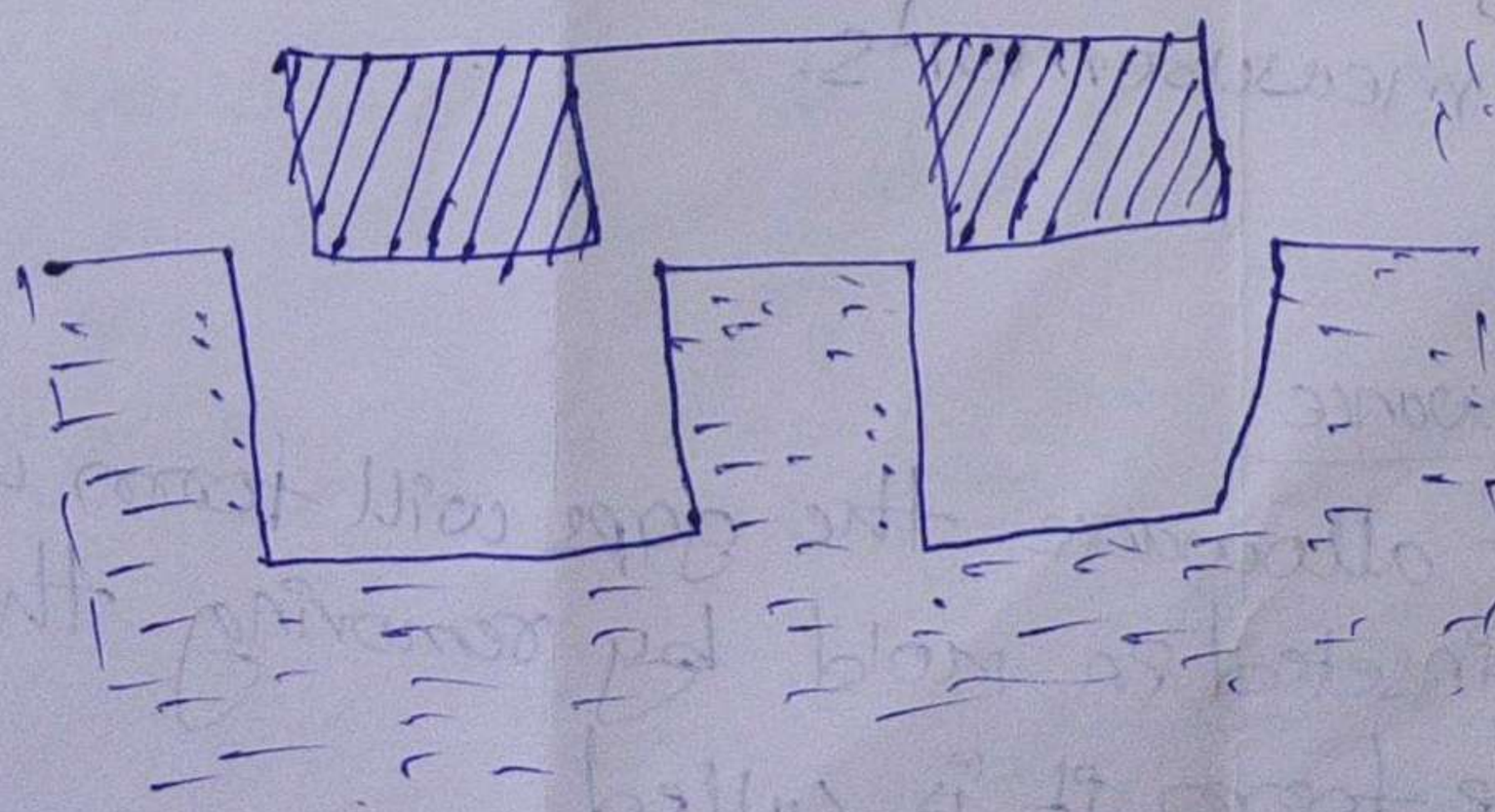
1. single peuce parttern
2. split pattern
3. cope drag pattern
4. sweep pattern
5. skleton pattern
6. crated pattern
7. match plut pattern
8. shell pattern.

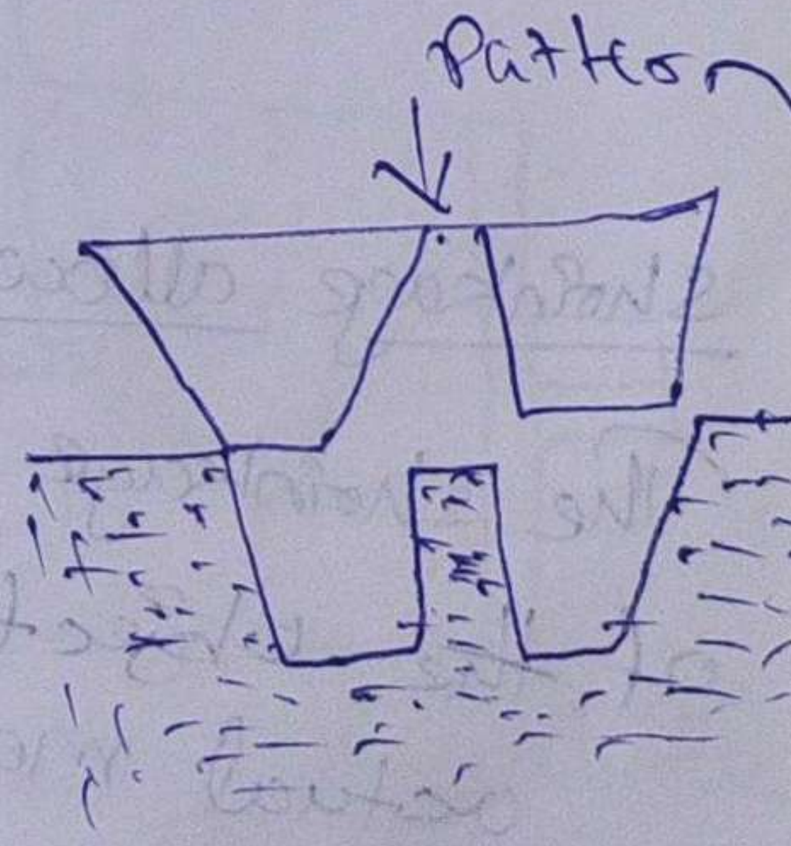
Types of Allocoance

1. Shrinkage Allowance
2. Draft Allowance
3. Distortion Allowance
4. shaking Allowance
5. finishing Allowance

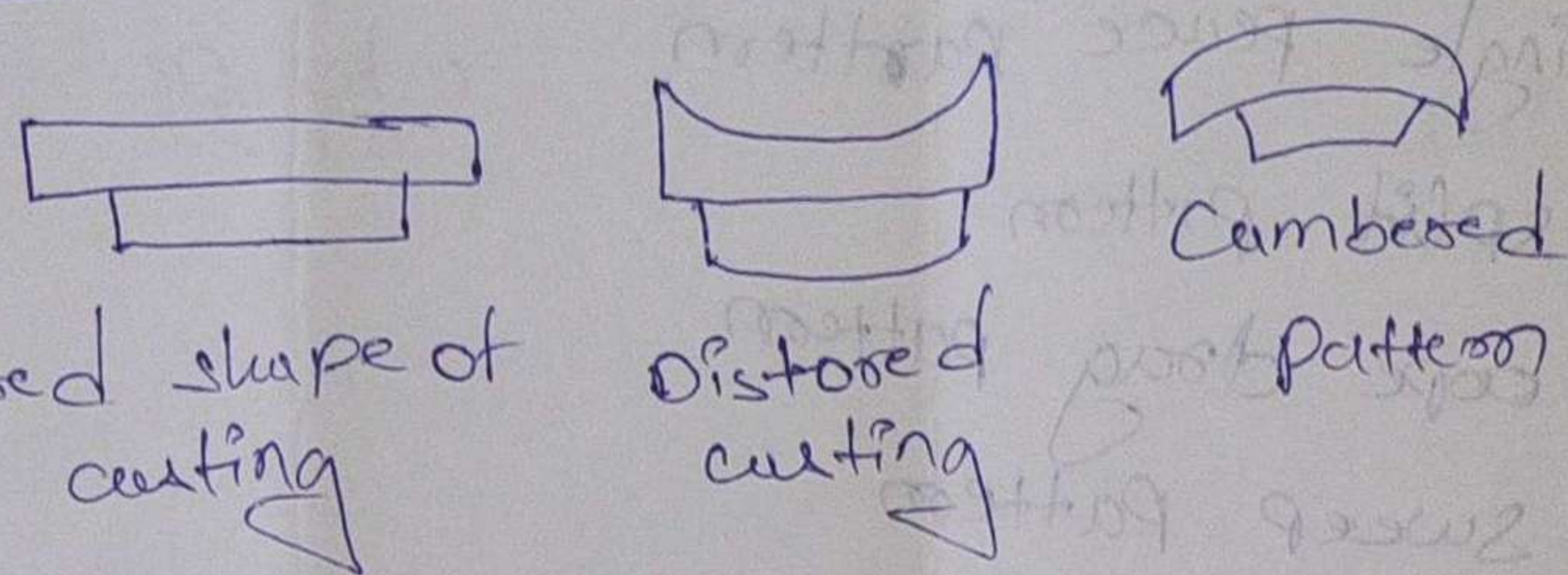
1. Shrinkage Allowance

Draft - A



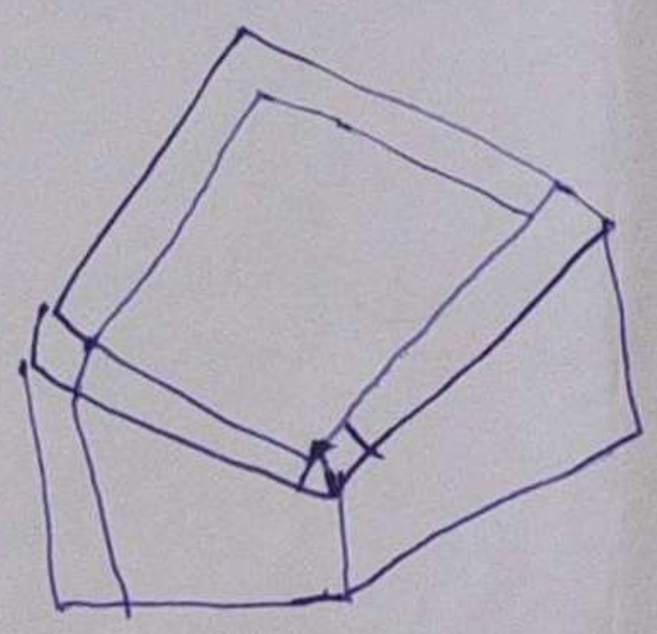


Distortion - A

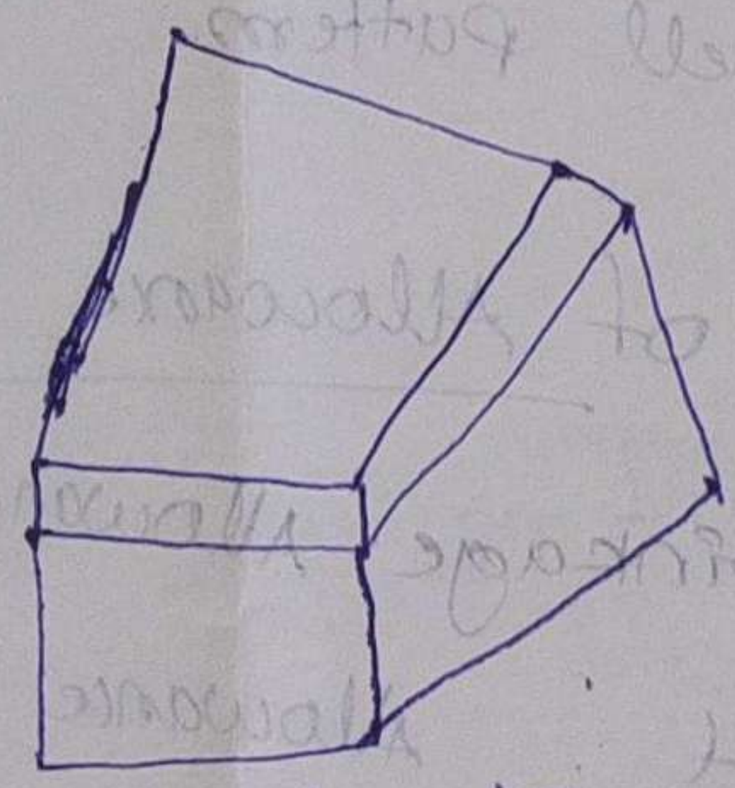


Finishing allowance

CASTING
↓



Before finishing



After finishing

Shrinkage allowance

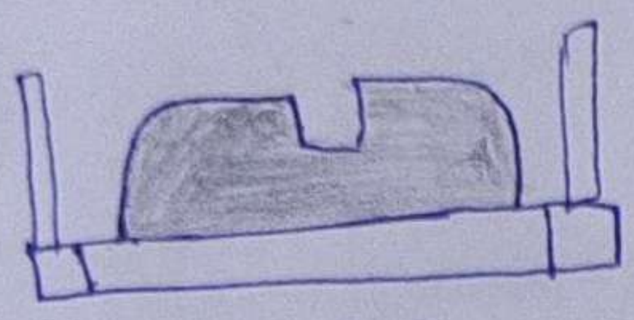
The shrinkage allowance the measurements of the object should be more than the actual measurements.

* Draft Allowance

In the draft allowance the gaps will form when the object is inserted in mold by removing the object space will be form it is called

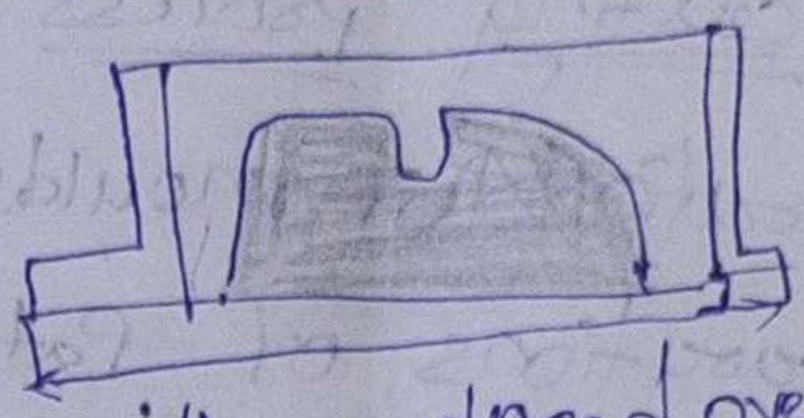
Distortion Allowance & SAND CASTING PROCESS

(1)



one half of the patteon

(2)

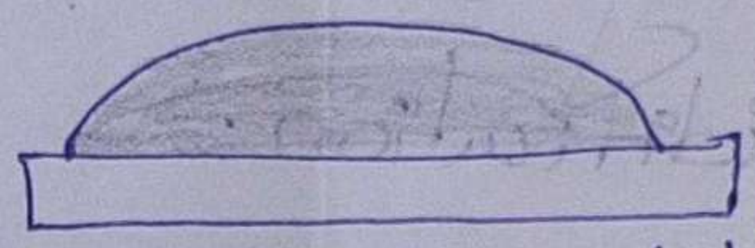


flask placed over the 1st patteon

(3)

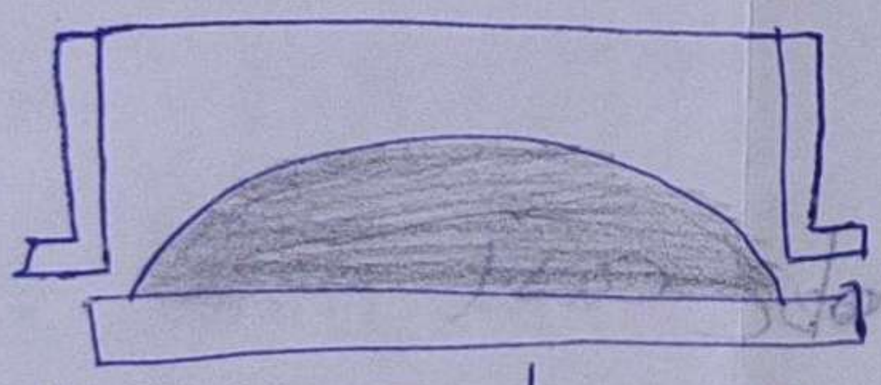
one half the Mold (cope)

(4)



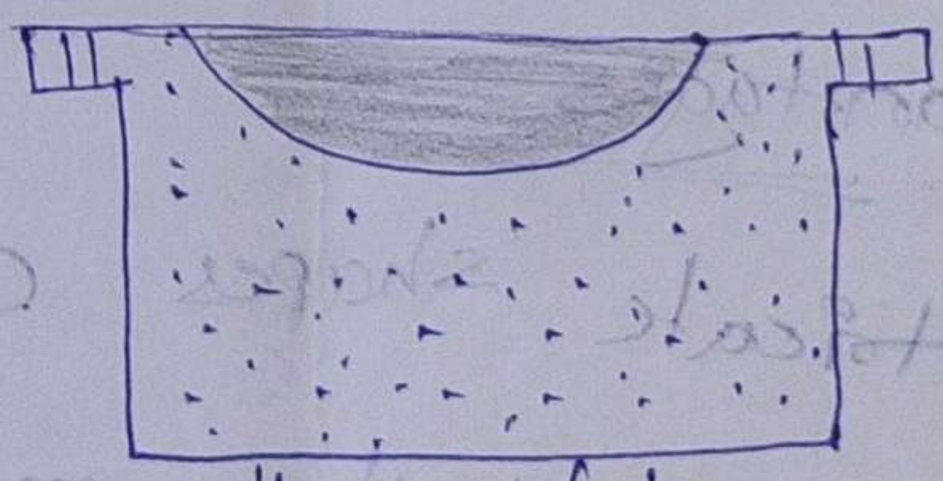
other half of the patteon

(5)



