACTICAL No.

FOUNDRY SHOP



* Layout of foundry shop.

* Description of layout of Foundry Shop

1. Semi automatic injection moulding machine.
2. Bench grinder
3. Anvil
4. Crucible furnace
5. Pit furnance
6. Moulding Bench
7. Leg Vice
8. Rock
9. Water tank.

Target:- Green stand practice of simple Pattern.

Object:- To prepare a mould of simple gland and cast it with aluminium.

Tools and Equipment:- Moulding boxes i.e drag and cope, flat hammer, peen hammer vent wire, Draw spike lifter leaves gate kins, wooden smooths, moulding board etc.

Material Used. Moulding sand, parting sand water, dressing power etc.

Operation involved :-

(I) To locate the pattern and drag Box on the moulding board.

(II) Fill up the drag with sand and rain with peen hammer.

(III) Finally ram with flat rammer.

(IV) Cut out the excess sand of drag and vent it.

(V) Roll over the drag and sprinkle Parting Sand.

(VI) Locate cope on drag with two gate Pins i.e for rise and other for rammer.

(VII) Repeat 2 and 4 operation with cope also.

(VII) Remove gate kins and separate the Cope.

(IX) Withdraw the pattern after ramming.

(X) Repair and gate cutting.
(XI) Dressing out the moulding.
(XII) Finally seming of casting.

Safety precaussions:-

(I) Use water as per sand condition.
(II) Ramming should be uniform. Avoid to hard and too lose ramming.
(III) Venting should be sufficient.

Sand Constitution:-

	Green Sand	Dry Sand
Clay →	9% to 14%	9% to 14%
Moisture →	4% to 6%	6% to 8%
Coal dust →	5%	6%
Silica sand →	Rest	Rest.

Foundry

Principle of foundry:-

(1.) Foundry has been used for shaping of metals since the earliest days for civilisation. A wide verify the size and shape of simple and intricate nature can be produce in different metal. Foundry or Casting in the process of producing metal alloy component of desired shape by pouring the molten metal alloy into a alloys

is known as casting.

Steps involved in making a carding:-

(1.) Make a pattern out of wood metal plastion.

(2) In the case of sand carting role & test and prepare necessary mixture for moulding and necessasary care.

(3) A care is a body (of sand etc.) which is employed to produce a cavity in the carding.

(4)* Melt the metal/alloy to be card.

(5)* Pour the molten metal/alloy into the moulds and remove the carding from the mould after the metal solidity.

(6). Clean and finish the carting.

(7). Test and inpect the carting.

(8). Remove the defect if any.
Recieve the carding rodness by heat treatment.

Function of a pattern:-

A pattern prepare a mould cavity for the purpuse of making a carting.
A pattern may be contain projection known as care prints of the carting required a care and need to be made hallow.
Runner, gater and riser (used for introducing) and felling molten metal to the mould cavity may from a

Part of pattern.

A pattern may help in establising locating pointer on the mould and therefore on the casting with a purpose to check the casting dimension. Pattern may help position a core before the moulding sand is rammed. Properly constructed pattern minimize overall cost of the casting.

Pattern Material:-

Selection of pattern material, The following factor arriest in selecting proper pattern material.

The number of casting to be produced metal pattern are prefered when the production quantity is large.

The desired dimensional accuracy and surface finish required for casting. ~~method~~

Method of moulding i.e hand or machine moulding shape, complexity and size of the casting.

(1) Metal
(2) Wood
(3) Plastic
(4) Plaster
(5) Wax

Type of pattern:

For selecting a particular kind of pattern for making a casting one may consider -

(I) A quantity of casting to be produced

(II) Type of moulding method to be used

(3) Problem associated with the moulding operation such as withdrawing the pattern from the mould.

The different type of pattern commonly used are -

* One piece pattern
* Loose piece pattern
* Cope and drag pattern
* Gated pattern
* Segmental pattern
* Split pattern
* Match plate pattern
* Sweep pattern
* Skeleton pattern
* Follow board pattern.

Pattern allowances:-

A pattern is always larger in size compared to final casting becomes it. Carriers allowances due to metallurgical and mechanical reason.

for example:- Shrinkage allowances in the result of metallurgical phenomenon where machine draft, desorption and shake,

allowances are provided on the pattern brass of mechanical pattern.
The various pattern allowances are discussed below and the are —
(I) Shrinkage or Construction allowance.
(II) Draft or allowances.
(III) Machine or finish allowances.
(IV) Distortion or counter allowances.
(V) Shake or Rapping allowances.

