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1. FITTING

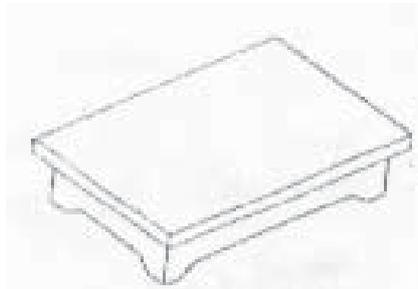
1.1 IDENTIFICATION & USAGE OF TOOLS

AIM: To Identify various fitting tools and their usage

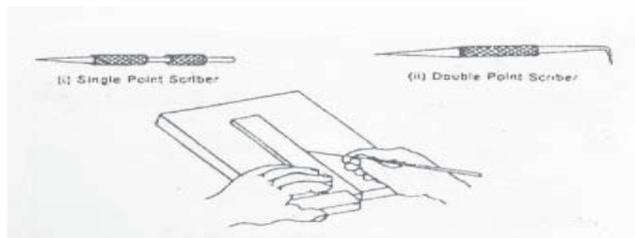
Fitting Tools; A) Marking Tools
B) Measuring Tools
C) Cutting Tools
D) Holding Tools
E) Striking Tools

A. Marking tools: These are the tools used to make marking on the work piece.

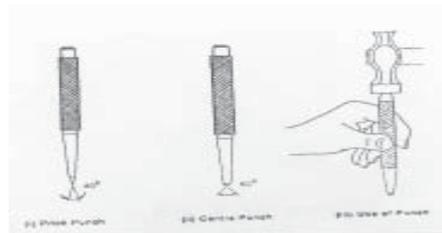
a) Surface plate: Work piece placed on this plate for marking.



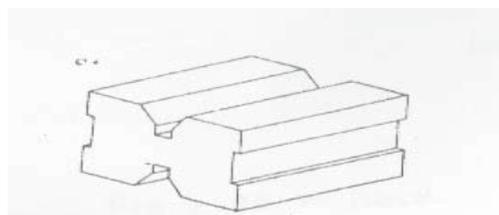
b) Scriber: It is used to marking of lines on the job.



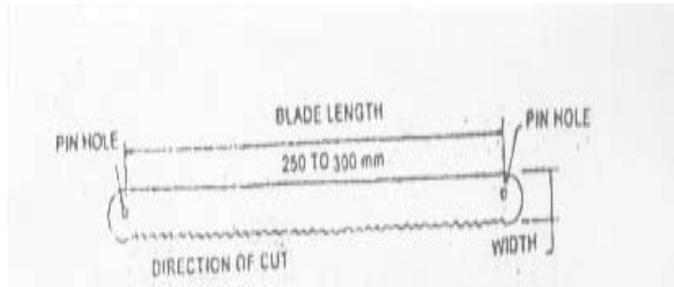
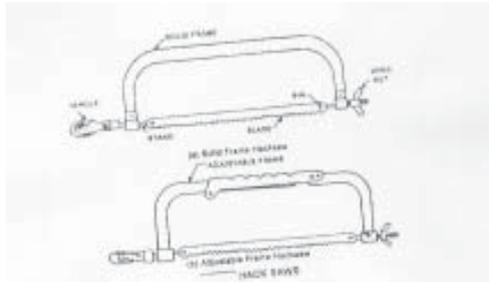
c) Punch: This is used to marking of work & locate centres.



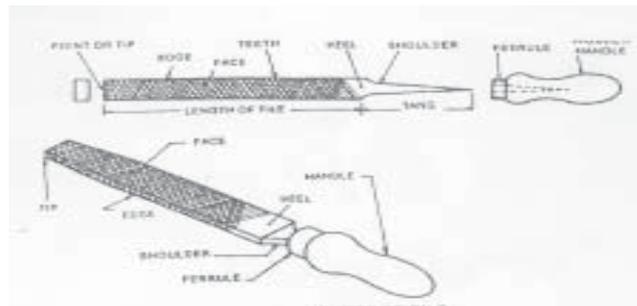
d) 'V' block: Round jobs may be placed in 'v' shaped groove for marking.



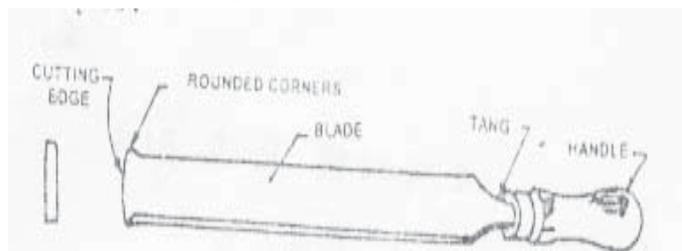
b) Hack Saw: It is used to cut the work by sawing.



c) File: It is used to cut the work piece by removing small amount of metal from the work.