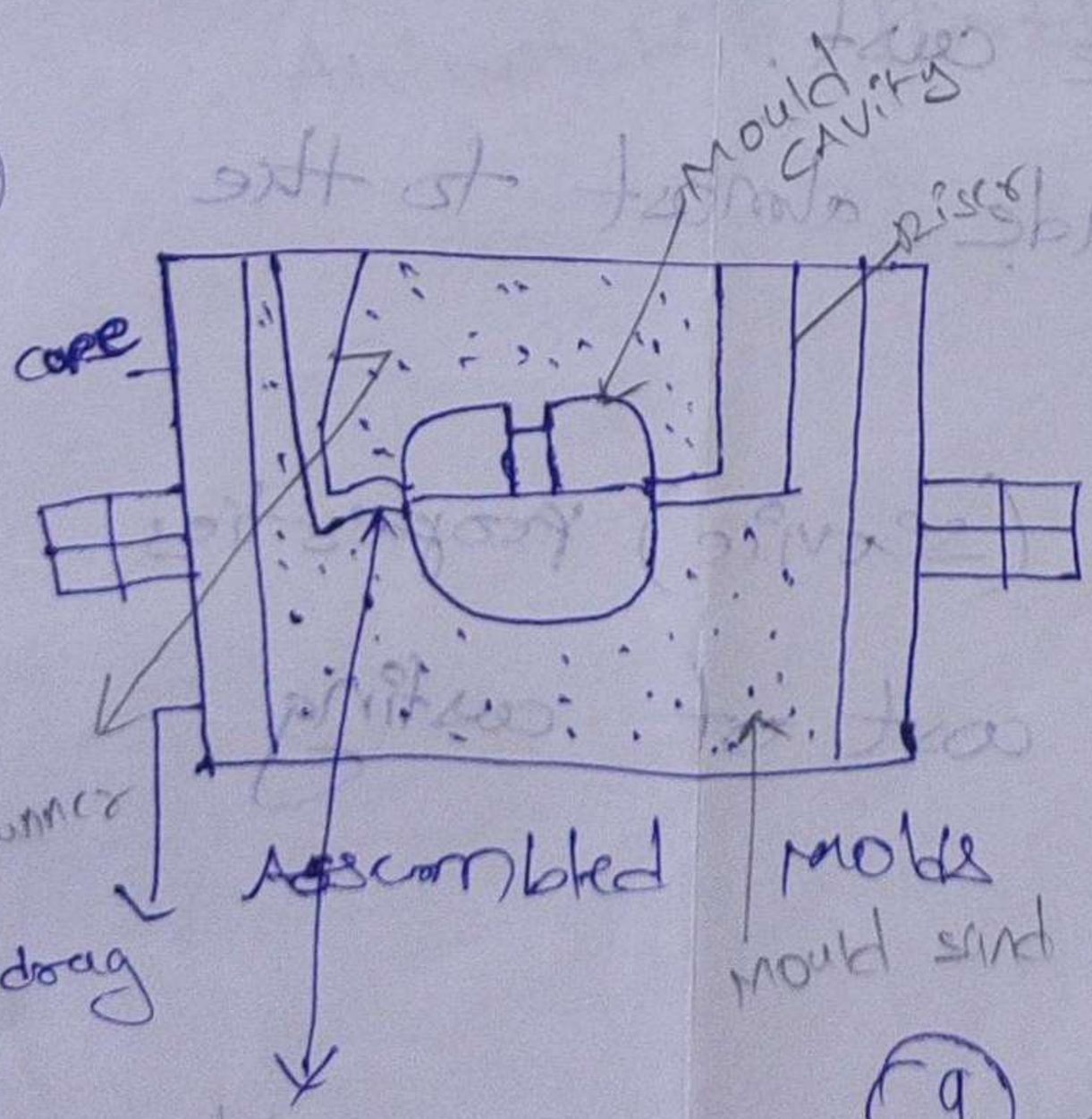
flask placed over the second patteon

(6)

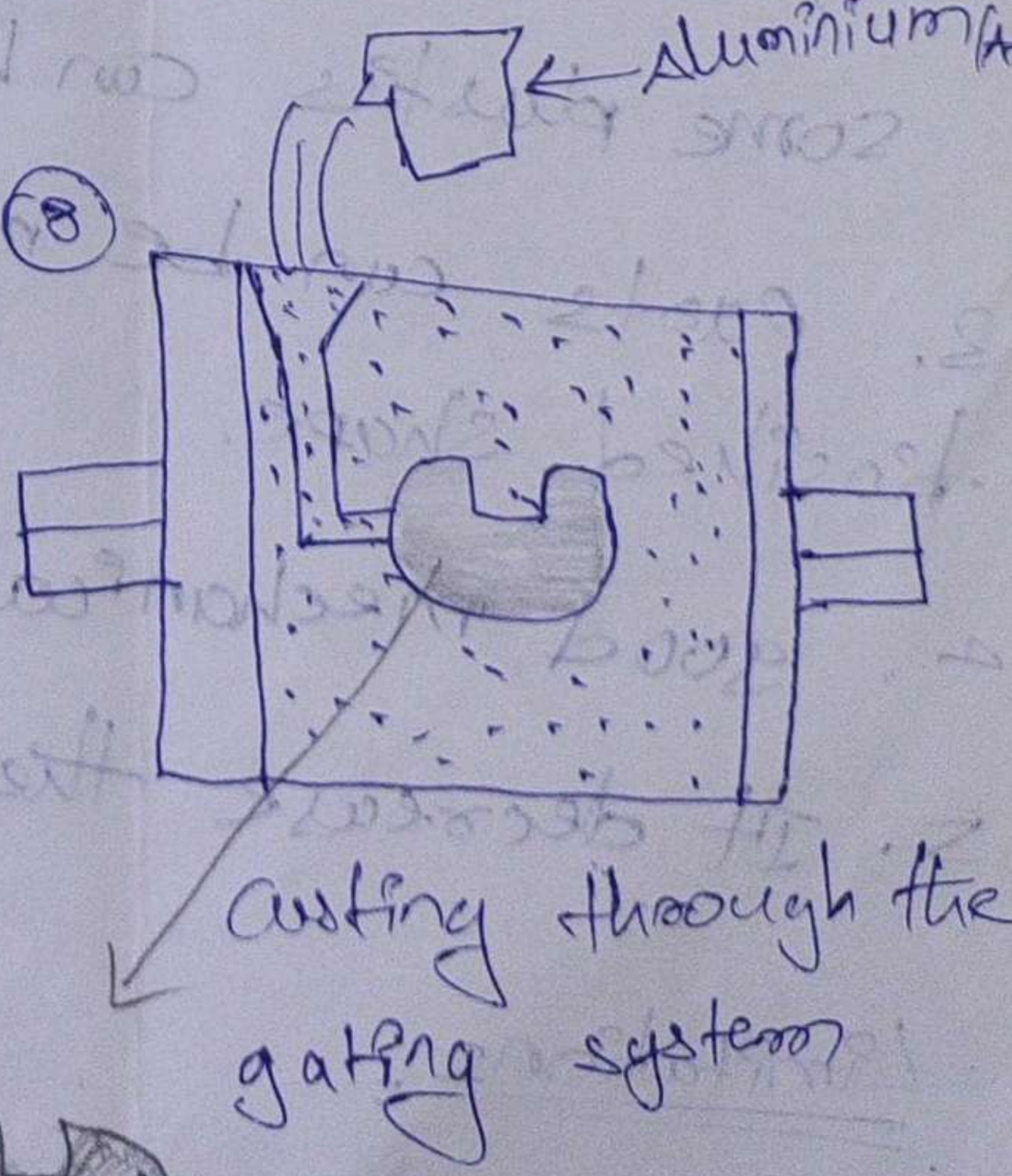


other half the mold (drag

(7)



(8)



(9)

CASTING WITH DEFECTS

15-Mar-2022

Sand casting process steps

1. Preparation of moulds.
2. Preparations of Patterns
3. Melting of material
4. Pouring of the liquid metal
5. solidification.
6. further cooling at room temperature
7. Defects
8. Inspection.

Advantages

1. Intricate shapes can be cast
2. Almost all the metals and alloys and some plastics can be cast.
3. Parts can be made almost to the finished shape.
4. good mechanical (service) properties.
5. It decrease the cost of casting.

Limitations:

1. Dimensional accuracy are not possible by normal sand casting process.

2. surface finish are not possible by normal sand casting process.

3. To ~~overcome~~ overcome that defects die-casting has been developed.

Applications :-

1. Liners
2. Machine tool bets
3. pistons
4. piston rings.
5. mill rolls
6. Cylinder blocks
7. Automobile parts etc.

Foundry tools & Equipments

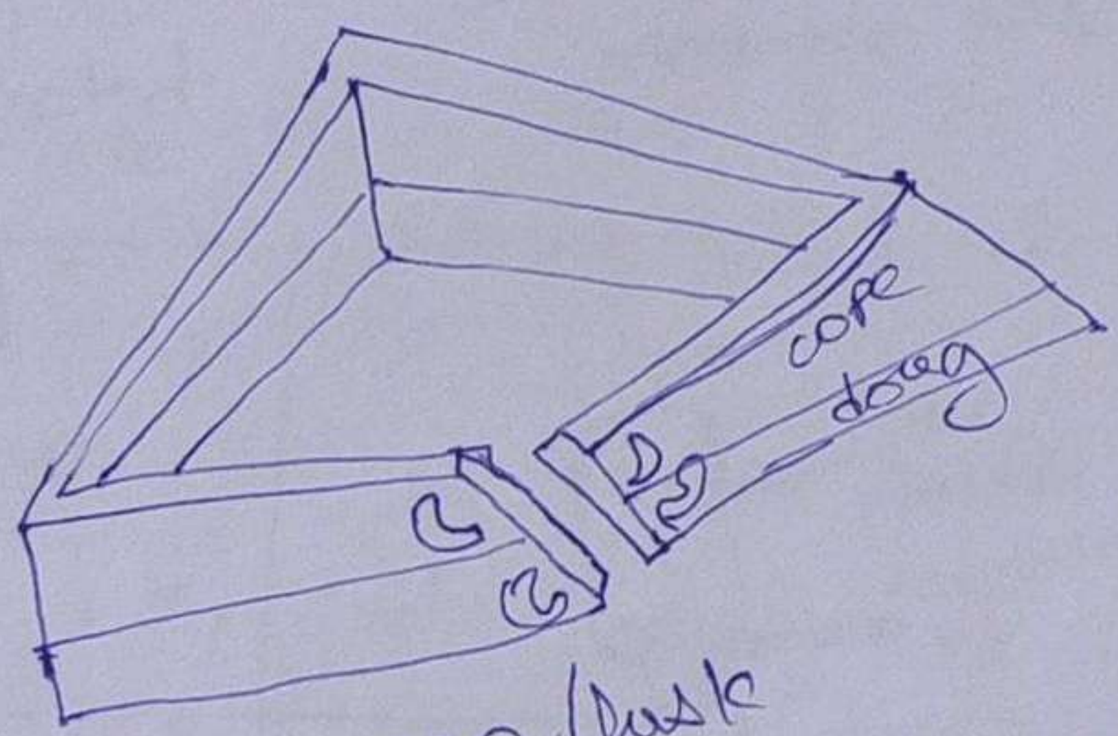
1. Flask
2. clamps
3. Runner
4. Raiser
5. sprue
6. vrate
7. Ventrod
8. Bottom board
9. strike of bar
10. vrate cutter
11. spike
12. Moulding sand
13. Binder
14. Additives
15. Green sand
16. charcoal
17. Wood flask
18. spirit level
19. Flanger
20. Mallet
21. Rammer
22. Floor Rammer
23. swab
24. Bellows
25. Litter
26. Slick
27. shovel
28. Trowel
29. Pouring basin/ tunnel/channel
30. crucible
31. Induction furnace
32. Aluminium
33. core
34. smooth brush
36. powder
37. cope & Drag
38. Tray
39. single phase pattern
40. split piece Pattern.

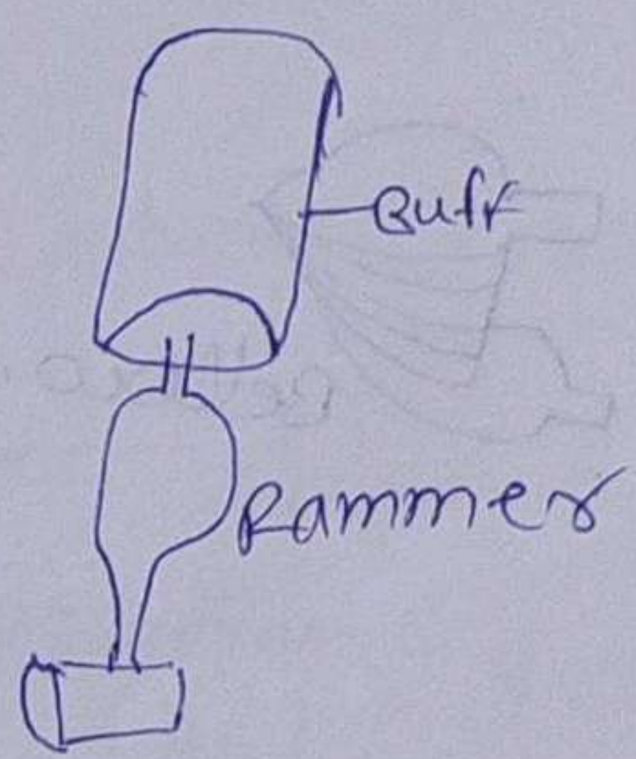
1. Flask :- The combing of cope and drag in between use flask line

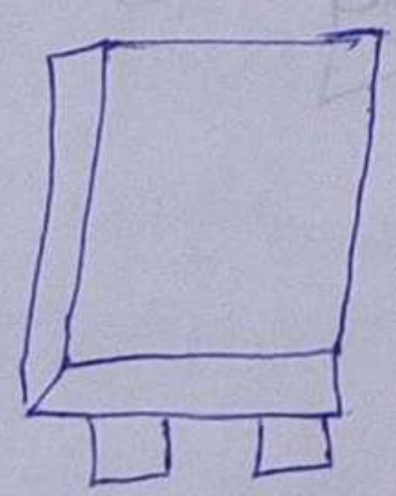
2. Clamps :- The combing of cope and drag to hold use clamps.

3. Runner :-

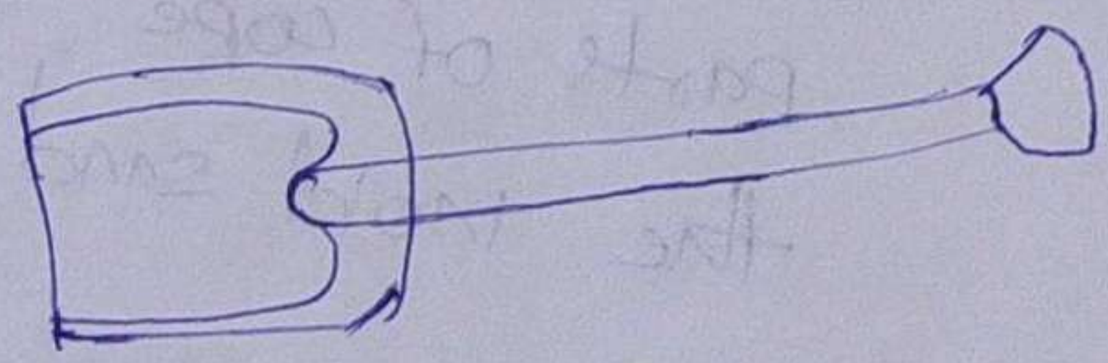
4. Raiser :