Types of Sand ~~att~~ used in mould :-

(a) Green Sand (b) Loam Sand
(c) Core sand (d) Dry sand
(e) Parting Sand (f) facing Sand
(g) Blacking Sand (H) Sharp Sand
(i) System Sand (J) Heap sand.

Core :-

(1) A core is essentially a body of material which form a component of the mould. If process sufficient strength to be as an independent unit.
(2) Core is an obstruction which when positional in the mould, naturally does not permit the molten powdered metal to fill up the space occupied by the core produce hollow carting.

Different function of Core :-

* For hollow carding provide the mean of forming the main internal cavities
* Core may form a part of green sand mould.

* Core may be provided external features.
* Core may be employed to improve the mould surface.
* Cores may be used to strengthen the mould.

Moulds:-

Prepared moulds sand is packed rigidly around the pattern and when the pattern is with drawn a cavity corresponding to the shape of pattern in the sand and it is known as mould cavity. Thus a mould is a sort of contain which when poured with molten metal a carting of this shape of the mould.

Types of Moulds:-

Green sand moulds, Dry sand, Skin dried moulds, Air dried mould Core sand mould, Lean mould, Shell mould, Cement bonded sand mould; Metal mould, Investment mould, Ceramic mould, plaster mould, Graphite mould, Sodium Silated ~~mould~~ CO_2 mould, Bench moulding, floor moulding, P.I moulding Machine moulding Hand moulding equipment.

Hand moulding equipment :-

(I) Bellow (II) Brush (III) Sifter and Copper Dust.
(IV) Gaggus (V) Pean Hammer
(VI) Hand hammer (VII) Trowel (VIII) Hand riddle
(IX) Sprevepin (X) Sprul Cutters
(XI) Spray guns.

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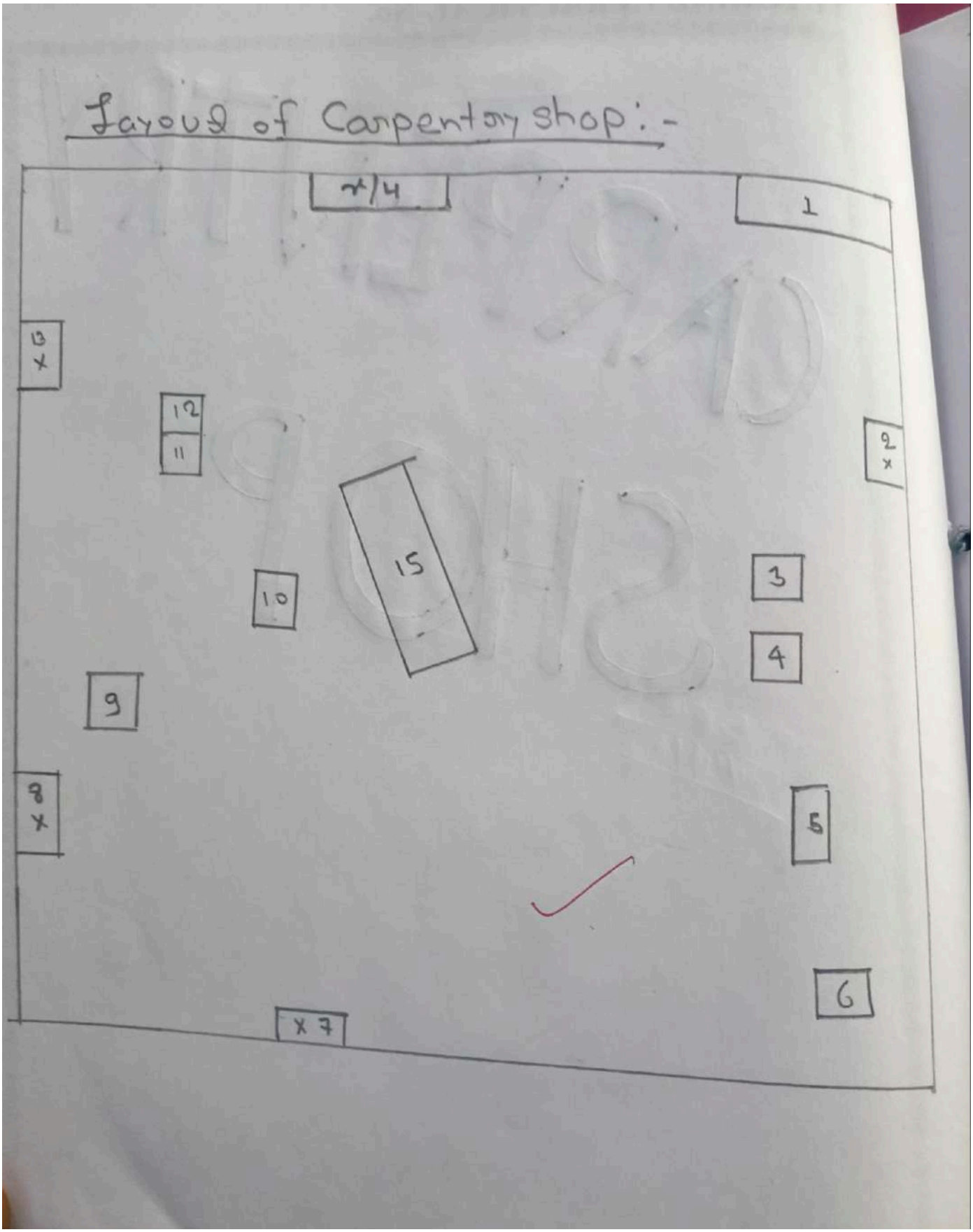
TUTORIAL / PRACTICAL No.