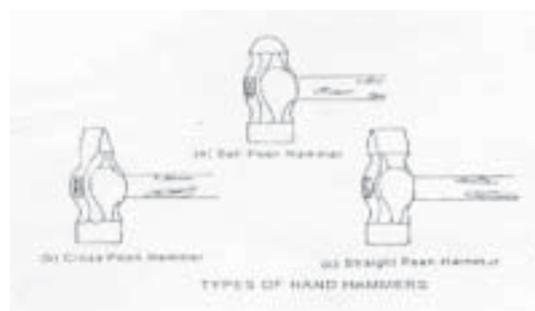


d) Scraper: It is used to pairing off thin slices of metals



D. Striking Tools: These are the tools used for striking on chisels.

a) Hammer: This is used to strike on the chisel for cutting

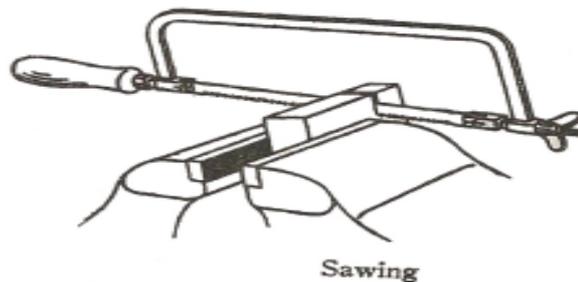


1.2 SAWING PRACTICE:

AIM: To practice with hack saw and cut the metal.

Tools & Equipment required:

- 1) Steel Rule
- 2) Try Square
- 3) Scriber
- 4) Punch
- 5) Hack Saw
- 6) Bench Vice



Procedure:

- 1) Mark the work with scriber and punch it.
- 2) Fit the work in Benchvice
- 3) Start the hacksaw with giving to & fro stroke
- 4) Apply coolant to cool the blade
- 5) Practice with hack saw with equal timings.
- 6) Practice by Sawing till the work is seperated.

Precautions:

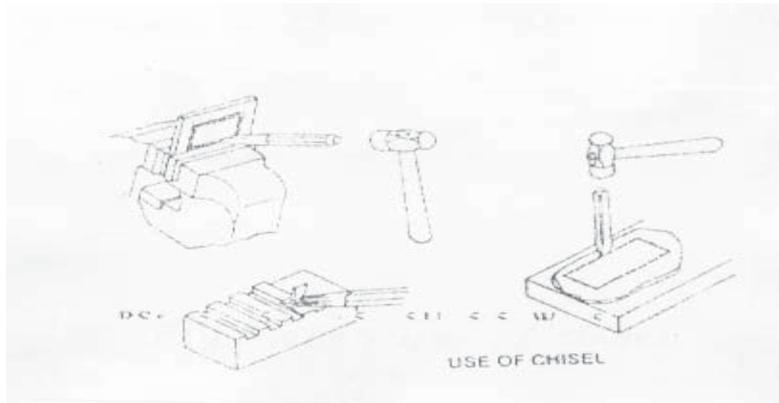
- 1) Hack saw blade's cut of teeth should be arranged to wards cutting direction.
- 2) Coolent should be used for correct sawing.

1.4. CHISELLING PRACTICE

AIM: To practice with chisel to obtain correct job

Tools & equipment required:

- 1) Chisel
- 2) Bench vice
- 3) Hammer
- 4) Scriber
- 5) Steel rule
- 6) File



- Procedure:
- 1) Mark the job to be cut.
 - 2) Place the chisel edge point at the marking.
 - 3) Give light blow on the chisel till the excess metal is removed.
 - 4) Continue the process till work is cut.
 - 5) After completion of cutting if the edge is rough use file to get clear.

- Precautions:
- 1) Chisel should be placed inclined.
 - 2) Peen hammer is used for light blows.
 - 3) Do not give heavy blows.

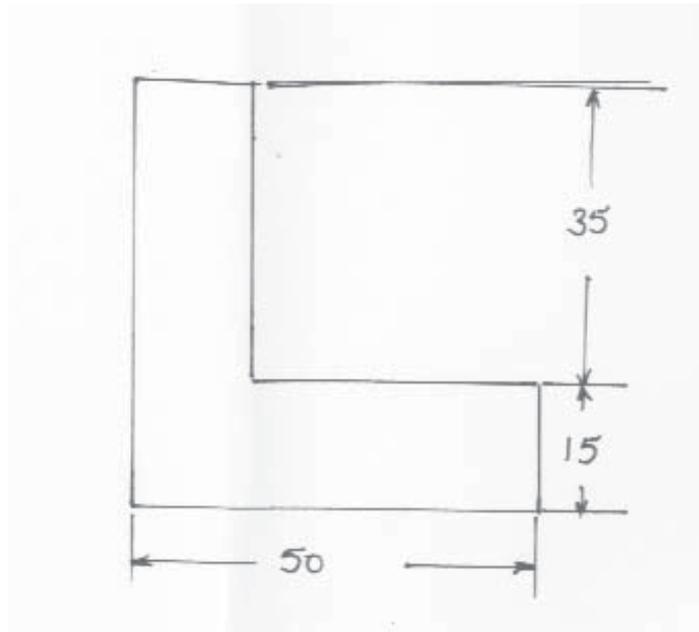
1.6. REPARATION OF 'L' SECTION

AIM: To Prepare 'L' in fitting for given measurements of size 50 x50 x 10 mm

Tools & equipment required:

- 1) Steel rule
- 2) Scriber
- 3) Try square
- 4) File
- 5) Hacksaw
- 6) Benchvice

Sequence of Operations: 1) Marking
2) Measuring
3) Sawing
4) Filing
5) Finishing



Procedure:

- 1) Cut the work piece from the bar for required size.
- 2) File the work piece edges each to right angle
- 3) Mark the work piece for 'L' section
- 4) Fit the job in Bench vice
- 5) Cut the job with hacksaw to get 'L' shape .
- 6) File inner side to right angle .