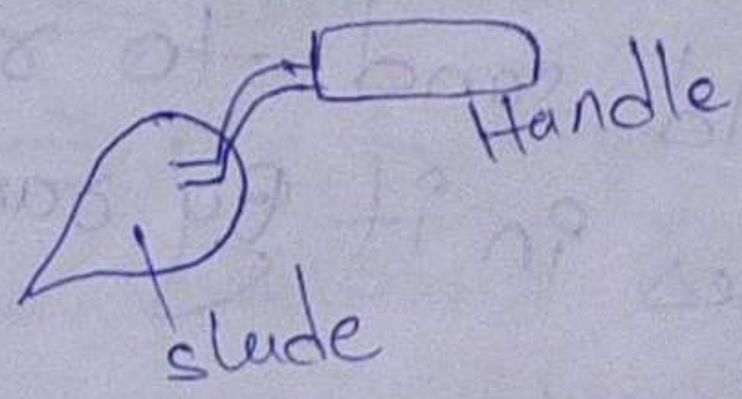


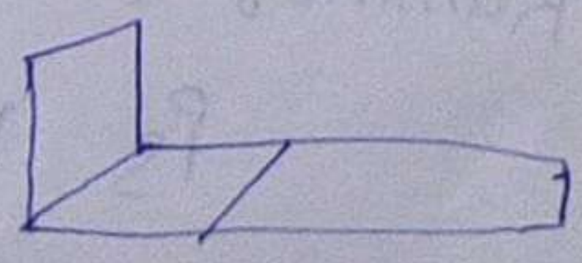
Moulding board



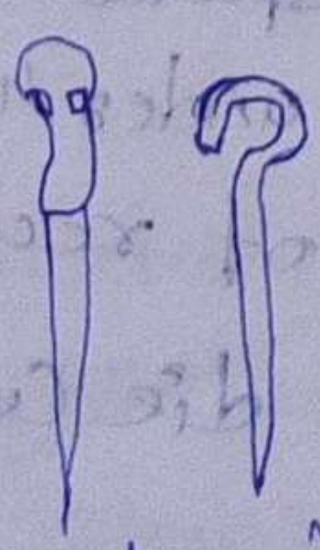
Shovel

Slick

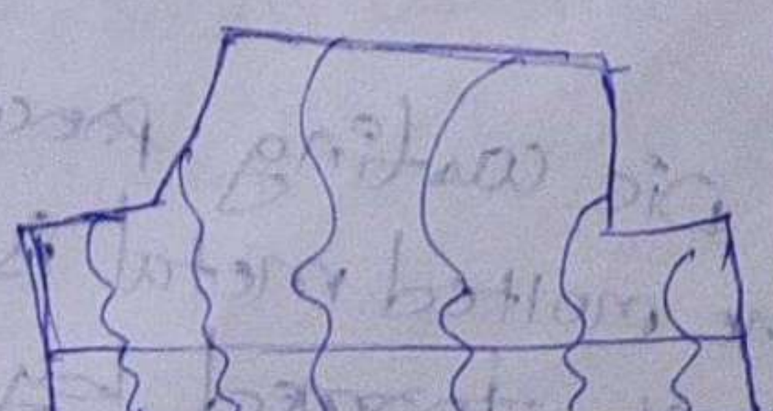




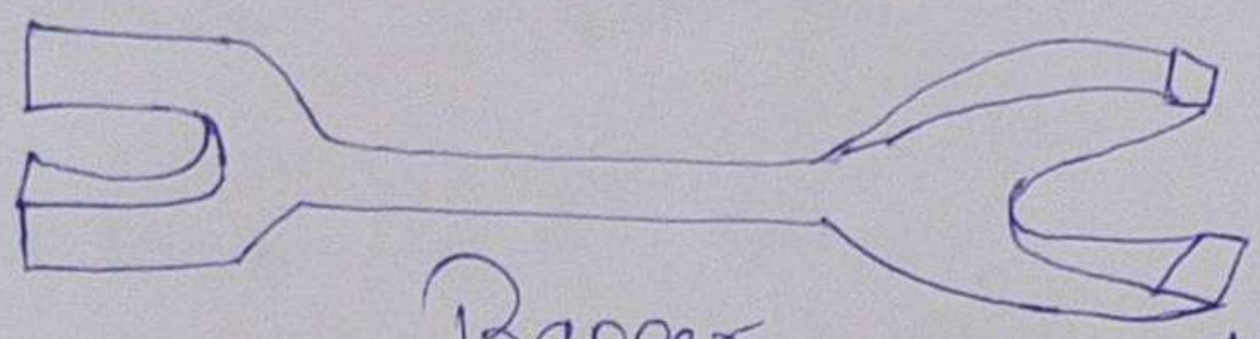
litter



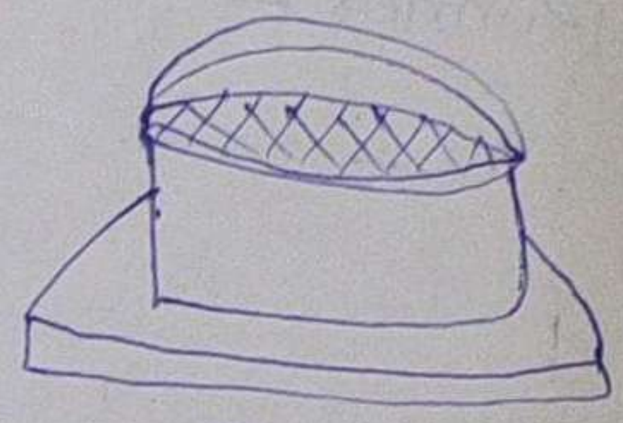
Vent rod



Strike of bar



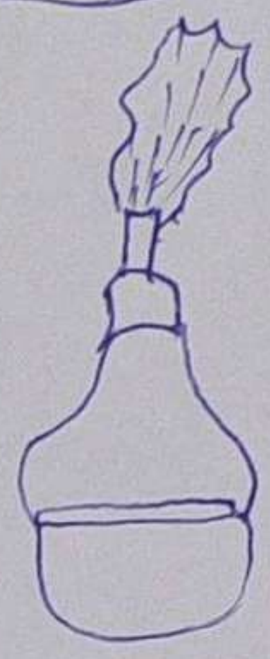
Rapper



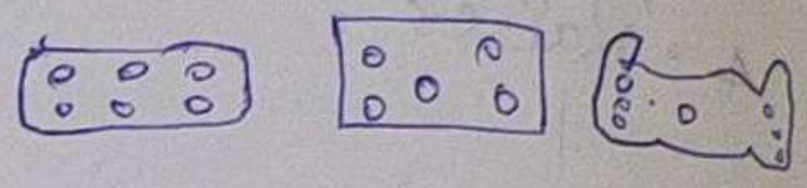
Riddle

Sprue

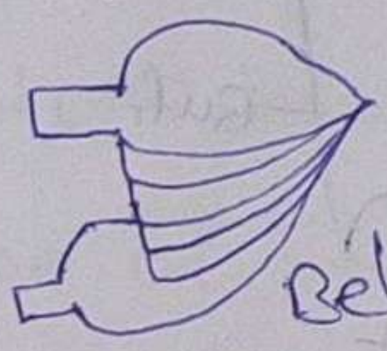
Gatecutter



swab



lifting plates.

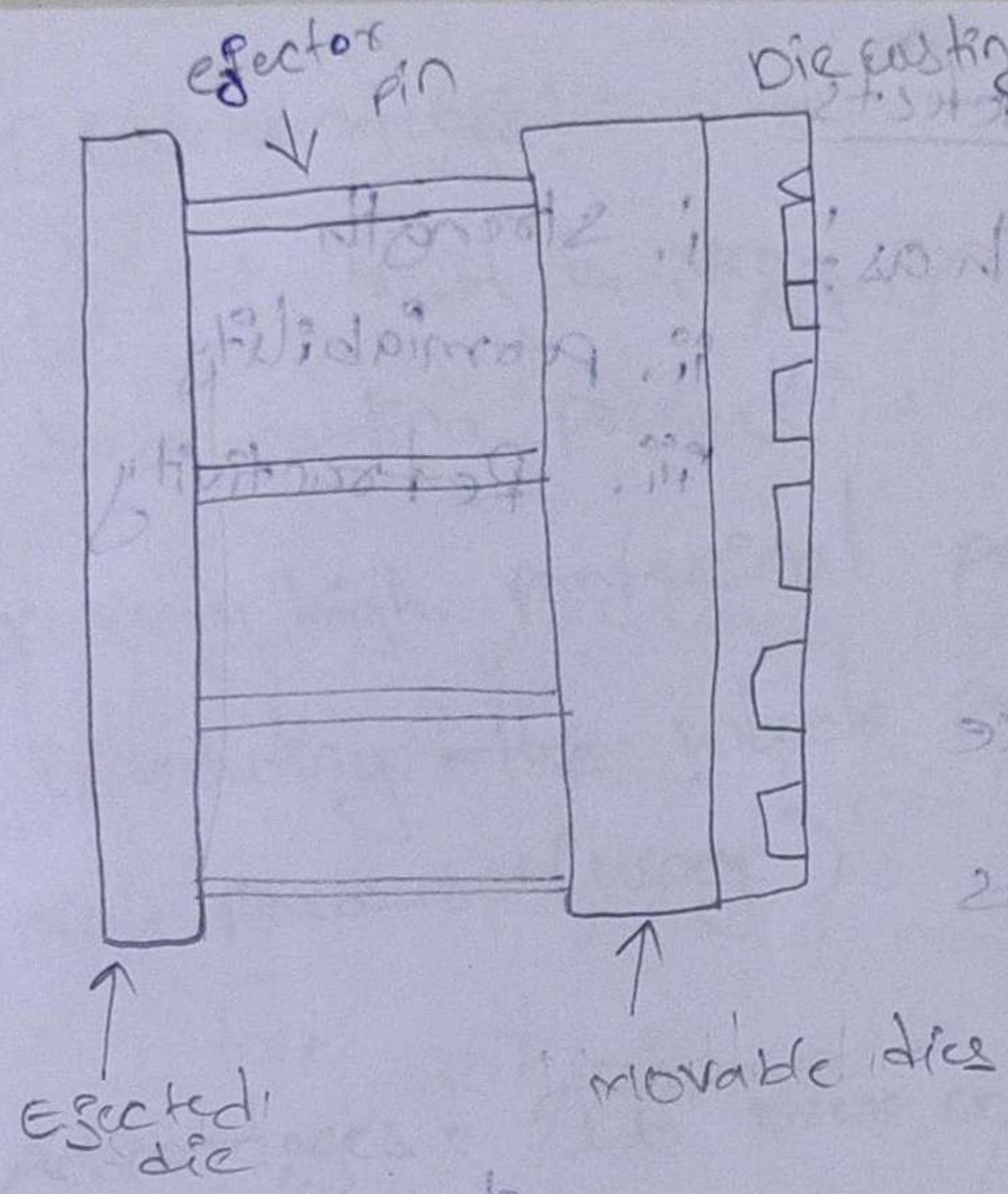


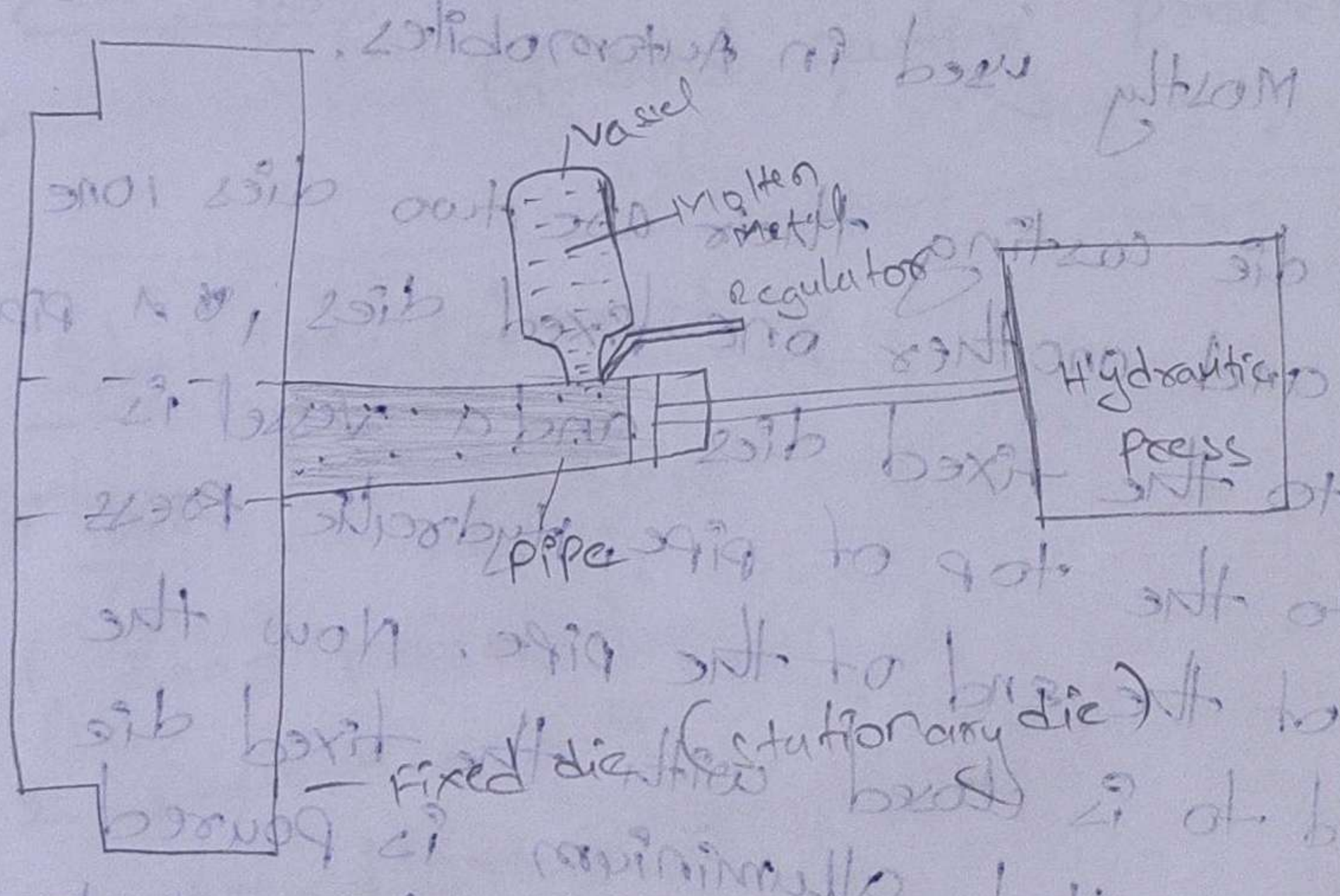
Belloo.

<u>snap flask</u> :- It is the two ~~xxxx~~ combing parts of cope and drag to hold the mold sand.

Rammer :- It is the strong object which use is mold sand to reduce the braps or spaces in it By ramming

<u>Die casting</u>* Die casting process is a special casting process where the molted metal is injected under high pressure into the mold cavity formed by a set of reusable metalic dies this phenomenis called die casting.





Procedure / Process:

Casting defects :
→ sand casting
→ Die casting
→ investment casting
→ shell casting
→ centrefugal casting

→ Gas defects
i. Air inclusions
ii. Blowholes.

→ Moulding Materials detects

i. sand properties such as:- i. strength
ii. permiability
iii. Retractivity

→ Pouring metal detects

i. Turblence

→ metallurgical detects

i. structure

Application:- Mostly used in Automobiles.

Process:- in die casting their are two dies, one is movable and another one fixed dies, A pipe is fixed to the fixed dies and a vessel is attached to the top of pipe, Hydralic press is present at the end of the pipe. Now the movable died to is closed with the fixed die one. Now the molted alluminium is poured through the vessel and pressed by the Hydralic press The molted alluminium is solidified and gets a shape as present in the dies. Now the solified alluminum is taken out by the help of elector pins and then it will be sent for testing.

Disadvantages:

* It is very expensive compared to sand casting process

* very high professinal personal is Required for operating the whole process properly because of High pressure (usage)

Advantages: It over comes all the disadvantages of sand casting process.

Shell Mould casting

There are 7 steps

1. sand preparation
2. pattern creation
3. Mould creation
4. Moulding assembly
5. Pouring
6. cooling
7. casting remove

* Sand preparation: To Prepare sand, we need to add the sand in the Dump bar with top from the Hot pattern with band with resin bin.

* Pattern creation: By combing the Dump bar and Hot pattern (at top) with the filled sand the pattern creation is completed.

* Mould creation: By removing the Hot pattern and separate from the Dump bar the mould creation is complete.

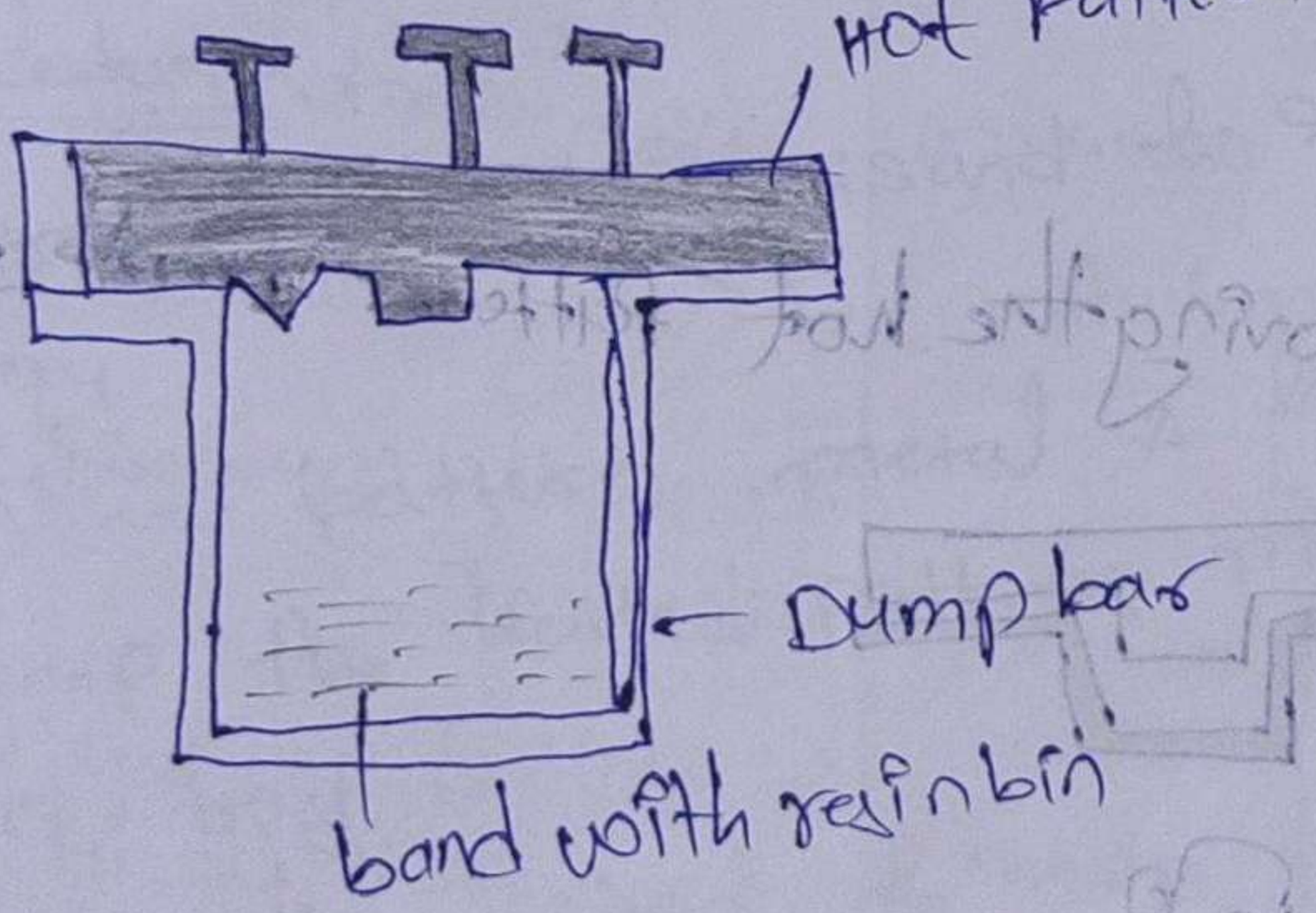
* Moulding assembly: After removing the Hot pattern and separate from the Dump bar And the repeat same process of Moulding creating by repeating all steps of Moulding creation. Now remove pattern from the shell of hot pattern assembly (combing).

* Pouring: After completion of Moulding assembly pour the metal eg: Aluminium.

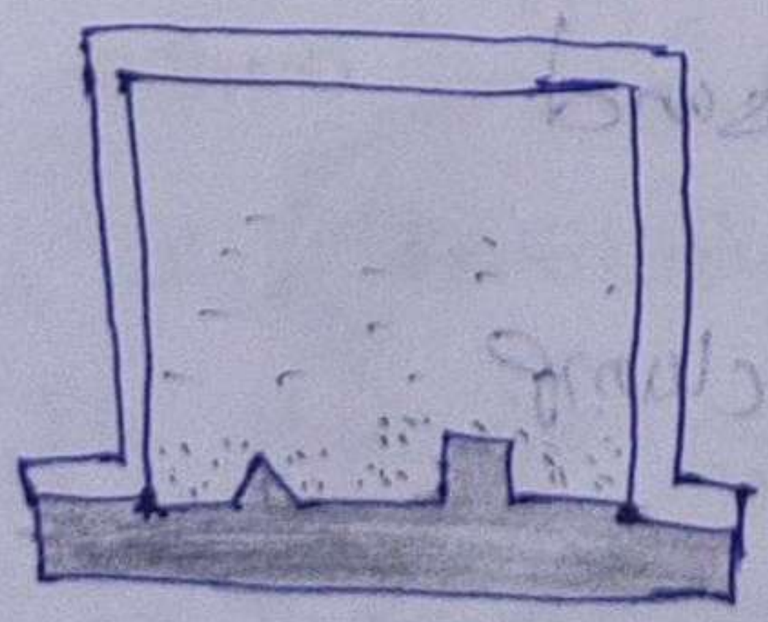
* cooling: The process of cooling completion of pouring metal need to cool in form of water (or) simply leaving, it will be cooled.