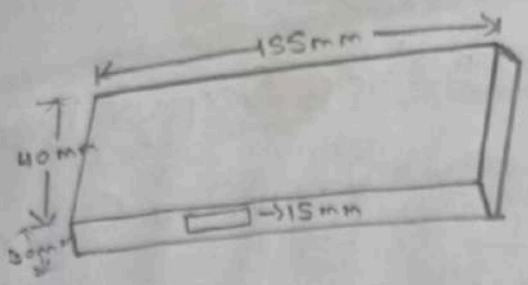
CARPENTRY SHOP

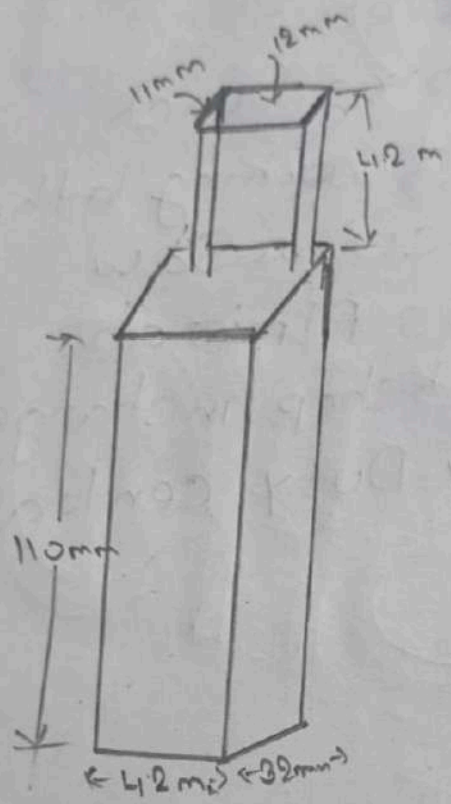
Layout of Carpentary shop:-

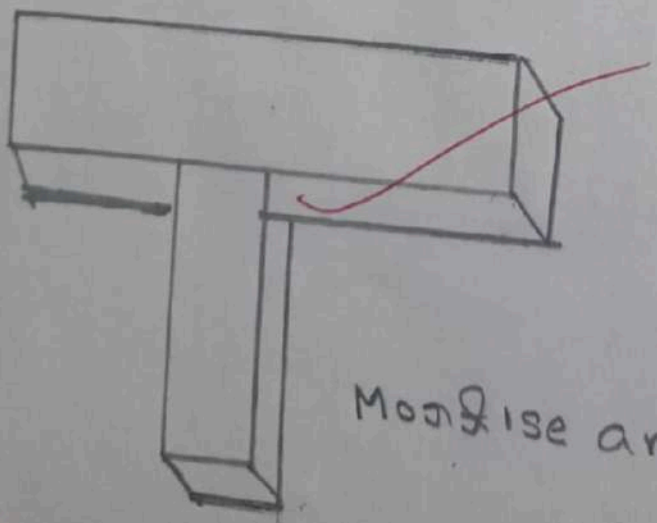


Carpentry workshop layout Description

(1). Foreman Instructor Cabin
(2, 13, 7, 8) Doors
(14). Shutter
(3, 4, 11, 12) Working Bench
(5). Wood working lathe Machine.
(6). Circular Saw
(9). Tools Almirah
(10). Workshop incharge Table
(15). Heay Duty central lathe Machine.