Precautions : 1) File the work piece on the sawing marks .
2) Use coolant while using hacksaw .
3) Inner side edges also checked with Try square for trueness of the job .

1.8 TAPPING

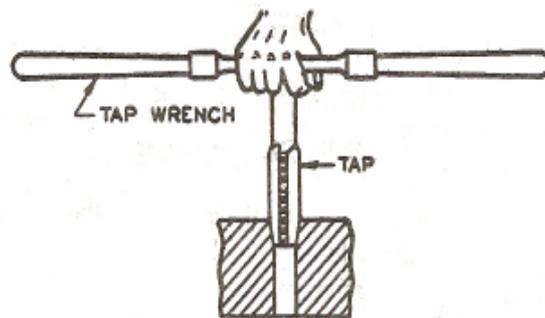
AIM: To tap the drilled holes on the work piece with the tap set.

Tools & equipment required:

- 1) Steel Rule
- 2) Center punch
- 3) File
- 4) Hammer
- 5) Surface Plate
- 6) Drilling machine with drill bit
- 7) Tap set
- 8) Tap handle
- 9) Bench vice

Sequence of operations:

- 1) Marking
- 2) Measuring
- 3) Filing
- 4) Drilling
- 5) Tapping
- 6) Finishing



Procedure:

- 1) File the surface of the work piece
- 2) Mark with punch
- 3) Drill the hole for required size of tap with the formula
- 4) Fit the work piece in the bench vice
- 5) Tapping is done by the tap set in the drilled hole.

Precautions:

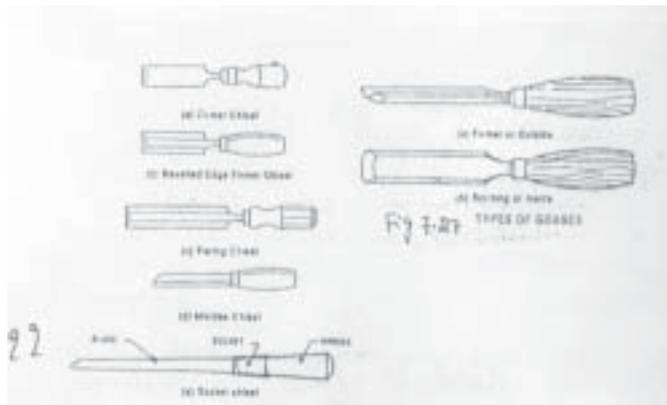
- 1) Use correct size tap set with handle
- 2) Handle should be parallel to the work. It should not be inclined.
- 3) Use coolant while drilling & Tapping
- 4) Give continues feed for the tap.

2.2. CHISELING PRACTICE :

Aim :- To Chisel the wood stock and cut it.

Tools & Equipment required :-

- 1) Chisel
- 2) Mallet
- 3) Carpenter's Vice
- 4) Carpenter's Rule
- 5) Marking Gauge



Introduction :- Chiseling is the process of cutting a small stock of wood to produce the desired shape .

Procedure :-

- 1) Mark on the wood with a marking gauge

- 2) Place chisel blade on the job and give light blows.
- 3) Remove the piece and strike with mallet.
- 4) Practice Chiseling till the wood get desired shape & size.

Precautions :

- 1) To cut horizontally with the grain, then the chisel is held slightly tilted.

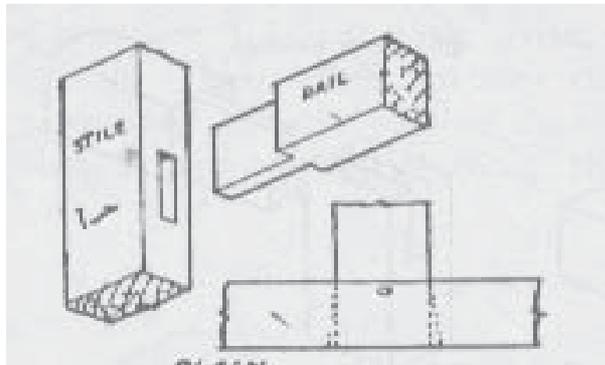
- 2) In Vertical Chiseling across the grain, Chisel is controlled with the left hand pressing firmly.

2.4 MORTISE & TENON JOINT

AIM: To prepare Mortise and tenon and joint it .

Tools & equipment require : 1) Marking gauge
2) Carpenter's rule
3) Try square
4) Rip saw
5) Jack plane
6) Chisel
7) Vice
8) Mallet

MATERIAL REQUIRED : 50mm x 150mm x 25mm Wooden pieces -2 Nos



PROCEDURE : 1) Mark on the wooden pieces
2) Plane the surfaces.
3) To prepare tenon remaining part of wood cut with chisel
4) Mark with pencil on mortise wood and cut the part with chisel .
5) Fit the rectangular peg (Tenon)in to the rectangular hole (Mortise).
6) Plain the surface and check up the trueness with try square.

PRECAUTIONS:

- 1) Prepare tenon first then after prepare mortise compare the size of peg.
- 2) Tenon should be fitted firmly in to mortise with very light blows .