7. Casting remove: In above process we g
our product (object) After
this process remove any unwanted casting.
(clean)
Finally the object will come.
(Note: These all steps as shown in figs below)

Step-1



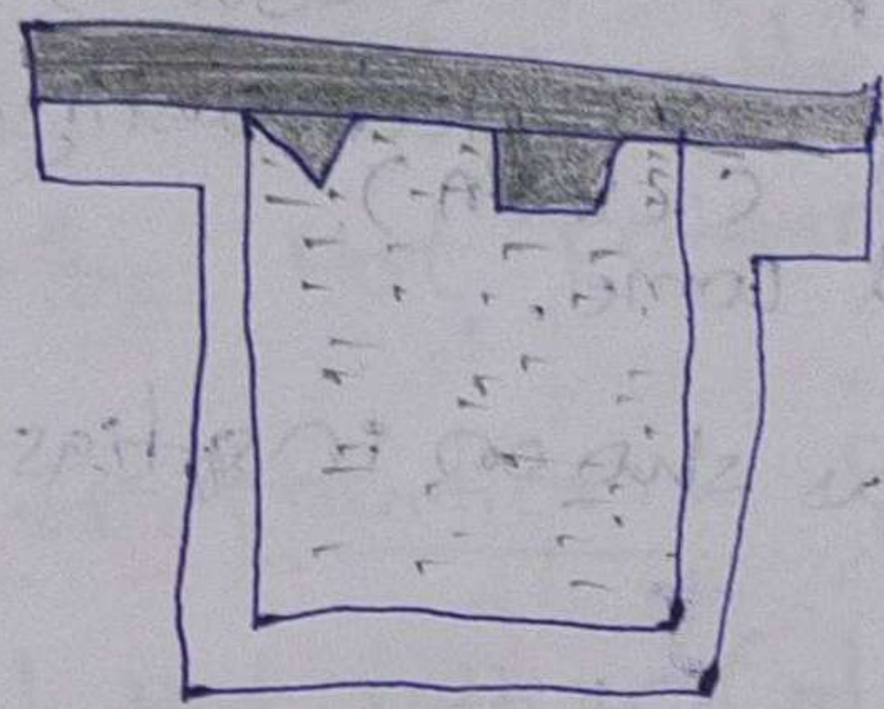
Step-2



Applications

gearbox housing
connecting rod
cylindrical head

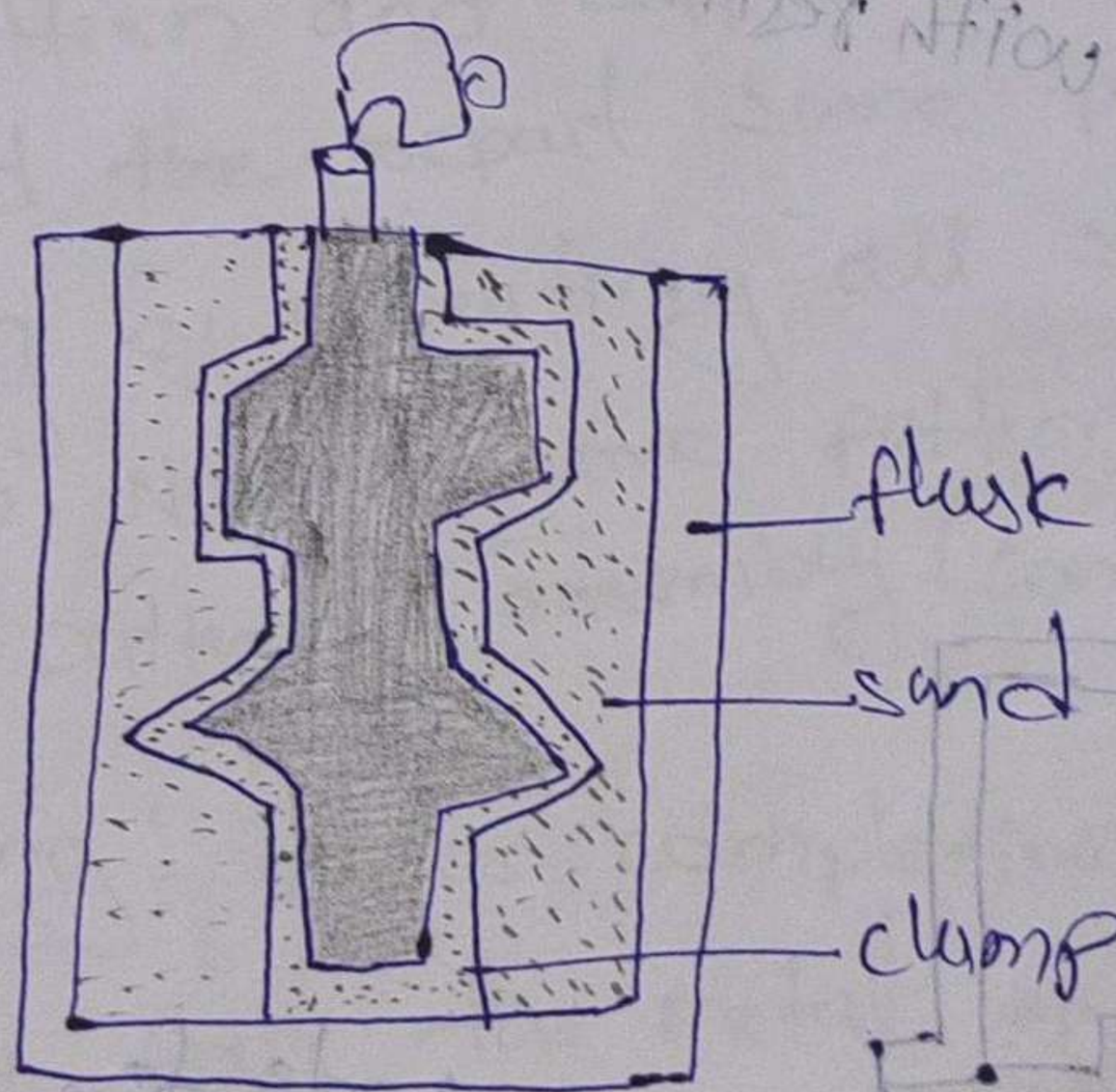
step(3)



step(4)

Removing the hot pattern from shell

step:-(9)

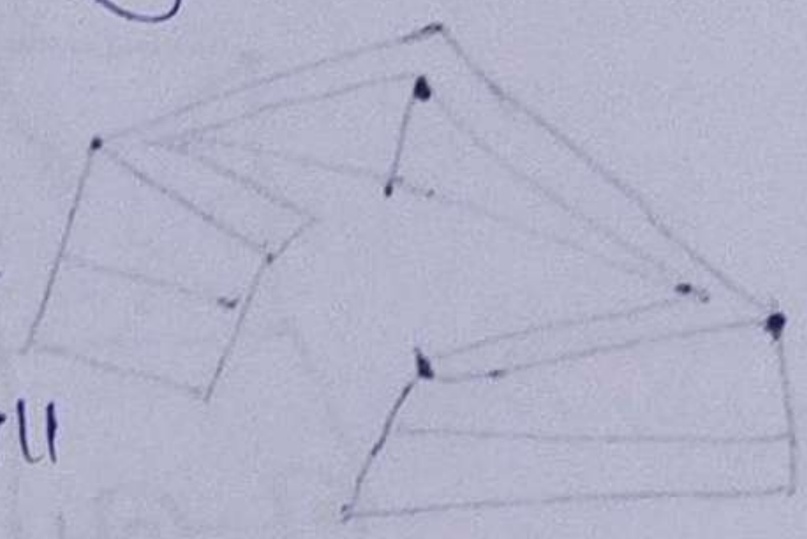


disadvantages

* High casting prices
* High pattern costs
* size and weight limitation

Advantages:

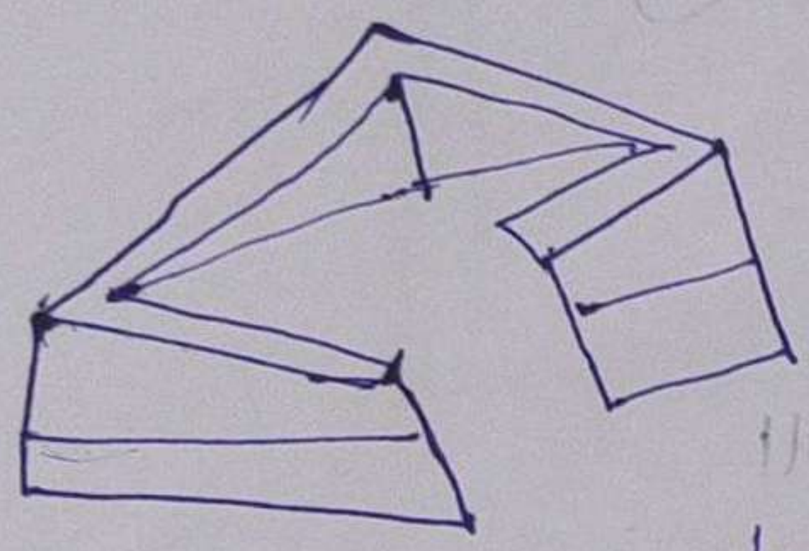
1. Good surface Quality
2. High Rough casting Dimensional Accuracy
3. Less man power
4. No special skill



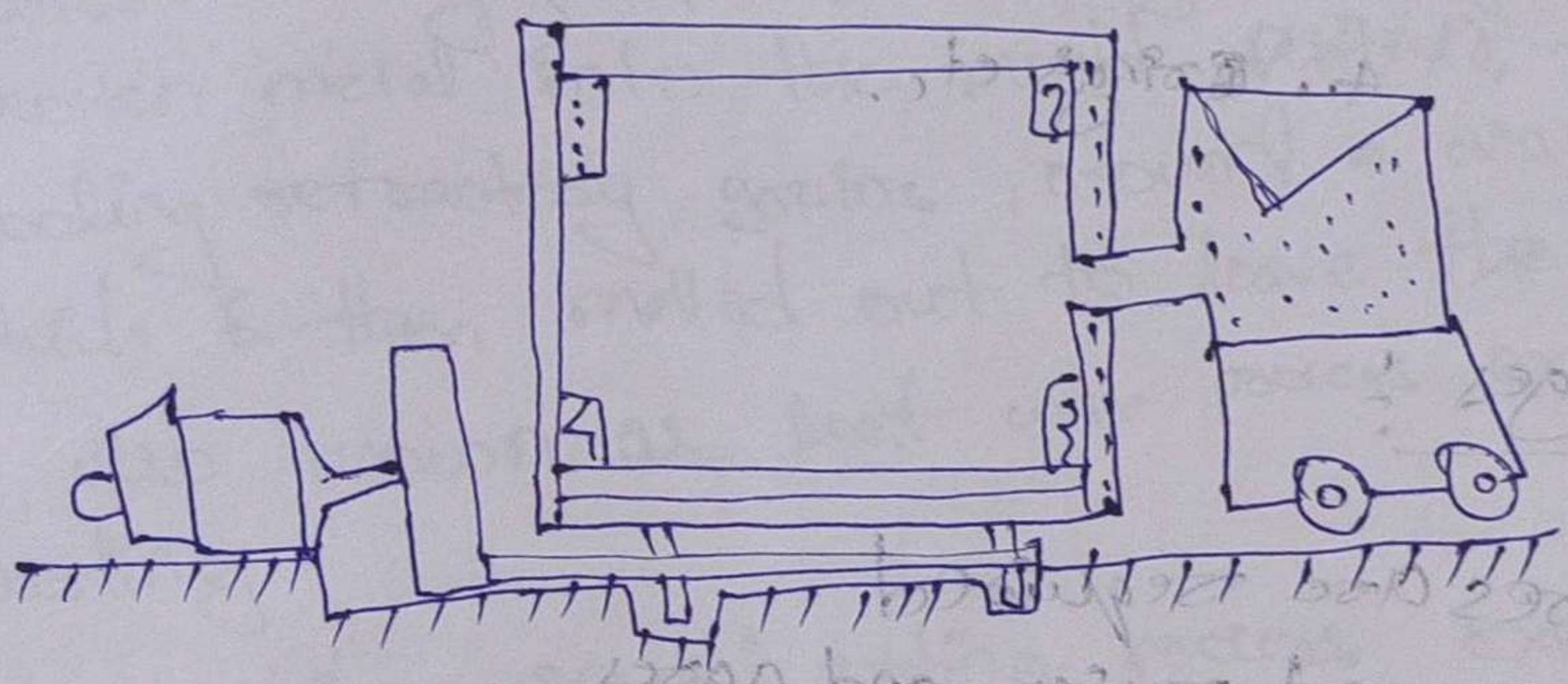
Procedure

1. Prepare moulding sand & resin in a tray
2. Take pattern metal & heat it
3. keep the heated pattern metal in sand & resin tray.
4. Then the sand & resin forms a thin layer on pattern metal.
5. Remove the thin layer and repeat the same other side of the pattern metal.
6. Join the two thin layer & pour sand around the cavity.
7. Pour the molten metal into the mould cavity and cool it
8. Remove the extra waste by finishing.

Difference between sand casting and Die casting.

sand casting	Die casting
	
1. Rough surface finish	1. smooth surface finish
2. less dimensional accuracy	2. High dimensional accuracy
3. No mass production	3. costly Mass Production
4. cheap in cost	4. costly compared to sand casting
5. skilled people are not required.	5. skilled person required to operate liquid metal in machine
6. More man power	6. less man power
7. No use of Hydraliks	7. Hydraulics are used
8. small parts cannot be prepared	8. small parts can also be prepared
9. Detetive are more	9. Detective are less
10. No pressure is required	10. pressure is required

centrifugal casting



In centrifugal casting process the mould is rotated at High speed so that the centrifugal force is produced that distributes the molten metal to the outer regions of cavity.

1. Pattern selection
2. pouring the moulten metal
3. Drum speed regulation
4. removing casting from mould cavity
5. Inpection of castings

Applications :

1. Pipes
2. Tubes
3. Bushes
4. Rings etc.

Advantages :

* No cores are required.
* No runner and risers and gases
* Proper directional solidification can be obtained starting from the mould surface to the centre of the casting.

Disadvanges.

Metalby Mechanical process :

1. The equipment is Expensive
2. It is suitable too large scale production
3. Any symmetric can be ment by these process

Investment casting / precision casting

→ Investment casting is a special casting process in which casting is prepared by pouring the hot molten metal into the mould pattern, formed by cooling refractory grains, around a wax pattern which is then melted out to leave the mould. It is also known as lost wax process or precision casting

→ I.C is a special casting process executed to produce multiple castings at a time