Mortise and Tenon Joint

Object:- To make a mortise and Tenon joint as per drawing.

Material Required:-

Two wooden piece of 150-50-25 mm

Tools Required:-

Steel scale scriber, Try square, Marking gauge, Tenon gauge carpentry bench vice, Iron jack plane, Rasp file, Firmer chisel, Mortise chisel, Mallet etc.

Process involved

* Measuring and Marking
* Planning
* Sawing
* Mortise and Tenon joint Marketing Practice cloueling.

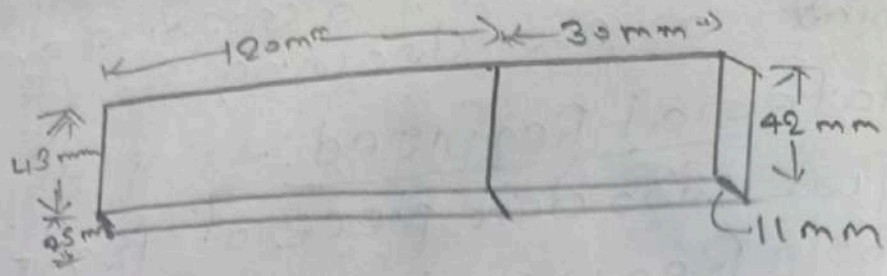
Processure:-

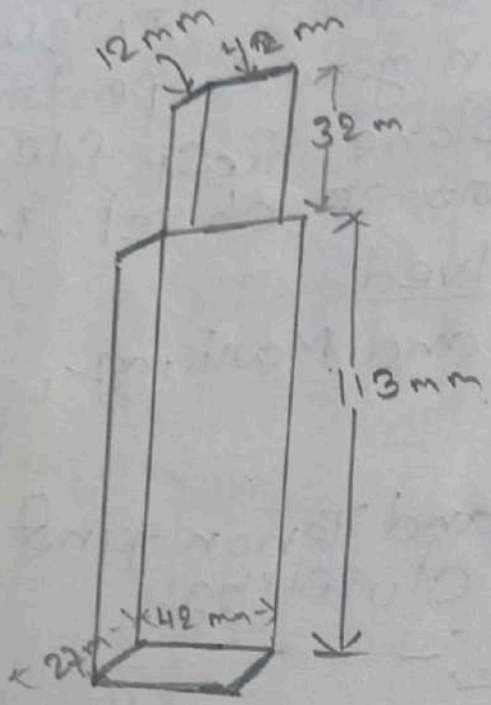
(1). First we place one face of workpiece and check the trueness of this face with try square.

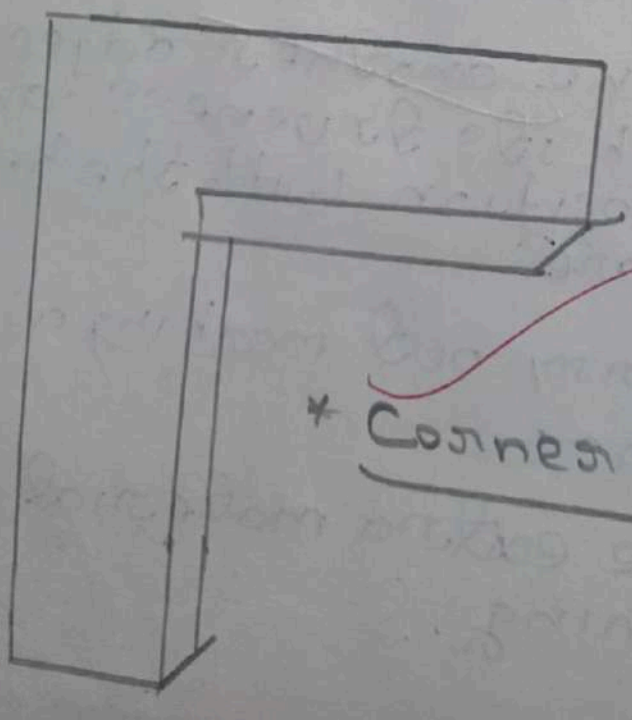
(2). We plane another adjecent side and check its trueness and right angle position with the help of try square.