3. BLACK SMITHY

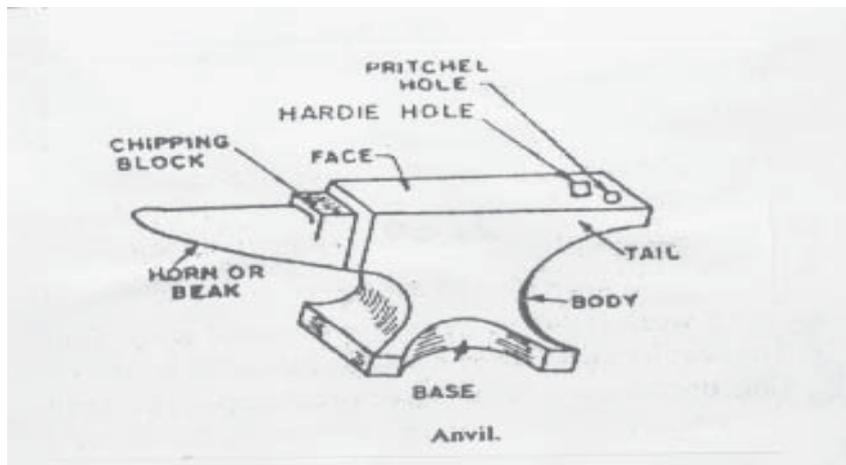
3.1.PRACTICING USAGE OF TOOLS

AIM: To practice various forging tools to know how they are useful

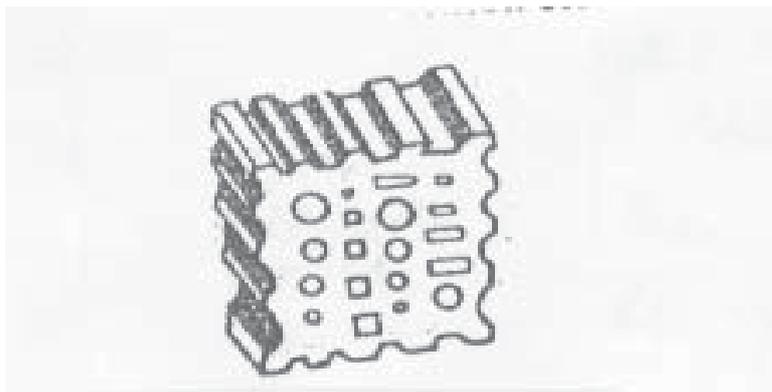
Description:

1) Anvil: It is a supporting tool used for smithy work. It is having various parts used for various purposes.

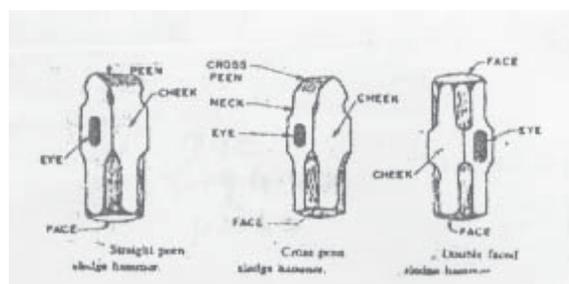
- a) Base
- b) Body
- c) Face
- d) Beak or horn
- e) Hardie holes
- f) Pritchel holes etc.



2) Swage block: It is used for squaring, sizing, heading, bending, forming operations.



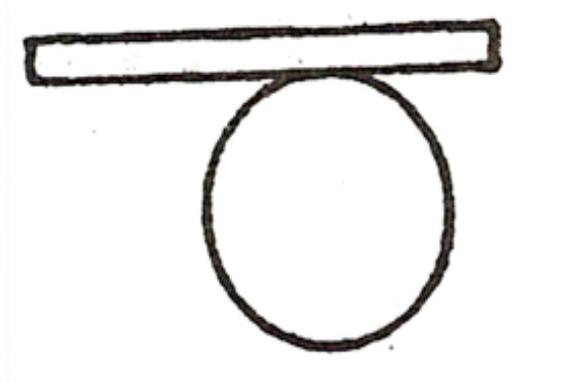
3) Sledge hammer: It is used by the striker



3.2.MAKING A ROUND BAR FROM A SQUARE BAR

AIM: To prepare round bar from given a square bar.

Tools & equipment required : 1) Anvil 2) Forge 3) Tong 4) Hammer etc.



Procedure:

- 1) Place the square bar in forge and heat it till it got red hot.
- 2) Pick up the red heated square bar with tong and place on the anvil and give blows.
- 3) Place the rod in the forge and then place it on the anvil and give blows with hammer till square bar made into round.
- 4) Continue the process till full length of the bar is made in to round.

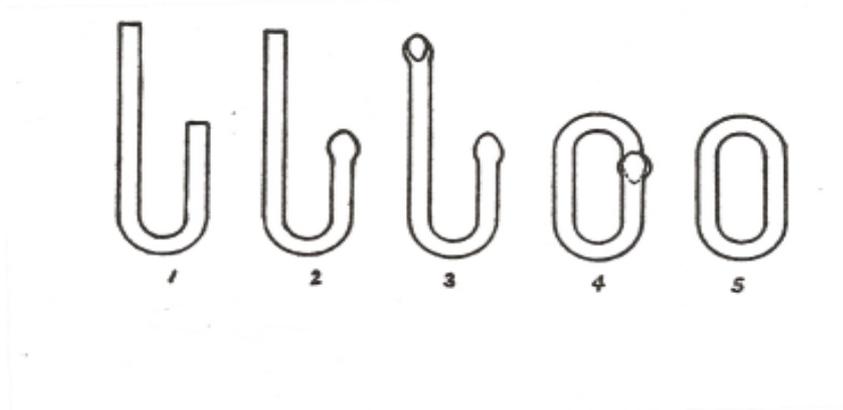
Precautions: 1) Always use hand gloves to protect hand from the heat.