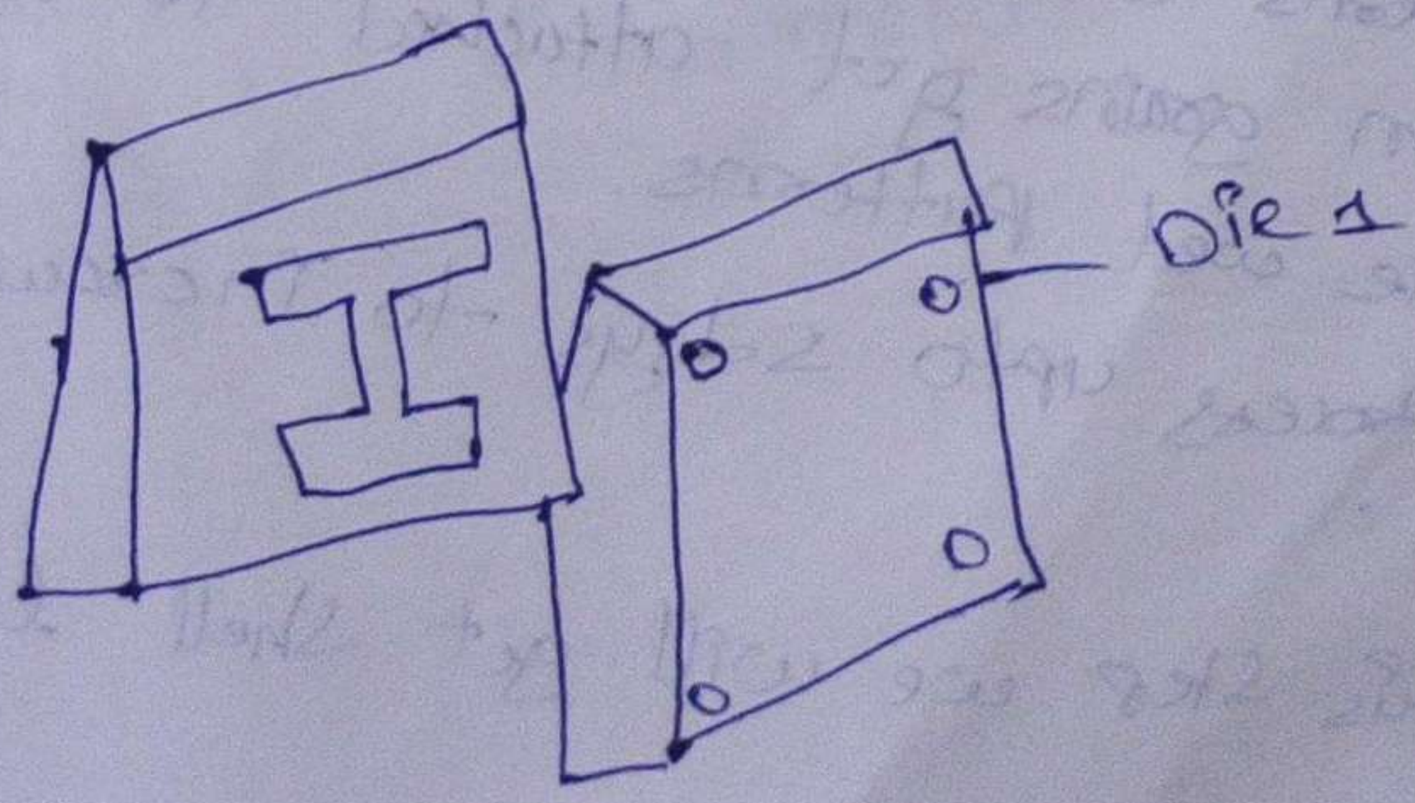
→ I.C can execute by 5 steps

1. Pattern creation
2. Mould creation
3. Pattern removal
4. Casting separation
5. Mould removal

→ To prepare DUMBBELL

→ step-1

∴ PATTERN CREATION :-



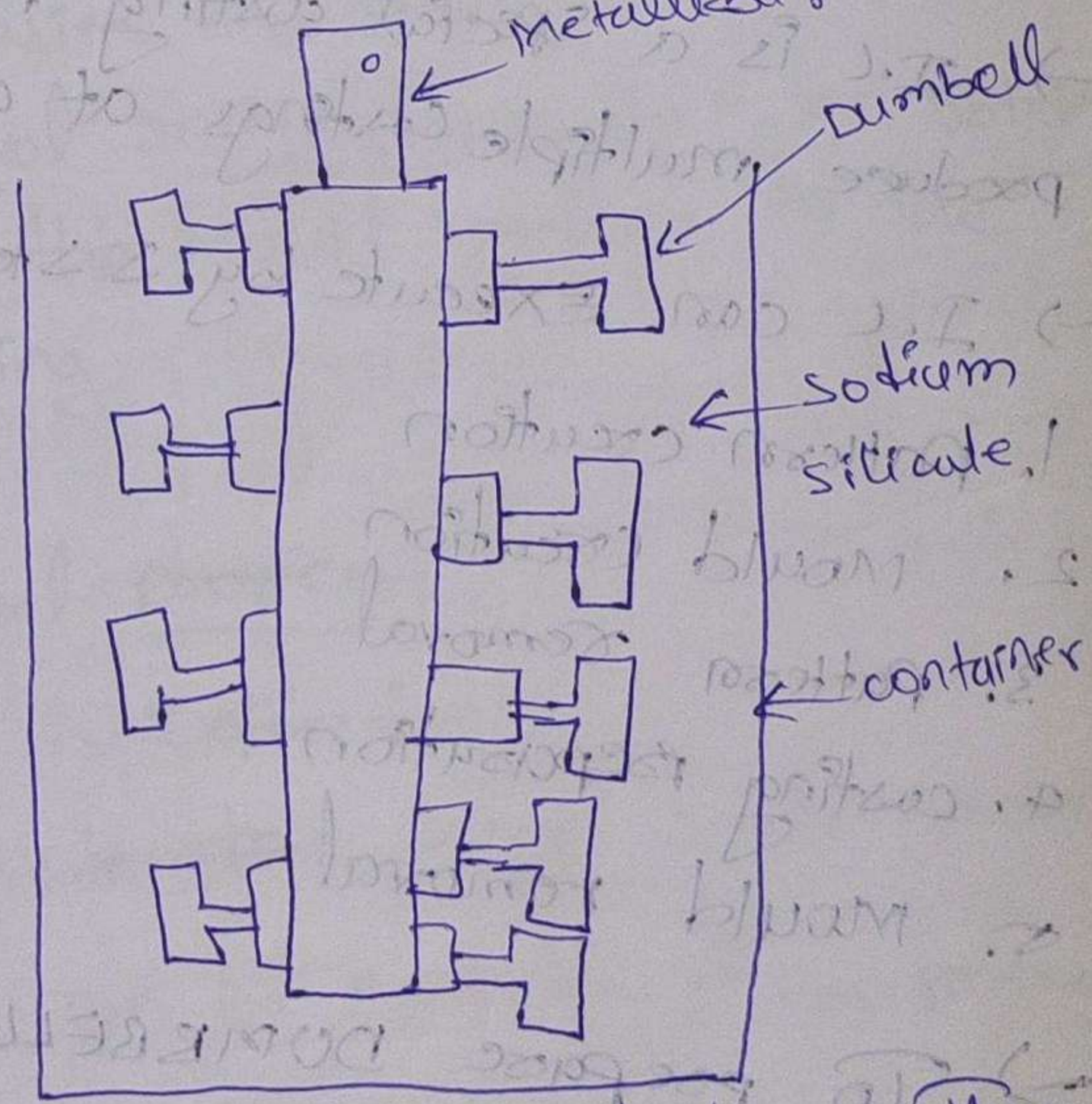
→ consider Aluminium dies that consists of cavity same shape as the final casting product

(b) Inject some amount of molten wax into these dies and keep it idle for some time

(c) As a result we get solidified wax structure. This structure acts as a pattern similarly make multiple patterns.

(d) Heat one portion of these wax patterns and paste them on a single metallic bar

⑦ <u>Mould creation</u> :-



→ Dip the group of patterns in a liquid of s.s Then take them out and allow the excess liquid to drain off

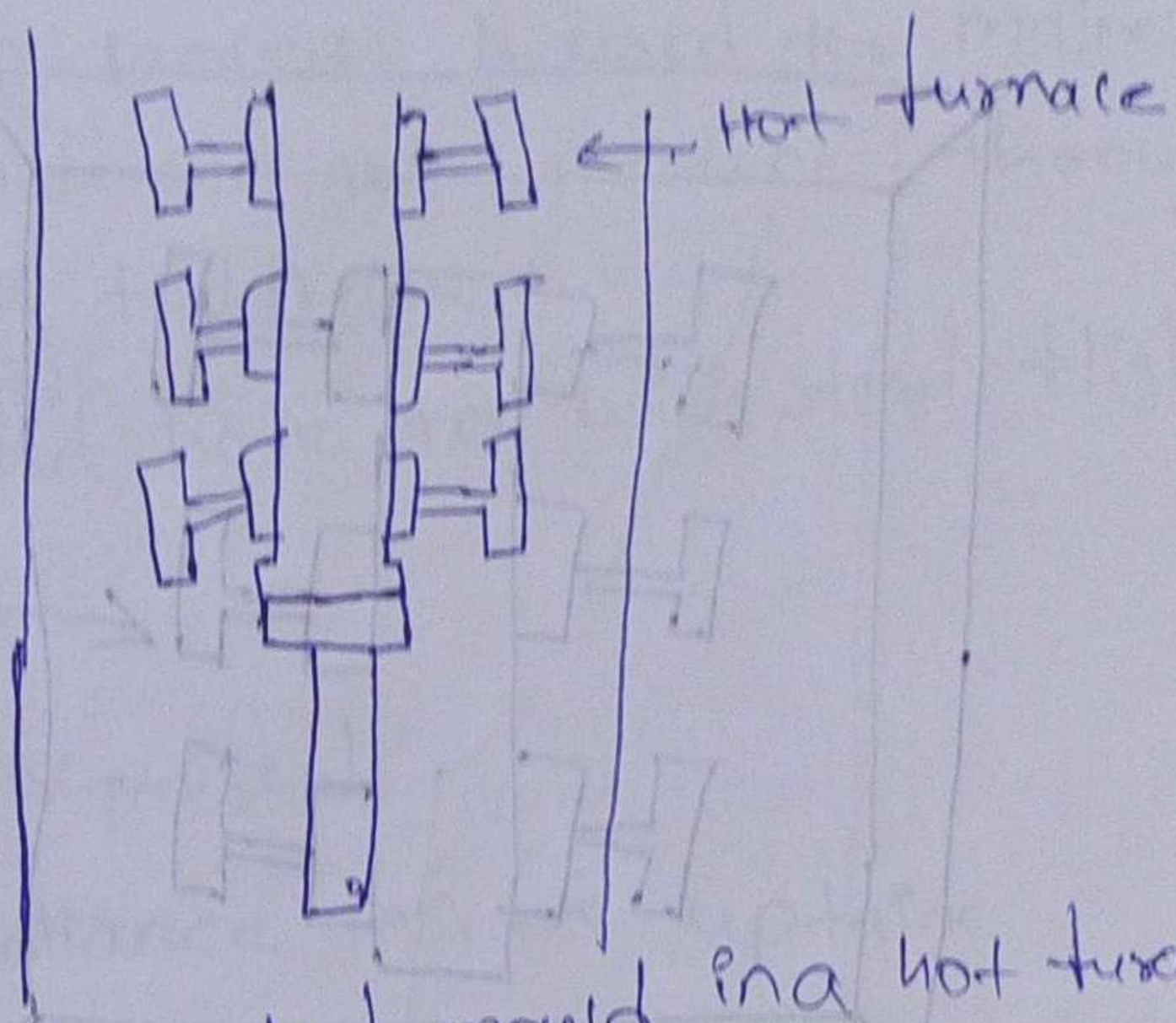
→ Place this patterns under the dropping zirconium

→ The zirconium grains get attached to the surfaces of the wet patterns.

→ Repeat this process upto 5 days to increasing the grain size

→ As a result this step we will get shell like structure.

③ pattern removal

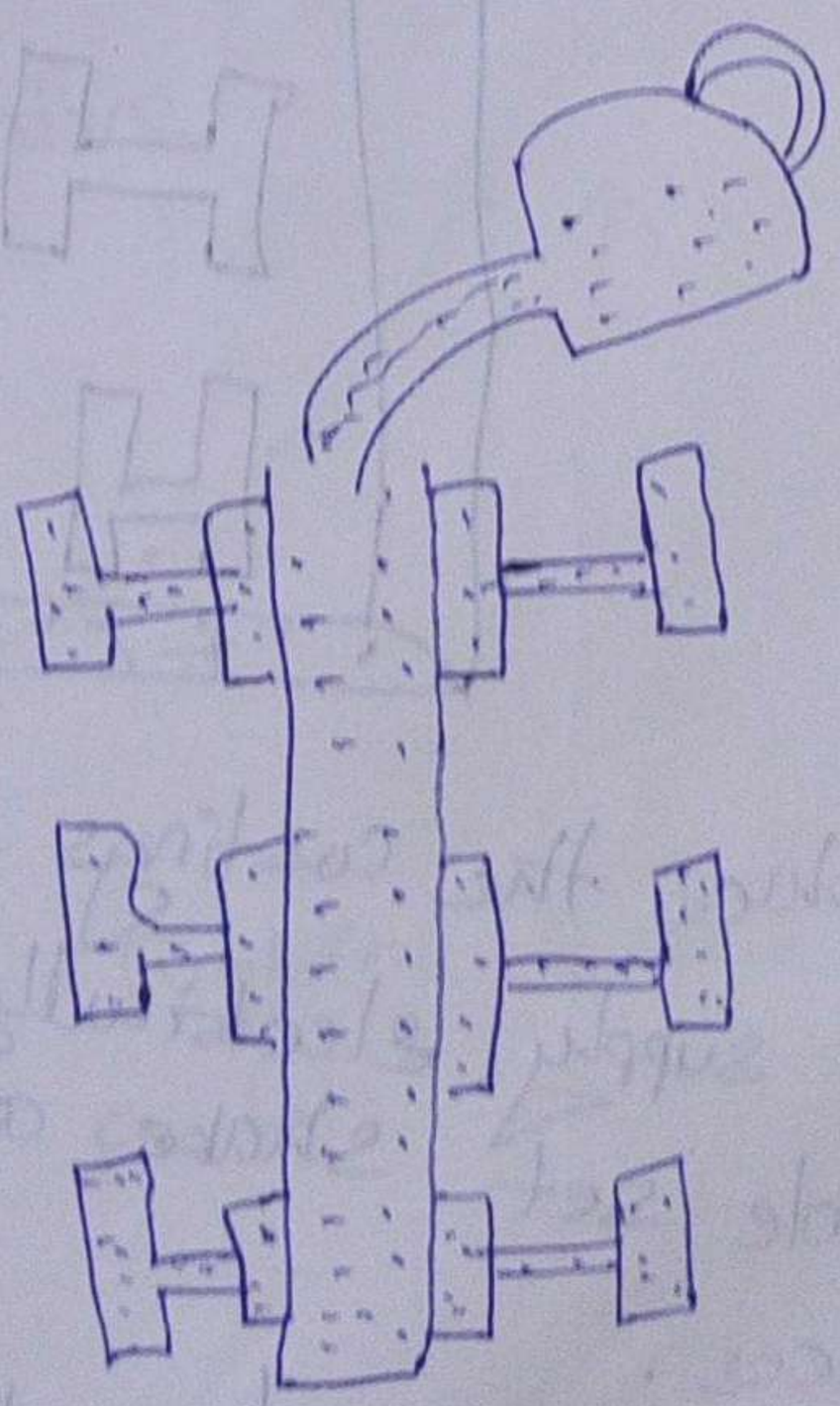


→ place the set of coated mould in a hot furace for about two to three hours

→ as a result the molten wax gets and the wax pattern gets removed.

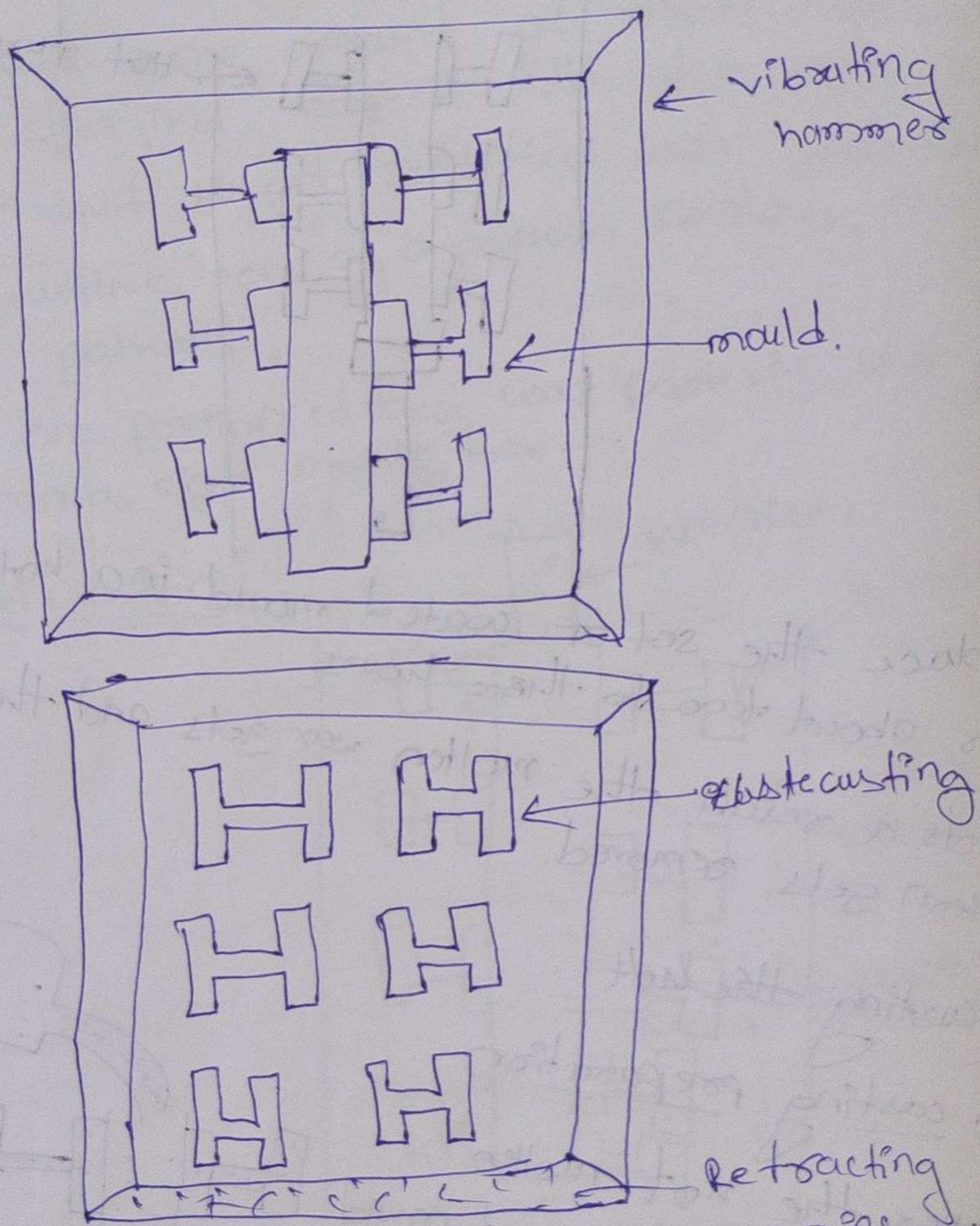
~~(A-) casting the hot~~

(A-) casting preparation



1. ~~pouces~~ pous the hot molten metal into the vacant mould set till the molten metal get distributed evenly in all the patterns and keep it soliolify the molten metal.

(5) Mould removal:-



→ place the castings set on the vibrating hammer and supply electricity to it As a result the whole set shake and the mould breaks into pieces.

→ Investment casting gives high dimensional accuracy for small castings

→ Advantages :-

→ Investment casting process is used to make special parts which can not produce through Normal manufacturing technique

→ Aiplane parts that have to with stand High Temparature.

→ No meching is required.