(3) We carry out marking as pergiven diagram.

(4) Remove extra material by Sawing and planning.







* Corner Lap joint

Object (2) → To make a corner lap joint as per drawing.

Materials Required :-

Two wooden piece of 150-50-25 mm

Tools :-

Steel scale, scriber, Try square marking gauge, Tenon saw, carpentry bench vice, Iron Jack plane, Rasp file, Firmer chisel, Mortise chisel, mallet etc.

Process involved :-

(I) Measuring and Marking
(II) Planning
(III) Sawing
(IV) Lap joint making practice.

Procedure :-

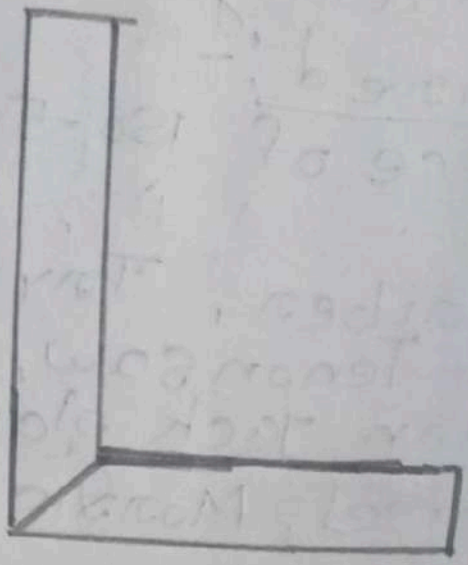
(1). First we plane one face of workpiece and check flueness of this face with try square.

(2). We plane another adjacent side and check its flueness and right angle position with the help of try square

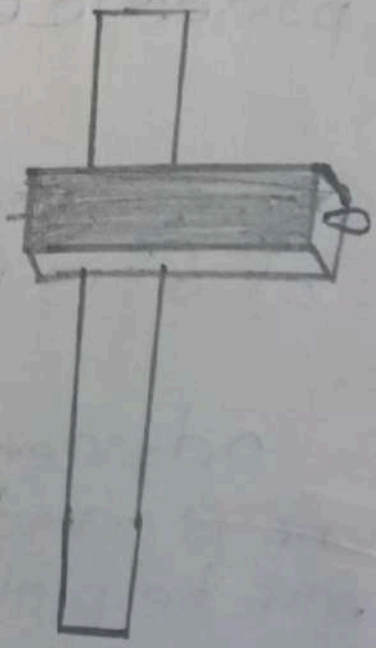
(3) We carry out marking as per given diagrams.

(4) Remove extra material by planning and sawing.

We prepare other working following the same process.



Try Square



Carpentry shop is an important shop of mechanical workshop. The process done in wood work are sawing, Marking, turning, chiselling etc. Wooden furniture doors, windows and patlean are generally made in carpentry shop.

Wood: Wood is a major raw material of carpentry shop. It is available in nature in the form of trees. Trunk are most useful part of trees.