- 2) Use correct tool.
- 3) Give blows continuesly with out gap.
- 4) If the job is not in red hot place it in the forge.

3.4. MAKE A CRANE HOOK:

AIM: To make a crane hook with given M.S. Rod

Tools & equipment required: 1) Anvil 2) Hammer 3) Tong 4) Chisel 5) Caliper



Procedure:

- 1) Heat the round piece
- 2) Place it with a round tong the horn of the anvil
- 3) Bend it by hammering a with a hand hammer
- 4) Place it in the forge and heat it
- 5) Place it on the anvil and bend it till we get required shape.
- 6) Upper part of the hook is joined with a ring.

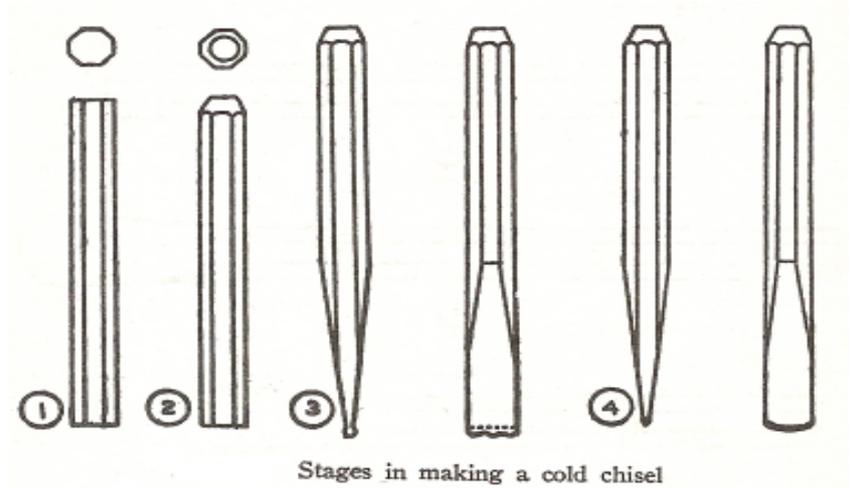
Precautions:

- 1) Lower part of the hook should be bend inside.
- 2) Take proper precautions while joining with the ring to the hook.

3.6 MAKING A CHISEL

AIM: To make a chisel with octagon steel bar

Tools & equipment required : 1) Anvil 2) Hammer 3) Flat tong 4) Flatner 5) Foot Rule



Procedure:

- 1) Heat one end of the octagon steel bar
- 2) Forge chamfer on head
- 3) Heat other end, forge to flat taper , and then cut off excess metal
- 4) Turn the chisel a quarter turn and holding the shank horizontally hammer the narrow sides to make them parallel . Alternate the blows four or five on the the wider surface then four to five on the narrow surface , and so on until the chisel is in the shape desired.
- 5) Heat treat and then grind.

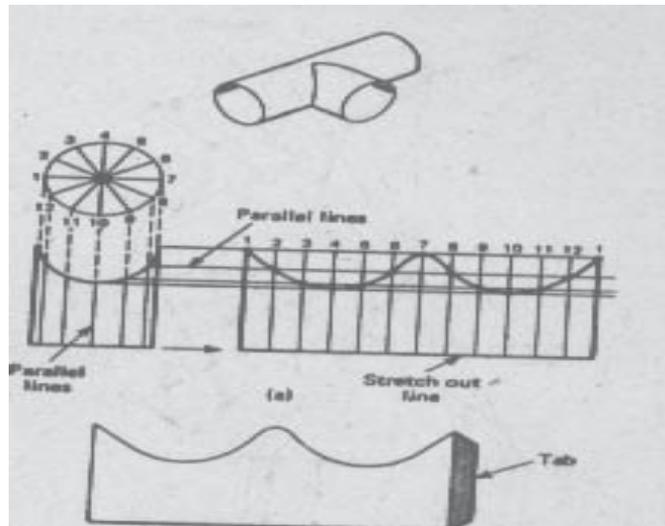
Precautions:

- 1) Heat the rod on both sides only
- 2) Make one side to be sharpened.
- 3) After the forging the chisel is annealed .
- 4) Tin smithy

4.2 MAKE ELBOW

AIM: To make elbow in parallel line Method.

Tools & equipment required: 1) Steel Rule 2) Scriber 3) Divider 4) Snip 5) Hammer 6) Stake etc.



Procedure:

- 1) Draw the plan and elevation of the connector pipe . Divide the plane into 12no of equal parts and project them in the elevation.
- 2) Draw the stretch out line equate to the circle reference of the circle at the angle of 90 to the plan
- 3) Divide the stretch out line in 12 equal are lengths of the plan.
- 4) Divide the stretch out line from each division of the stretch out line and locate the top and bottom and points of these lines by projecties the correspondent points from the elevation.
- 5) Join the points together by sketching free hand from point to point and complete the structure or pattern.