→ Very close trollance can be uptaine

→ Exllance process

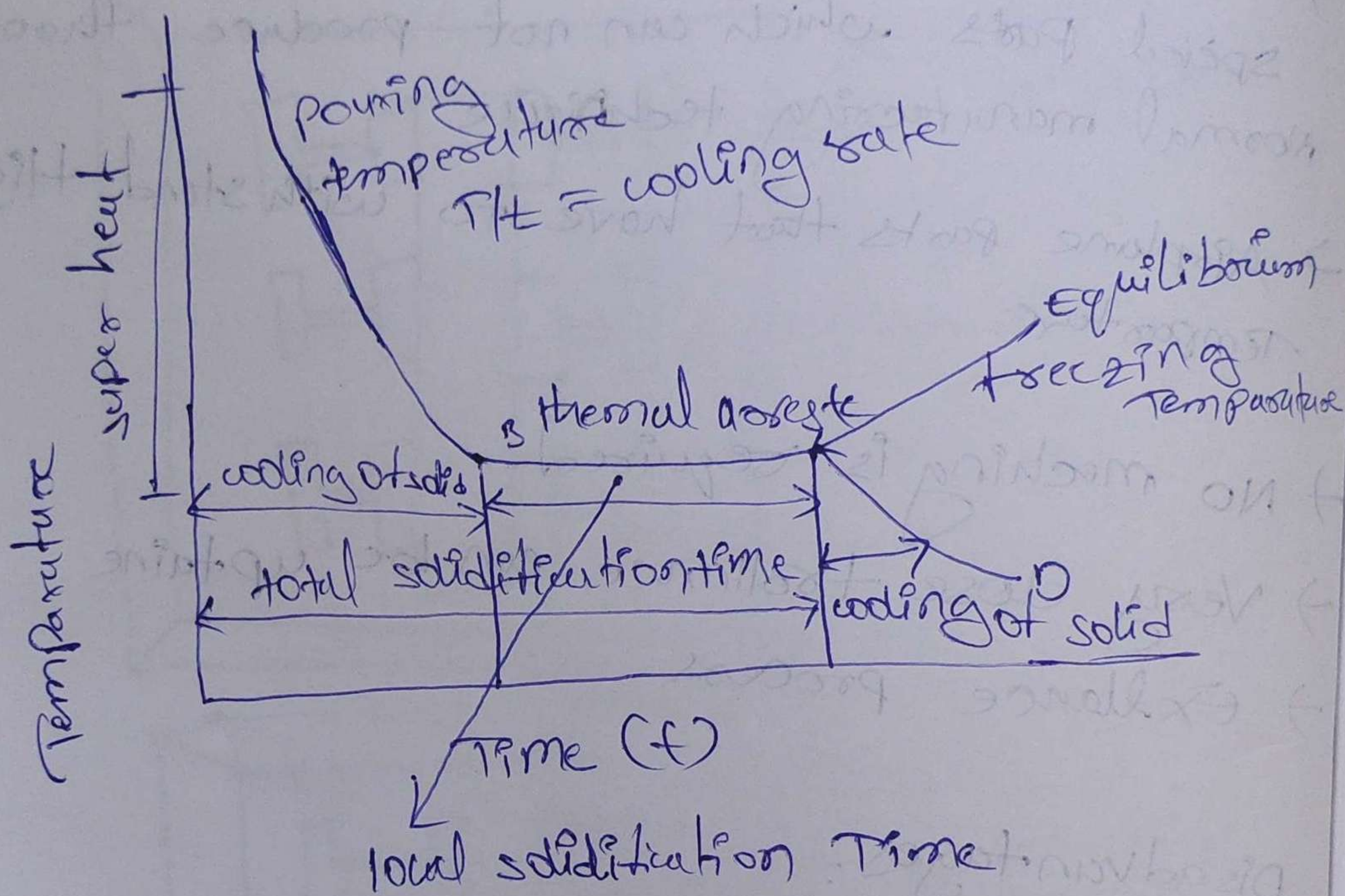
Disadvantages :-

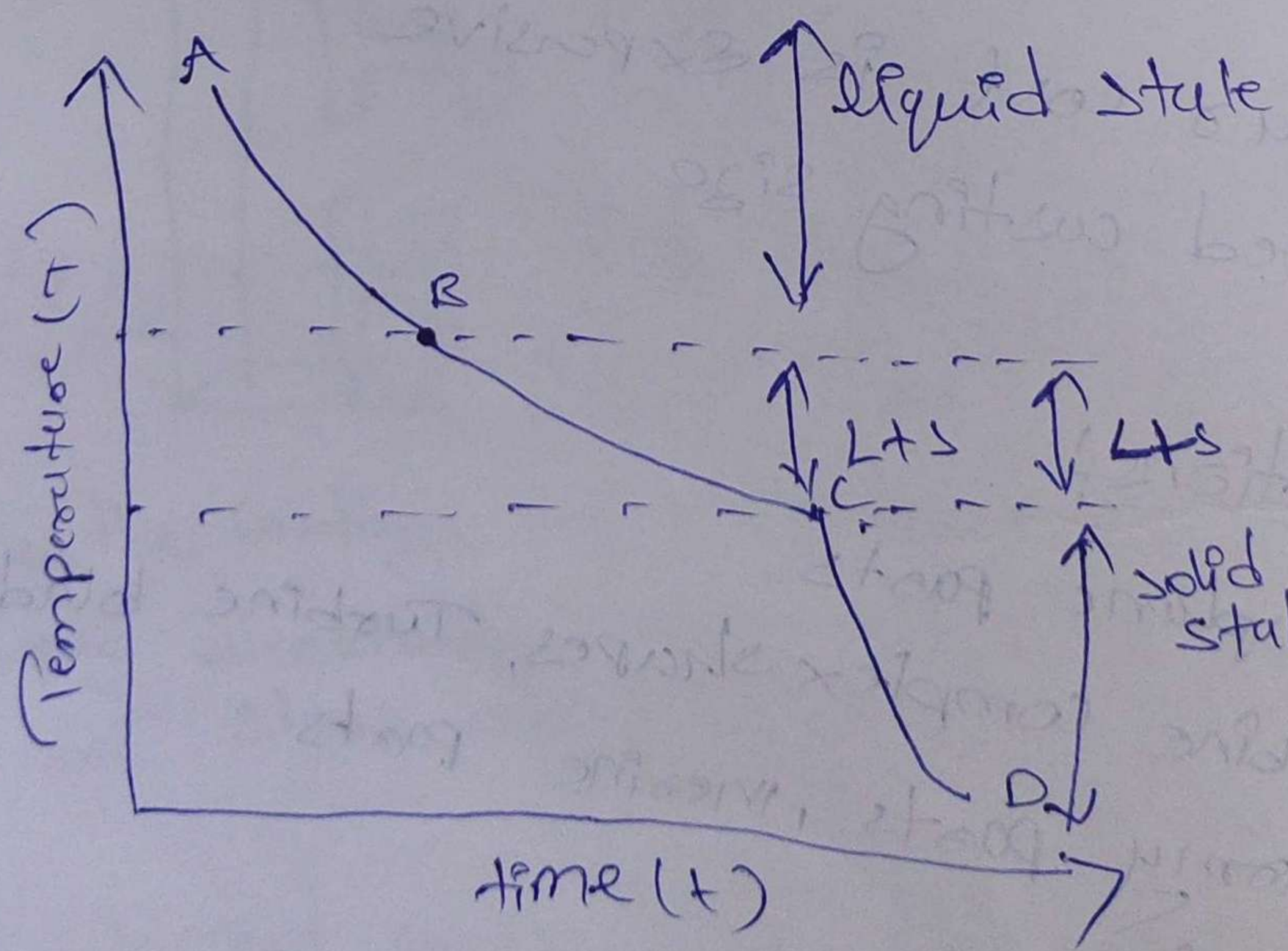
1. Time consumed process
2. labour cost is expensive
3. limited casting size

Applications :-

1. Aeroplane parts
2. Turbine complex shapes, Turbine blade
3. Aromy parts, Marine parts
4. Medical parts

solidification curve for metals





solidification can be defined as a phase change of matter that results in product of solid

solidification are two types

1. directional
2. progressive

during solidification casting acquires ~~metto~~ metallographic ~~stru~~ structure

i.
ii.
iii. volume shinkage
iv. liquid contraction

→ Molten metal that cools it looses energy to form crystals.

→ During solidification casting forms cohivison process and equries structural characteristics slow cooling making dendrite to grow long

→ Fast cooling makes short dendrite growth

Solidification of Pure metals

Pure metals generally posses

1. Excellent ~~pure~~ thermal pure condativity
2. Higher Duclity
3. Higher melting point
4. Better corrosion resistance

where as ~~alloy~~ alloics ~~alloy~~ Higher strength lower melting ~~melting~~ point Prclude castability

better High temperature strength.

Unit - 2

* WELDING *

welding is a process of joining to similar (or) dissimilar metals by heating them to a suitable temperature with are with out the application of pressure and with are without the use of fillermetal.

Solidification:-

It can be defined as a phase change of matter that results in product of solid.

solidifications are 2 types

1. Directional 2. Progressive

During solidification casting acquires metallograph structure such as grain size, shape, orientation volume shrinkage liquid contraction

As the molten metal cools it loses energy to form crystals.

During solidification casting forms cohesion process and acquires structural characteristic slow cooling makes the dendrit to grow long.

Fast cooling makes sharp dendrit growth

Pure metals generally posses.

* Excellent thermal conductivity & electrical conductivity.

* Higher ductility higher melting point

* Better corrosive resistance as compared to alloy.

where as in alloys higher tensile strength better corrosion resistance lower melting point

* improved castability

* Better high temperature strength

PROPERTIES OF MOULDING SAND

A moulding sand posses the following properties.

i. Porosity:- Moulding sand must be sufficiently porous to provide a passage for steam (formed due to evaporation of moisture) and gases (evolved during solidification) otherwise, the gas penetrates into metal with leads to the formation of gas cavities (blow holes).

The ability of sand to allow the gas to pass through it is called permeability. It depends on size and shape of grains moisture content and degree of compaction (ramming)

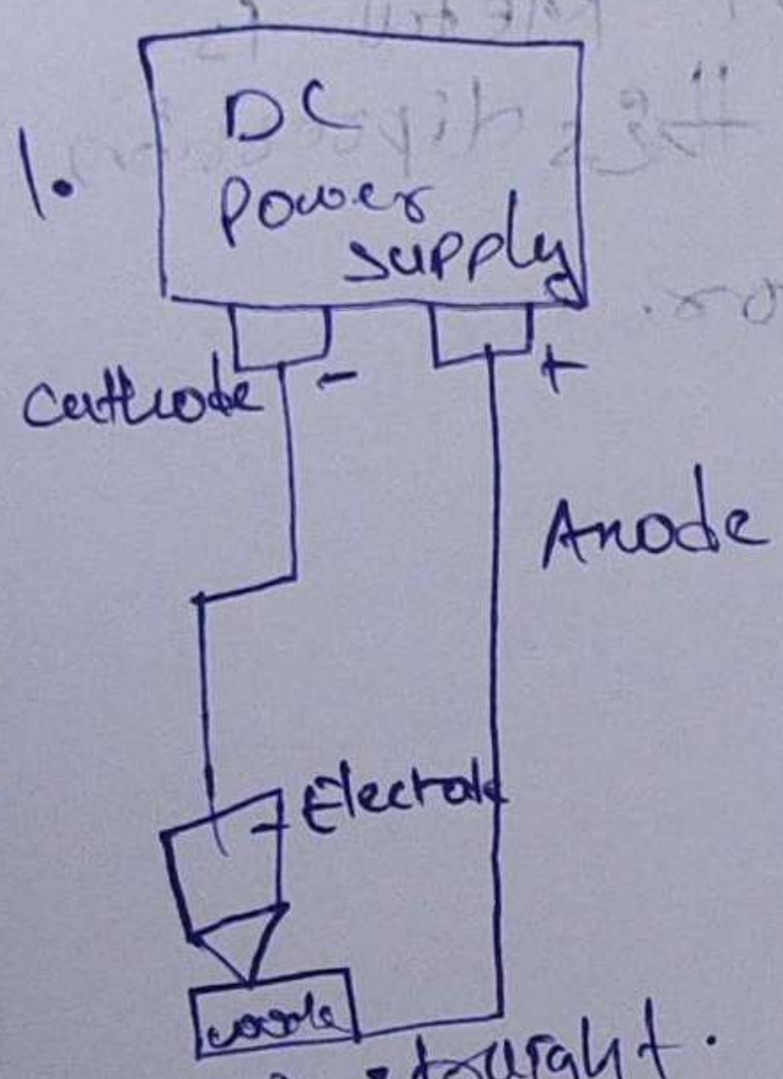
ii. plasticity:- sand should have plasticity. It is the ability of a sand to acquire shape from the pattern that is moulded and retain it during casting. The plasticity of a moulding sand depends on properties of ingredients and binders.

iii. flowability:- flowability of a moulding sand refers to its ability.

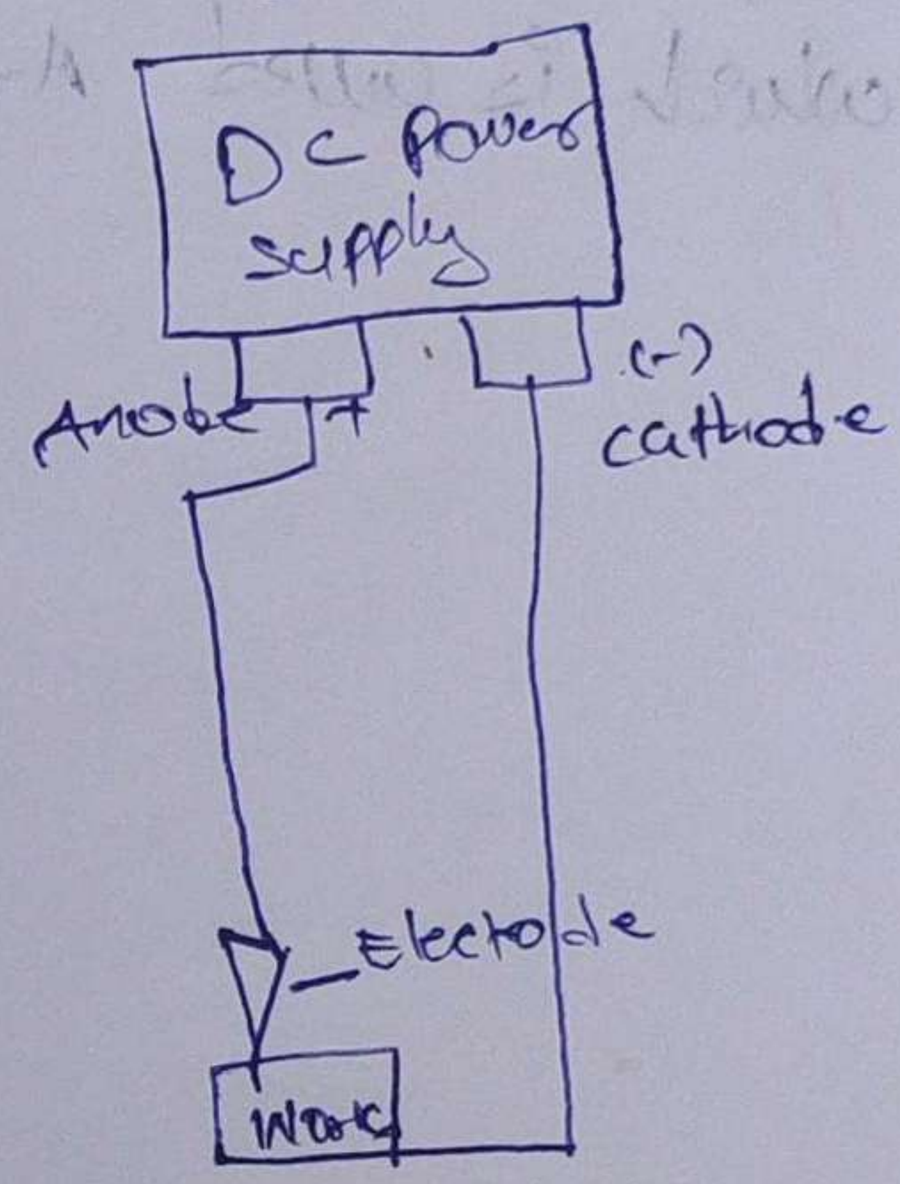
principles of Arc welding

1. straight polarity
2. Reverse polarity

1.



→ straight. Polarity (High heat)



Reverse Polarity (Medium heat)

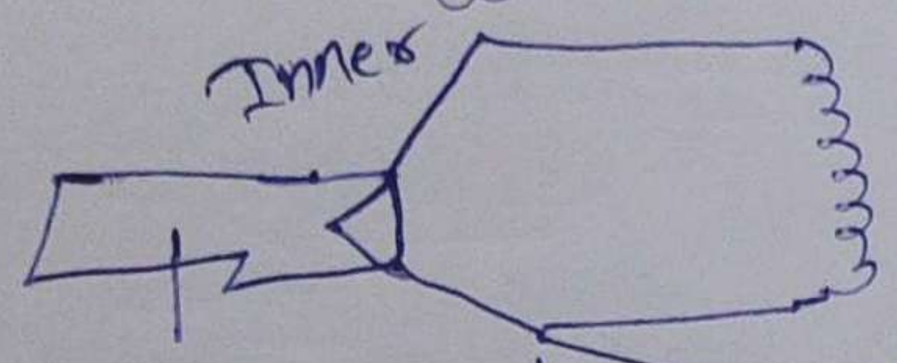
* In Arc welding process welding is done by producing heat on electric arc. b/w the base metal and electrode.
* The electric arc is produce while contacting the electrode and the work to form an electric circuit.

→ The arc is produced while maintain. maintain gap b/w electrode and work

→ The electric energy is converted into heat energy its generates the temparature from 3500 to 4 1000 c

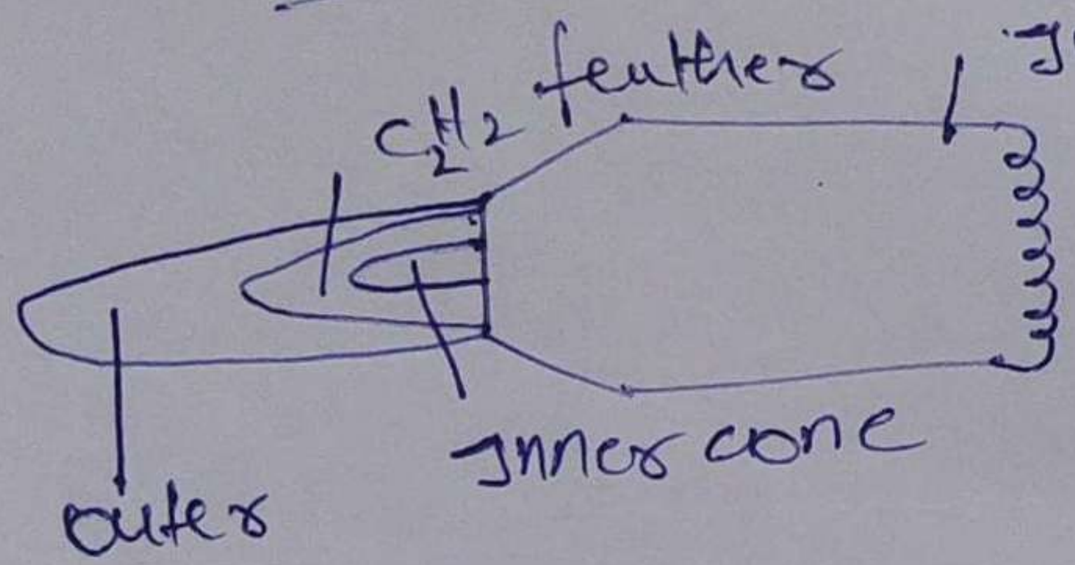
→ when the arc is obtain the work melts with

Types of flames



max temp 3200°c

Neutral flame



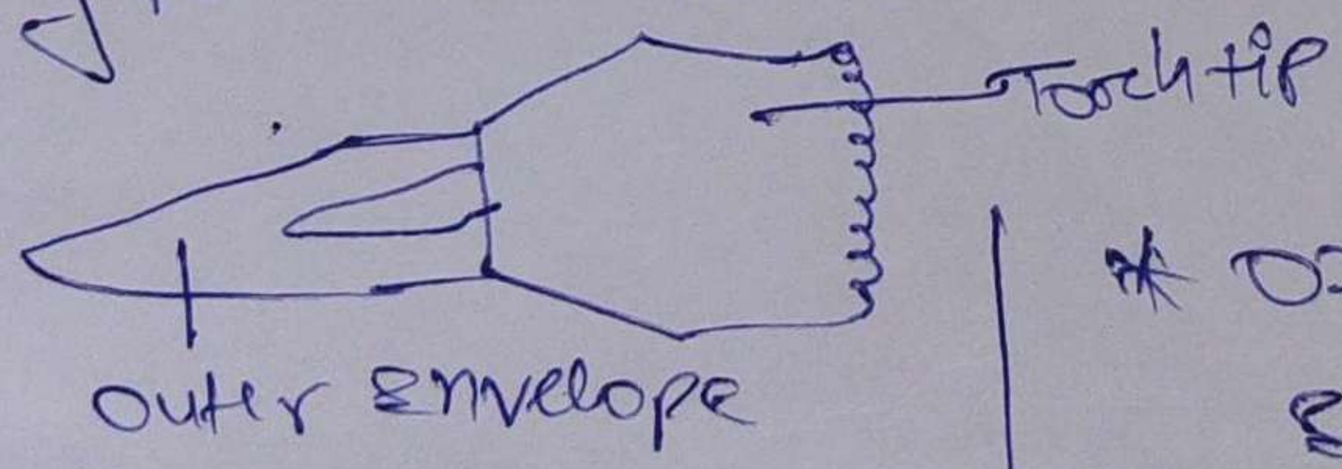
excess of C_2H_2

excess of O_2 & H_2.