Types of Wood

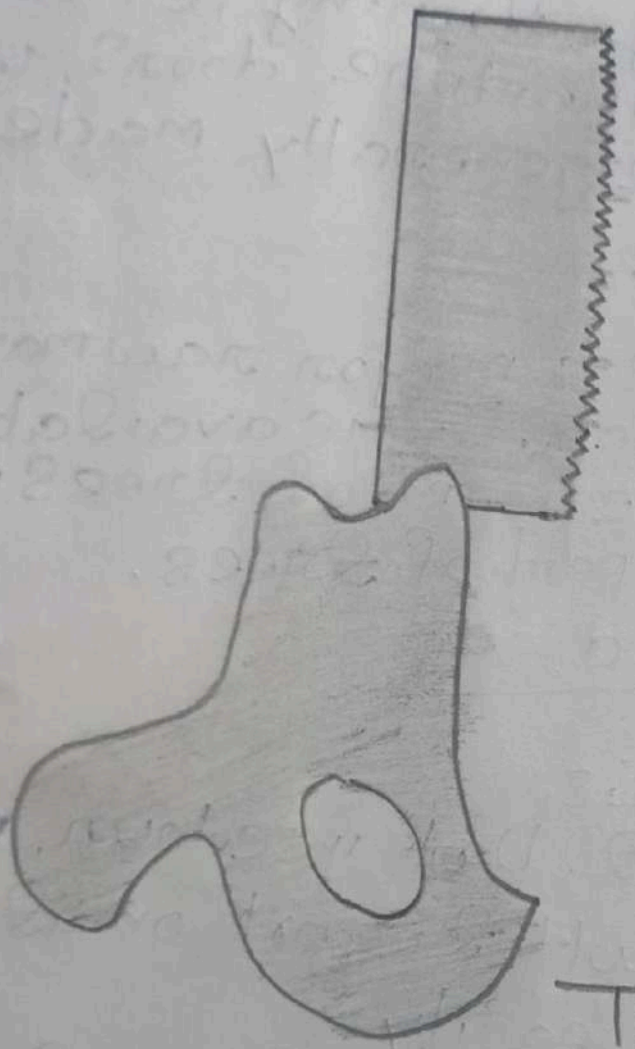
(I) Hard Wood :-

Heavy in weight, Dark in colour, more durable, difficult to work on it, does not catch fire easily
e.g - Task, oak, Mohagany, Babool, Seasam etc.

(II) Soft wood :- Less weight, less durable easy to work on it, catch fire soon as compare to hard wood
e.g → Pine, Ash, Chir, Deodar etc.

(3) Ply wood :-

Ply wood is made by pasting and applying pressure on three as more veneers together.



Tennon Saw

Timber:- Wood that is used in building construction or in any engineering construction is called timber.

Properties of Timber:-

(I) It should not have natural defect i.e knots or cracks etc.
(II) Timber should be well seasonal.
(III) Timber should produce metlalic sound on hammering.
(IV) Timber should have resistance to fier.

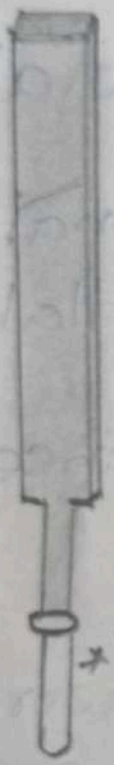
Advantage of Timber:-

(I) It is light in weight, more workable and requires less labour expenses.
(II) Its availability is quite easier than other material.
(III) It is bad conductor of heat and electricity.
(IV) It can be used in making sound proof construction.

Carpentry Tools.

In the carpentry shops tools are classified as.

(1.) Measuring Tools
(2.) Marking Tools
(3.) Cutting Tools
(4.) Planning Tools.



* Firmer chisel

* Mortise chise

(5). Drilling and boring Tool
(6). Holding Tools
(7). Striking Tools
(8). Shaping Tools.

Measuring Tools -

(I) Folding wooden Tools :-

It is made up of wooden strip and 4 strips are hinged together & provide it following capacity, It is generally 2 feet long and marked with inch and millimiter scale.

(I) Steel scale :- It is made up of stainless steel and is marked with inches and can be both.

(II) Construction scale :- It is also a rule type scale used for marking pattern, casting allowances are added to this scale.

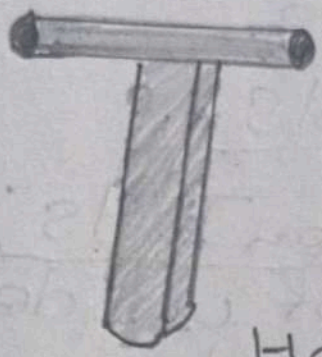
(III) Inch Tape :-

It is made up of flexible thin steel. It is folded arounded a centre pin attach with a small handles.

(2) Marking Tools :-

(I) Pencil :→ lead pencil is generally used for marking.

(II) Marking gauge :→ It is used to draw Parallel line. It is made up of wooden or aluminium casting etc.



Hammer

Mallet

(III) Mortise Gauge: It is used in scratching two parallel line. It has two sharp edge one fixed and other adjustable.

(IV) Try-Square ⇒ Measuring for Angle.

Cutting Tools

(I) Saw: A saw is a multi-tooth tool made up of thin sheet attached with a wooden handle Different types of Saw are -

(a) Rip Saw

(b) Tennon Saw

(a) Tenon Saw:- It is a thin saw ranging from 20-40 cm in length and it is supported by back of wrought iron or brass. Hence it is also called a backsaw. It contains about 4 teeth to a cm.

Compass Saw:- It is short narrow Saw tempering towards a point used for cutting sweep and large interior curved by hand. It is also called table saw.

Keyhole Saw:- It is used for cutting thick internal curved where it is impossible to use other saw.