Precautions :

- 1) Maintain inner & outer corner to right angle.
- 2) Trimming to be done at open side for good apperance.

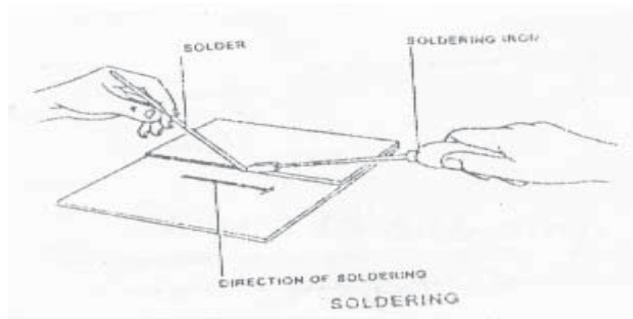
4.4 SOLDERING THE JOINTS

AIM: To make soldering at the joints to make the joint strong .

Tools & equipment required : 1) soldering Iron 2) supporting stake 3) hammer etc.

Material required: 1) Solder 2) Flux etc.

Introduction : Soldering is done at the range of heat 150 to 350⁰c for the trays, funnels & other joints etc.



Procedure:

- 1) Clean the Joint
- 2) Heat the soldering Iron and touch the solder with tip .
- 3) Apply flux at the joint
- 4) Apply the molten solder at the joint and let it be join.
- 5) Repeat the process till the joint is joined with solder.

Precaution :

- 1) Joint should be clean & clear .
- 2) Do not apply solder without using flux.
- 3) Handle the soldering Iron with the wooden or plastic handle only.

5. WELDING

5.1. ARC WELDING PRACTICE

AIM: To Practice arc welding for the effective welding.

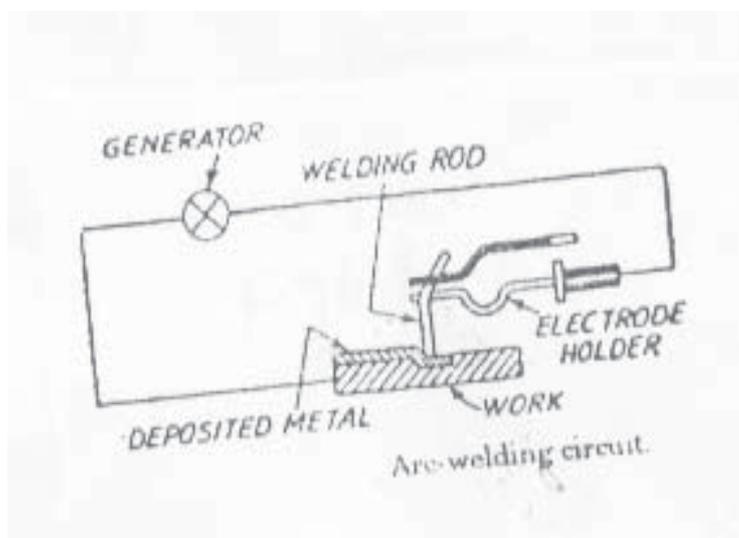
Tools & Equipment required: 1) Electric arc Welding Machine

2) Electrode Holder

3) Earth Plate

4) Chipping Hammer

5) Wire Brush.



Procedure:

- 1) Identify the nature of power supply . If it is A. C. do not matter whether the work or electrode is positive. If it is D.C. Polarity is important.
- 2) Take care of the connections given to the work piece and the electrode.
- 3) Select a correct size of electrode.
- 4) To produce correct arc , maintain a gap of 2 to 3 mm between the work surface and the electrode top.
- 5) While driving the electrode maintain a uniform stream of molten metal run.
- 6) Allow the welded zone to solidify.

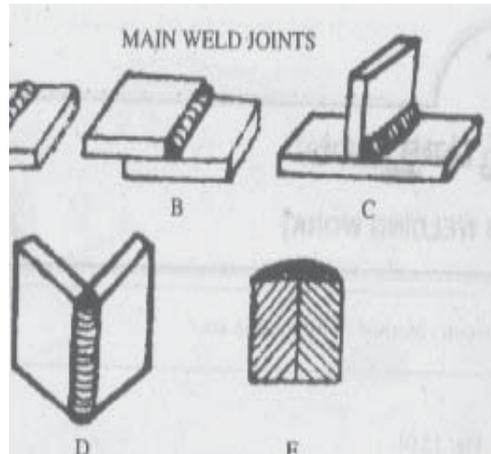
Precautions:

- 1) Use goggles, gloves and apron.
- 2) Ensure correct insulated connectors between the power source and generator to the electrode holder.
- 3) Ensure that short circuit feasibilities are not there.
- 4) Do not keep at the weld zone with bare eyes.
- 5) Observe continuously whether correct fluxing action and slag forming is going on or not during the welding process.

5.3: LAP, CORNER AND T- JOINT WHEREVER REQUIRED

AIM: To practice Lap, Corner, T-Joint in Arc Welding

Tools and equipment required : 1) Steel rule, 2) Scriber 3) Try Square, 4) Hack Saw, 5) Benchvice, 6) Wire Brush & 7) Welding Equipment.