Reducid flame / carbonizing flame

max temp - 3040°c

sharply pointed inner cone



Excess of O_2

oxidizing flame

max temp - 3400°c

* Neutral flame

50% of O_2 & C_2H_2

Temp - 3260°c

* oxidizing flame

excess of O_2

Temp - 3400°c

* Reducing of flame

Excess of C_2H_2

Temp - 3040°c

→ In case of gas welding process welding is done by proceeding heat from hight temperature flame ~~apt~~ obtained mixture of two gases oxygen and Acceletene

→ The gases are mixed in proper proposition in a welding touch for controlling the welding flame

→ By regulating the two Nodes of oxygen & Aceleten we can perform welding. heating

→ The intensity of the heat of the flame makes melts the surface of the base metal to form molten pool then filler metal is add to goodness fill the (or) Gaps

→ And melted add base metal.

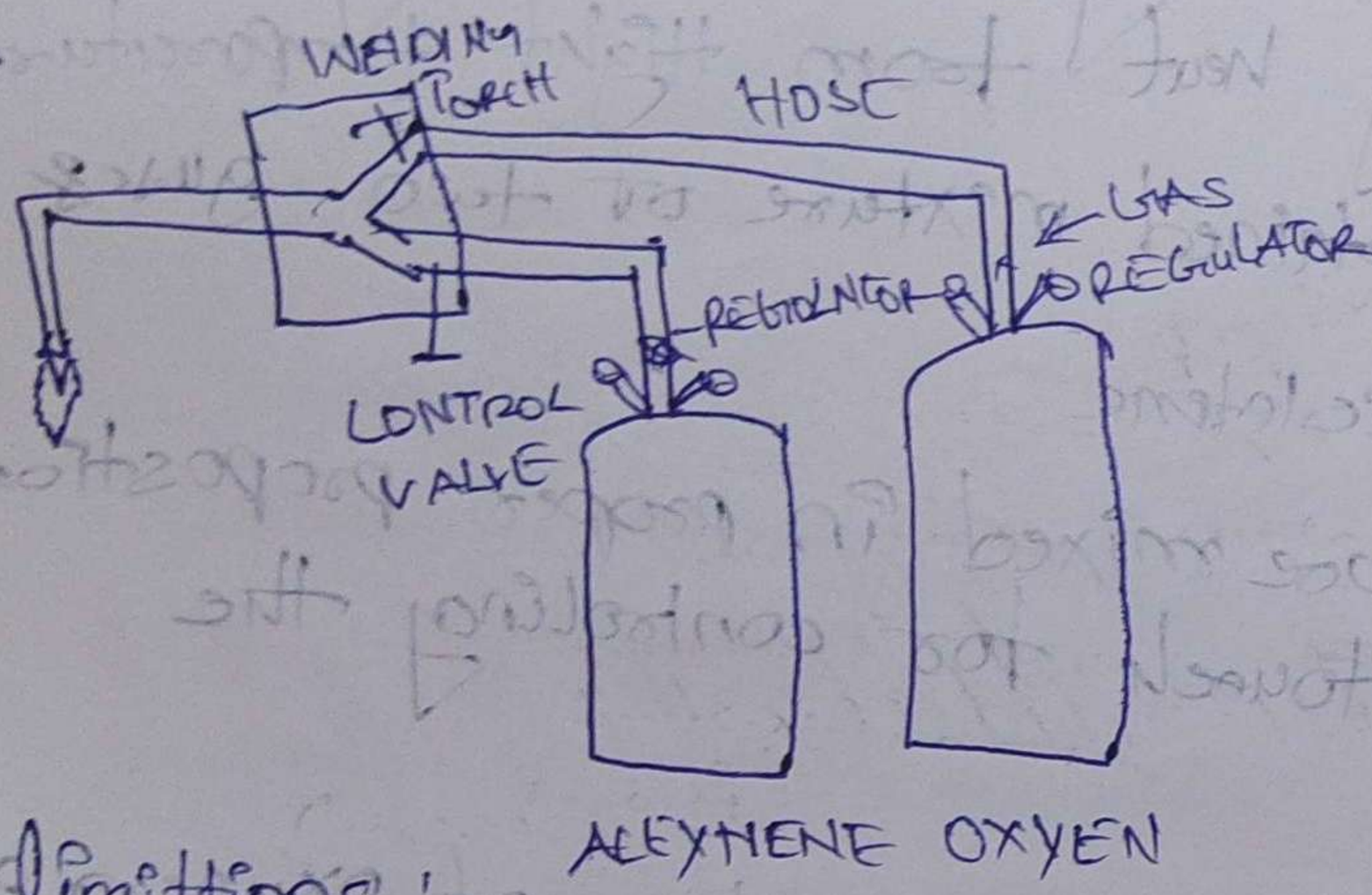
→ In welding zone. $O_2 + C_2 + H_2 \rightarrow 2CO + H_2 + heat$

→ Advantages of the Gas welding

1. oxyacetelene flame is versatile by changing the nozle or torch it can be used as 1. welding 2. Brazing 3. Cutting 4. heating

2. It is a portable machine.

3. It is extensivly used for sheet metal fabrication & repairs.



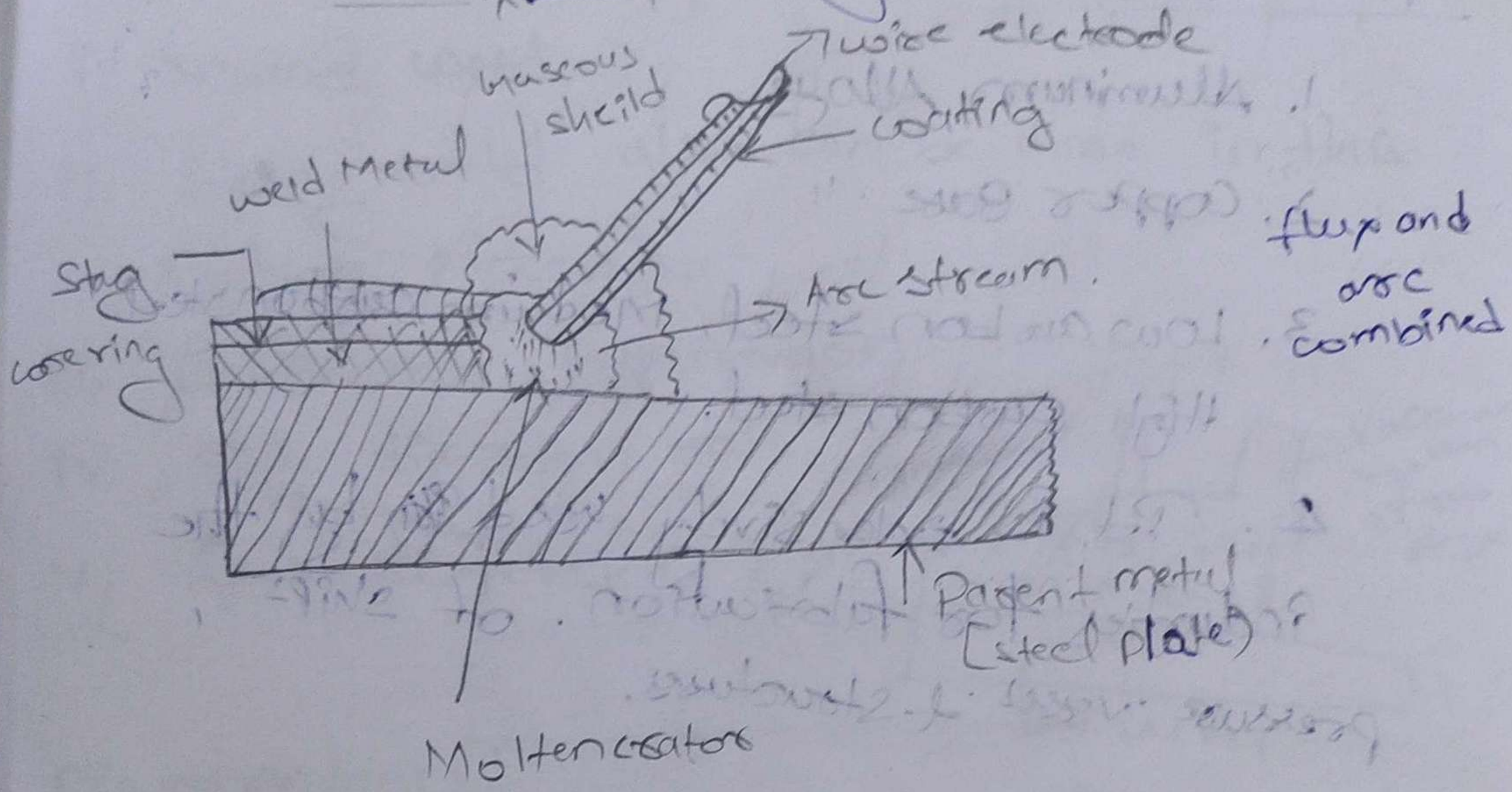
Limittions:

1. It is slower than Arc welding
2. Heat Effect zone (HEZ) and distorsion zone more compared to arc welding.
3. Gases are expensive compared to arc welding
4. setting problems Easy to store Gas cylinder such as: Oxygen
   Acetlene

Applications:

i. Mostly used in sheet metal ~~fa~~ fabrication.
ii. Before going to welding we can pre-heating the
iii. Almost in all industries less than 3mm thickness sheets welded.

Metal Arc welding



Advantages

→ It is faster than gas welding process

→ It is less cost compared to gas welding

→ It is used in all positions

→ It can used ~~too~~ all metals for which electrodes have being developed.

Limittions :-

→ It is not suitable for thin sections. (below 2mm)

→ It can be used in manual mode only.

→ It can be not suitable for heavy work because large metal to be deposited due to that time consumption is more.

Applications :

1. Aluminum Alloys

2. Copper Base "

3. Low carbon steel, Medium carbon steel. High carbon steel.

4. It is extensively used by the industries for fabrication of ships, pressure vessels & structures.

→ Submerged Arc welding :

→ is a an arc welding process in which Heat is generated by an Arc, which is produced b/w base electrode consummable wire and work ~~pice~~ piece. The Arc and weld zone are completely covered under granular fusabull flux.

→ This flux is melted and flows down towards and fresh granular fusabull flux is falling on the weld zone. And also Acts as shelding gass to the welding zone and protects the atmospheric gases

Advantages:-

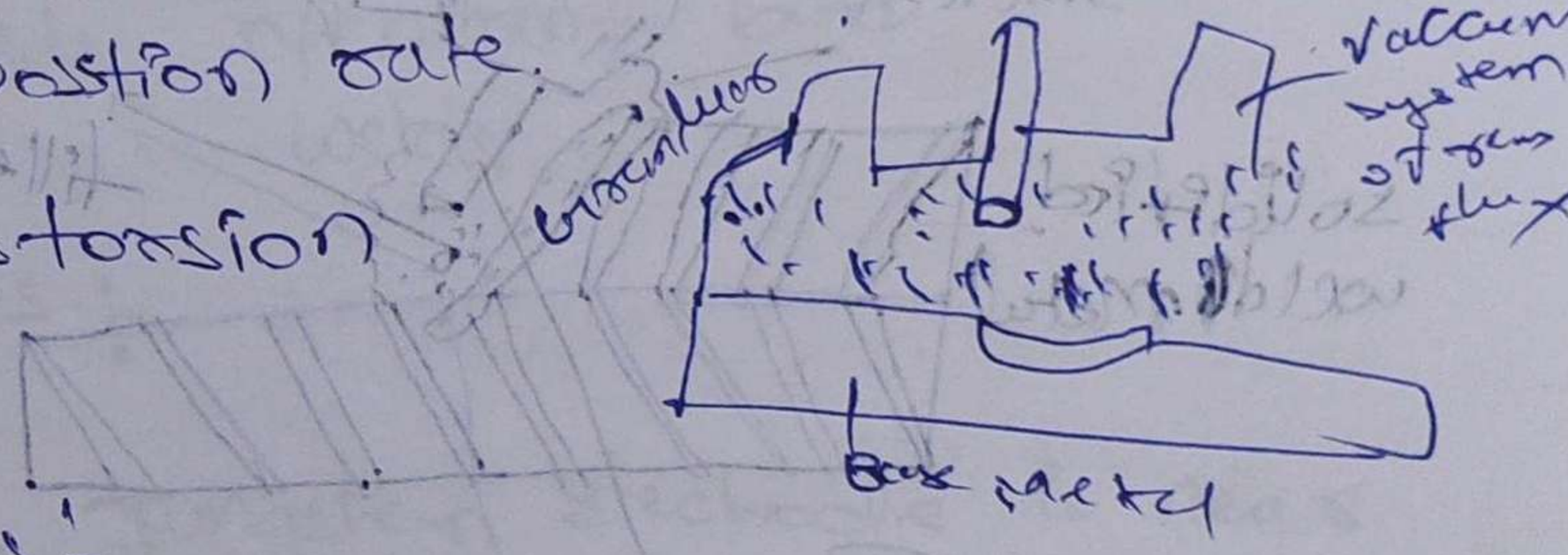
i. sound weld.

ii. Strong weld also can be done in this system (process).

iii. Deep weld penatration

iv. High diposition rate.

v. less distorsion.



Disadvantages:-

i. It is not a potable meechine

ii. Riquires flux handling system.

iii. It needs slug (granular tusaball flux) removel system

→ Applications:-

i. It can be used different grades of steels.

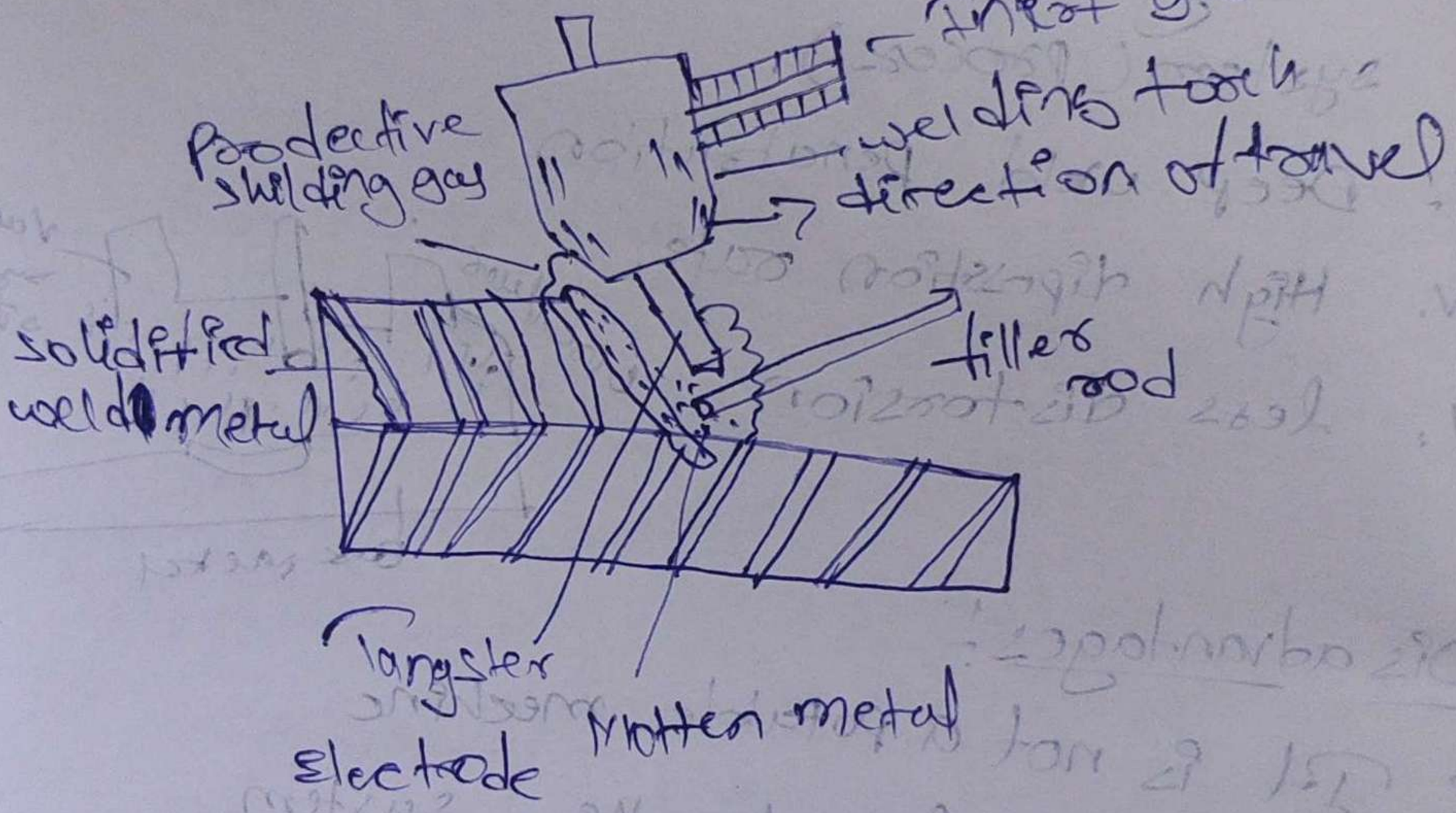
ii. Ship Building

iii. It is used in offsure environment.