Chisels:- It is made up of high Carbon steel. It is used with the help of any impact load such as blow of hammer etc.

There are three chisels commonly used in carpentry shop.

(I) Firmer Shop:- It is general purpose chisel used to finish inside grooves. It has various sizes of cutting edge depending upon the work to be done with varies from 5mm to 35mm.

(II) Mortise chisel:- It is used to make mortises. It is used for heavy cut. The blade thickness varies from 5mm to 12mm.

(III) Adz:- It is hand tool used to take very thick cuts. Rough works is generally done with adz. It has heavy body with a long wooden handle. It can also be used as striking tool.

(IV) Planing Tools:- It is used for fine cutting of wood after rough cutting of wood with saw.

Classification of Planning Tools:-

Planes may be broadly classified to the material of their body.

(I) Wooden plane:- The plane whose stock or body are made up of wood are known as wooden plane.

(II) Iron planes:

The plane whose stock or body are made up of iron are known as iron plane.

Rasp File :- It is a fine cutting tool having number of cutting teeth on its face. It is only used in wood work. Process of cutting by the tool is called filling. It is made up of Tough Carbon steel or Cast steel.

(5) Drilling and Boring Tools :-

It is used to make holes in a wood pieces. Commonly used drilling and Boring tools are -

Hand Drill :- Hand drill consist of spindle, drill chuck, crank, handle and two levels gears. Bevel gears are fitted on the body. Drill is held in chuck and rotation of spindil is given through gears with the help of crank. The handle is pressed into the wooden piece while rotating the drill.
Thus hole is formed.

(I) Grimlet

(II) Handle :-

It is made from a long twisted bar. It has a screw type starting edge while drilling it is rotated and pressed on the wooden work-piece with the help of handle.

Handing Tools:

(I) Bench Hook:- It is a simple type of holding tools used for supporting the wood while working on it.

(II) Compendry Vice:- It is used for holding and supporting jobs in wood working process. It main parts are:-

Name	Material generally used
Jaws	Cast Iron (Casted)
Spindle	Mild Steel
Handle	Mild Steel
Sliding rod	Mild Steel

(7). Striking Tools:- Striking tools are used to force the nails or chisel into the wood, main striking tools are -

(I) Cross pean Hammers:- It is made up of high carbon steel or cast steel generally. Its body form of a narrow round edge placed at right angle to the axis of the handle.

Claw Hammers:- It is made up of high carbon steel generally. It is used for striking as well as pulling the nails from the wood.

Mallet Hammer:- => It is made up of wood.

Sharpening Tools:-

Water stone:- It is a rectangular piece of stone generally kept in a wooden base. It is used to re-sharpen the chisel, bits, plane, blade and other tools, while sharpening water is sprinkled to the stone.

Joints:-

To connect togather the different piece of wood in proper manner is knownas joining.

Some important joints are —

Lap joints:-

(I) Cross lap joints:- This joints are employed where two pieces are crossing each other from center to the center remaining in same plain.

(II) T-joints:- This joints is used where one end of wooden piece is crossing center of other making lap and remaining in same plane.

(III) Corner lap:- This joint is employed where end of one wooden pieces is crossing center of overlap to end of their piece remaining in same plane.

(4) Mortise and Tennon joint :-

Wood working Machine.

In mordern workshop wood working machine are used instead of hand tools Machine has the following advantage over the hand tool.

(I) More productions
(II) less fatigue to worker
(III) Saving in times
(IV) More accuracy

Wood working lathe :-

A wood working lathe consist of a cast iron bed, a head stock tail stock tool rest live and dead center and driving mechanism. It is used for producing round ~~tools~~ symmetrical jobs. Scraping tool chisel and turning guage are used as a turning tool on a working lathe.

(2) Circular Saw :- It is generally used for cross cutting of the wood, other operation like tail stock, grooving rebating, chamfering tapering etc. are perform in machine.

(3) Band Saw :- A band saw consist of a table, guide pulleys, belt and tension adjusting screw. It is used to saw the wooden piece length wise. A band

type cutter reviewed over the two pulleys. After preparing both work pieces, assemble both pieces and do fitting.

Precautions :-

(1) Always adopt right tools and right procedure for every operation in carpentry shop.

(2). Workpiece should be well right in vice in proper position.

(3). Tools of saw should be well set and sharpness.

(4). Tools should be ready and in good position.

(5). During marking, keep suitable margin desired as per operation to be carried out.

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