Procedure: a) Lap Joint:

- 1) Take two plates.
- 2) Place first plate part on the other plate used weld the seam.

b) Corner joint :

- 1) Place two plates one by one in 'L' shape.
- 2) Weld in the corner.

c) 'T' Joint;

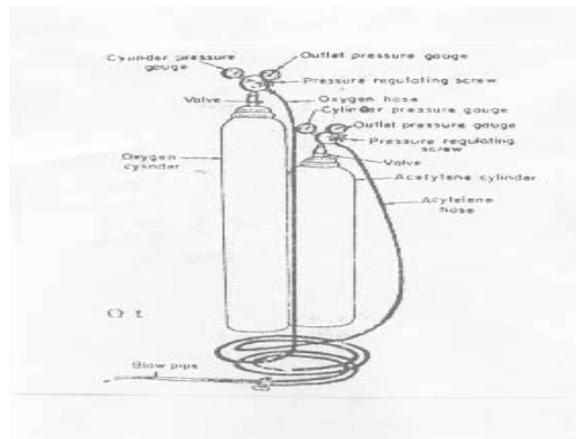
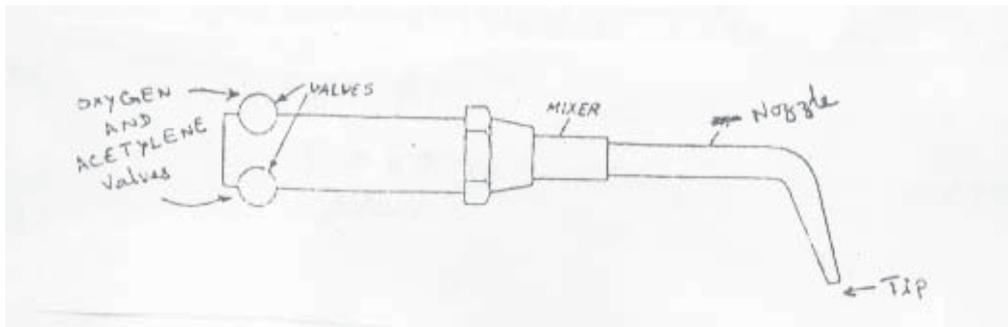
- 1) Place the one plate in horizontal.
- 2) Place another plate on the horizontal plate.
- 3) Join the corner with welding.

Precautions: 1) T Joint & corner joints inside & outside should be in right angle

- 2) Weld inside .

5.5 IDENTIFICATIONS OF GAS WELDING EQUIPMENT .

AIM: To Identify the Gas welding equipment used for the gas welding.



Description: In Gas welding various equipment used for welding process.

- 1) Welding torch: It is a tool for mixing the oxygen and acetylene in desired volumes. In General 2.5 parts of oxygen with one part of acetylene is recommended proportion. Flow gases regulated by control valves.
- 2) Welding torch tip: Tip has a nozzle whose size is denoted by the diameter of its central hole. The size of torch tip selected with reference to the thickness of the metal to be welded.
- 3) Gas cylinders: oxygen cylinder is black in colour and filled with oxygen gas at 140 kg/cm² pressure. Acetylene cylinders at 15.45 kg/cm² pressure painted with maroon colour.
- 4) Hose pipe & fittings: Hose pipes are connects cylinder and regulator valves of torch. These flexible clamp fittings are provided at each joint.
- 5) Spark lighter: It is the tool for instant lighting of the welding Torch.
- 6) Welding rod: Gas welding rods are available usually from 1.5mm to 10 mm dia. and 90 cm in length. It should essentially match with the base metal very closely.

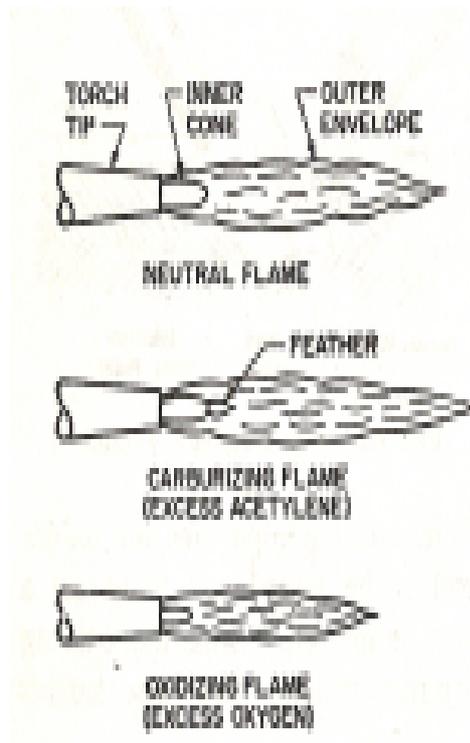
5.7 GAS WELDING FLAMES

AIM: To practice and adjust gas welding flames for to maintain temperatures.

Tools & Equipment required : 1) Gas Cylinders

- 2) Regulator
- 3) Welding torch
- 4) Torch tip
- 5) Spark lighter.

Description: 1) Neutral flame used in welding at high temperatures.
2) Oxidizing flame is used in cutting operation.
3) Carbrising flame : It is used for welding hard surface metals.

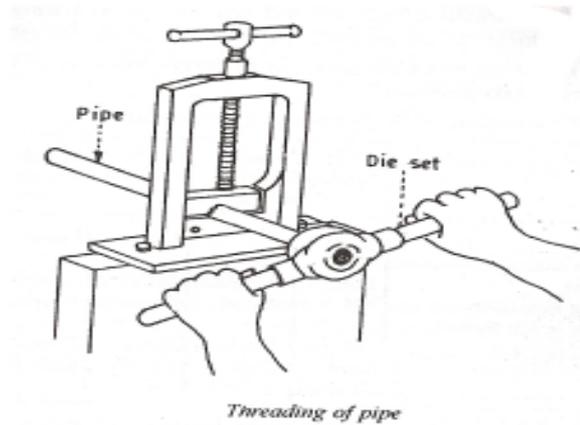


- Procedure: 1) Release actively gas and lighten it .
2) Release oxygen gas at equal volume.
3) Then the inner cone luminous zone and outer bluish envelop. It produce high temperature and useful to weld steel, copper, Iron, etc.
4) Release excess oxygen then the flame has shorter inner cone.
5) Oxidizing flame useful to weld brass and bronze and also for cutting operation.
6) Then reduce oxygen and release excess acetylene then the flame consists
- a) An inner cone
 - b) An intermediate cone in whitish colour and
 - c) An outer bluish cone.
- 7) The carburizing flame is suitable for welding alloy steels , and non-ferrous alloys .

6.2 THREADING PRACTICE

Aim: To practicing of threads on the pipes in plumbing work.

Tools & equipment required : 1) Die set 2) Pipe vice, 3) Handle 4) Screw guage 5) Hammer
6) Pipe wrench 7) Hack saw etc.,



Procedure : 1) Fit the pipe in vice

- 2) Set the Dieset on the pipe
- 3) Tighten the Dieset on the pipe.
- 4) Turn the dieset on the pipe
- 5) Complete the turning of the die on the pipe.
- 6) Check up the threads with pitch guage.
- 7) Assemble the pipe with collar

Precautions :- 1) Turn the dieset on the pipe with dieset handle.

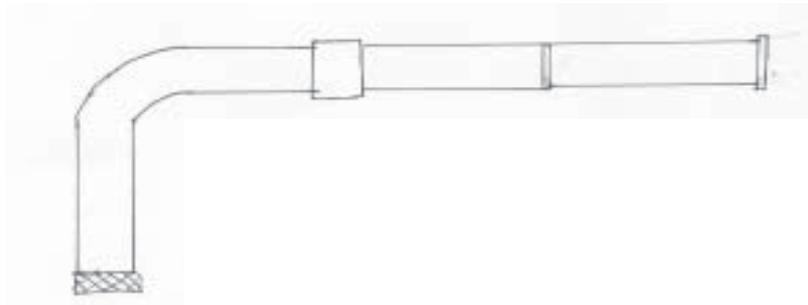
- 2) Turn dieset complete slowly
- 3) Tight the collar with pipe wrench.

6.4. JOINING A NIPPLE

Aim: To join a nipple to the pipe wherever necessary.

Tools & equipment required:

- 1) Screw Driver
- 2) Hammer
- 3) Pipe Wrench
- 4) Hack Saw
- 5) Scriber
- 6) Pipe Vice.



Procedure:

- 1) Arrange the pipe line as per the line diagram.
- 2) Extend the pipe line with a nipple.
- 3) Join the nipple to the end of pipe collar ..
- 4) Fit the collar at the end of pipe.
- 5) Tighten the collar and nipple with a pipe wrench.
- 6) Arrange the nipple for required length. with out any damage to the threads.

Precautions:

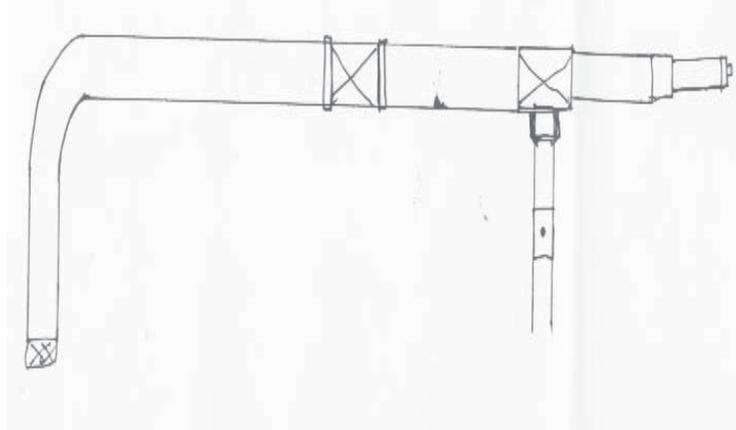
- 1) Tighten the nipple with pipe wrench
- 2) If the length of the nipple excess cut it with hack saw.

6.6 FITTING OF TAPS & VALVES

Aim: To fit the valves and taps in the pipe line.

Tools & equipment Required:

1) Screw Driver 2) Hammer 3) Pipe wrench 4) Hack Saw 5) Pipe vice 6) Spanner etc.



Procedure:

- 1) Mark the pipe line diagram.
- 2) Fit the valve in the pipe line
- 3) Extend pipe line till the job is in progress
- 4) Fit the taps in the pipe at the job places.
- 5) Tighten the valves & taps with pipe wrech.

Precautions:

- 1) Arrange the valves where pressure of liquid is heavy
- 2) Taps should be placed where job or delivery of the liquid.