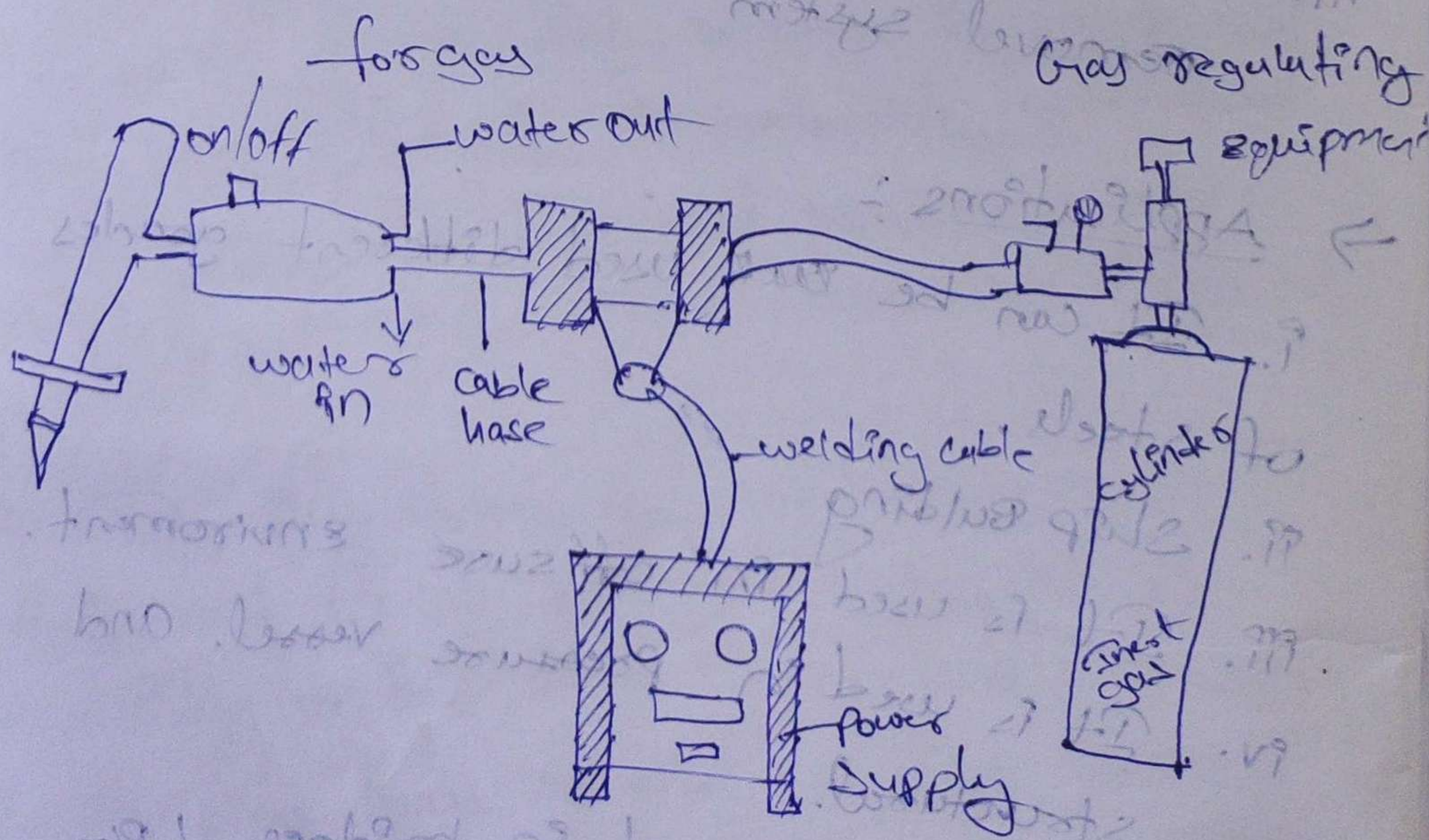
iv. It is used in pressure vessel. and structural.

v. It is can be used in bridges, LPG cylinders also

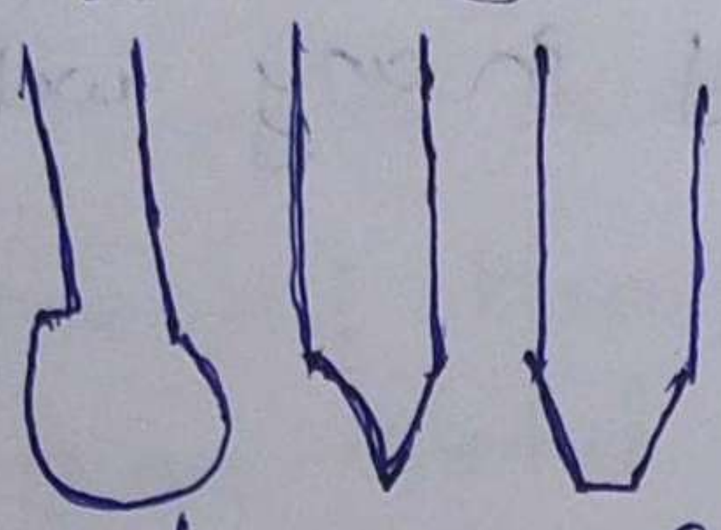
Tig welding



The setup of GTAW:



shape of tungsten electrode.



High heat capacity | fillet welds | Best suited for open roof butt welds.

Some points :-

* When the Tungsten electrode is near the base metal the filler metal angle should be around 15-20°.

→ TIG welding must be operated with a drooping, constant current power source either DC or AC. A constant current power source is essential to avoid excessively high currents being drawn when the electrode is short.

Advantages :-

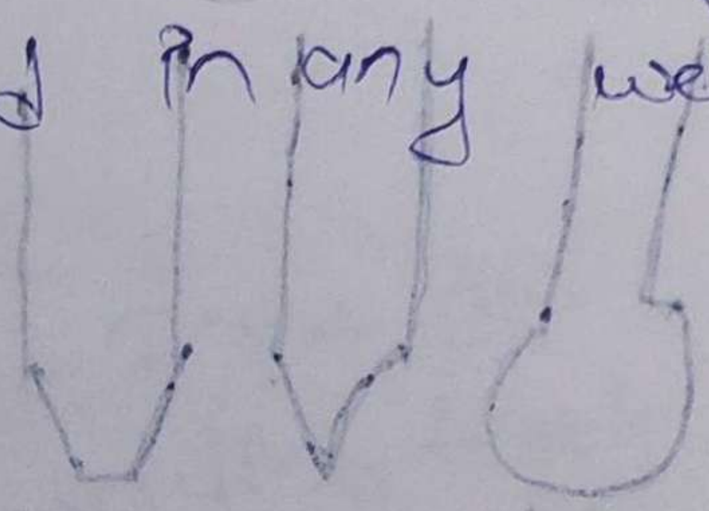
The following are advantages of TIG welding.

→ It produces high-quality welds

→ It is protected by the inert gas during the process.

→ TIG welding does not produce slag (extra fusing)

→ It can be performed in any welding position.



Disdavantages:

→ offers a slow welding process

→ High skilled labor is needed

→ High initial cost

→ upto 5mm thickness will be weld

Applications:

→ except Pb & Sl lead and tin

→ It is applicable for Alluminum alloys copper alloys, megnisium alloys and also Nikkel, carbon steel and stainless steel alloyes.

→ Tig welding process is also known as gas Tungsten arc welding in this process the arc created b/w not consumable electrode (Tungsten) and Base metal.

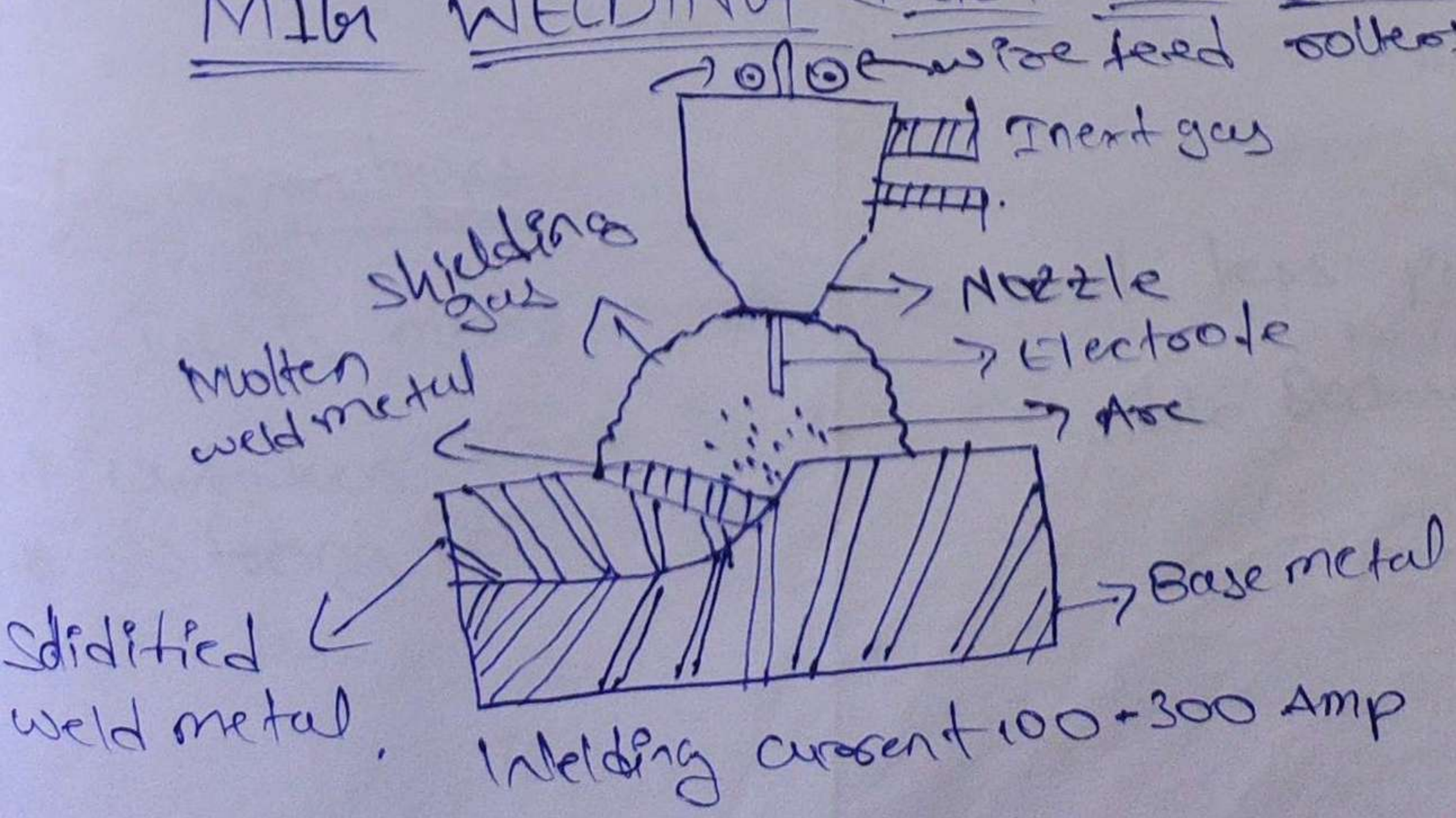
→ To form a molten pool b/w the base metal & Tensenal electrode the power should be given in Amperies.

→ After creating the arc ~~when~~ well pool is going to solidified to make a joint b/w the place.

→ The electrode is shell in a special type of electrode holder that is called torch

→ The torch carries passes of inert gas process water input and output and also welding electrode

MIG WELDING (Metal Inert gas welding)



AC welding	DC welding
1. More efficiency	1. less efficiency
2. Power consumption is less	2. Power consumption is more
3. cost of equipment is less	3. cost of equipment is more
4. High voltage. Hence not safe	4. lower voltage Hence it is safer
5. Not suitable for non ferrous metals	5. suitable for both ferrous & non ferrous metals
6. Not suitable for welding thin sections	6. for thin & thick sections
7. Any terminal can be connected to work & electrode	7. +ve terminal connected to work and -ve to electrode

NIM

→ In the MIG welding process the filler by filler metrial consumed and shillinding gas effect from the oxygen gas.

→ The arc is created b/w base metal consumable wire electrode.

→ In this one welding current well use 100-300 Amperes.

Advantages:

* It is faster than sheild metal arc welding
* No slag formation
* Higher diposition rate.
* Deep penatration is possible.
* Better quality weld produced
* Higher utilization of filler metirul. (wire) (No wastage)

Disadvantages

* It is more expensive and less potable
* Out door work is not possible. Because of
* strong wind

Applications

* Carbon Steel
* stainless steel
* Alluminium Alloys
* Copper "
* megnisum "

TIG	MIG
* Less utilization of filler wire	* more utilization of filler wire
* Non consumable electrode	* consumable electrode
* AC welding is used	* AC & DC welding → Both used
* More wastage of filler wire	No wastage of filler wire.
* Filler wire adjusted by holder	* filler wire is adjusted by roller
* Thickness upto 5mm	* more than 5mm
* No slag	* No slag
* Gas Tungsten arc welding	* Metal inert Gas welding

Brazing

* Brazing is a process of joining two similar (or) desimilar metals with help of some fuessable alloy (known spelter) having its melting point above 450°c. But lower than the melting point of the parts to be join process
* Filler metals used in this copper based alloys and sliver based alloy. The flux used in Borax. This Borax flux used in two ways
(i) It dessolves any oxide in the weld
(ii) when Borax becomes red it fuses to form a glassy fill over the metal.

Metals which can be Brazed

→ copper based alloys
→ Mild steel
→ Cooban steel and alloy steels.

→ stain less steels
→ alluminium and few alluminium alloys
→ Nikel base alloys.

i. copper to Brass.

ii. copper to steel.

iii. Brass to steel.

iv. cast iron to mild steel.

v. Mild steel to stain less steel.

Advantages

→ It is applicable for feross and non feross metal.
→ dissimilar metal can be joined easily
→ complex joints can be joint.
→ Accembly joints can be join in stress free condition.
→ Metarials of difference thickness can be joint easily.
→ It requires less removing of of slag remove.

Disadvantages

-> lower joint strength than that of the part metarial

-> cost of joint preparation is High

-> It is applicable for sheet metal only and assemblys

Applications

-> It is used in electronic and electrical industry

-> It is used in utensile manufactering

-> It is used in maintainance (cast iron componets)

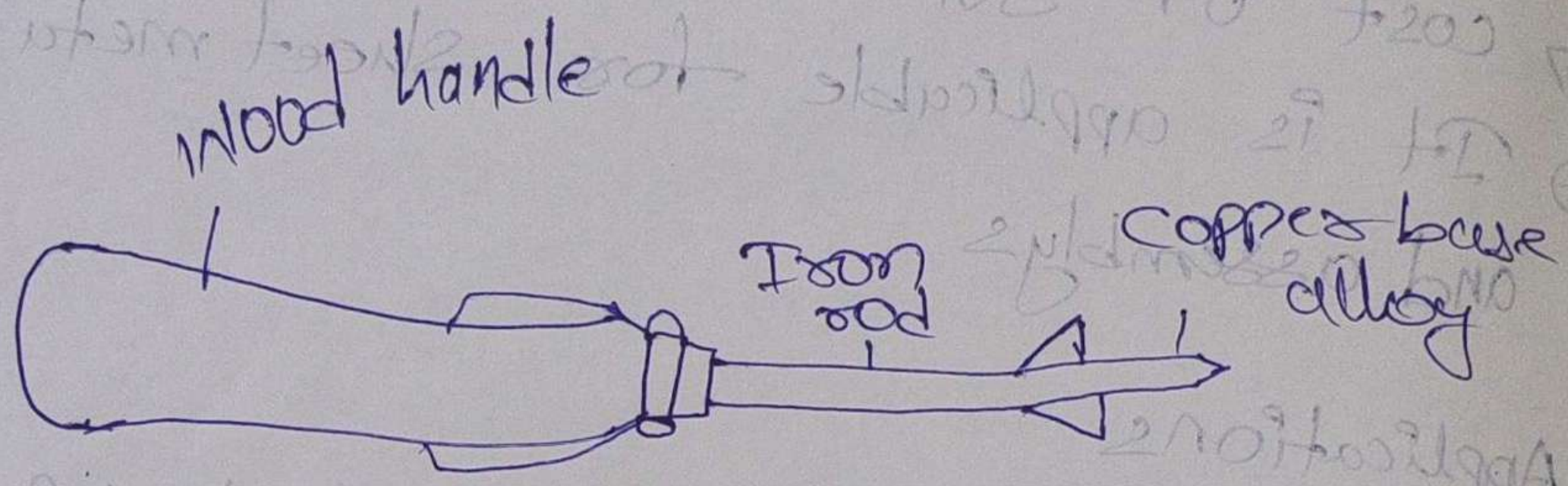
soldering

soldering is the process of joining similer and disimilar metals by means of heat & filler metal known as solder which's melting point below 450°c than the melting point of metals to be joined

soldering equipment :-

i) soldering iron

ii. solder & flux



Filler metal → solder

flux — paste

→ copper is a good conductor and high

→ copper is mixed with tin easily.

→

Advantages

→ It is used in sheet metal work.

→ Due to low melting point the joint is very easy to produced

→ Expensive equipment is not required

→ It is useful for delicate work

Disadvantages

→ It gives soft joined, so that it very week

→ It can not give strong joined
→ The mixing (composion) of lead and tin
various in preparation than it makes
week joined.

Applications:-

i. electrical and electronics mother board
ii. Food containers.
iii. Automobile industry (for radiators &
body finishing).

* Different b/w welding Brazing and
soldering.

Thermit welding

Thermit welding is special process to
joined the weld rail tracks.

It is a exothermic reaction in which
molten metal is formed by the composion
of alluminum powered and Iron oxide

To form a moulten metal megnisum ribbon
also mixed in Aluminum & Iron oxide.

The moulten metal is passed through the
pouring gate into the mould cavity.

The slag is dipossited at the basing or tray

Heating rate is provided through maintain temperature of the moulten metal.

Advantages

-> It is quicker process then the shield metal arc welding.

-> High deposition rate.

-> Deeper ~~conduction~~ is required (possible) penetration

Disadvantages :

1. Thermit welding is essentially used for ferrous metal parts of heavy sections.
2. It is uneconomical for welding cheap metals and light parts.

Applications

i. Thermit welding is traditionally used for the welding of very thick and heavy plates.

ii. Thermit welding is also used in joining all roads, pipes and thick steel sections.

iii. Thermit welding is also used in repairing heavy castings and gears

iv. Thermit welding is used for welding cables made of copper

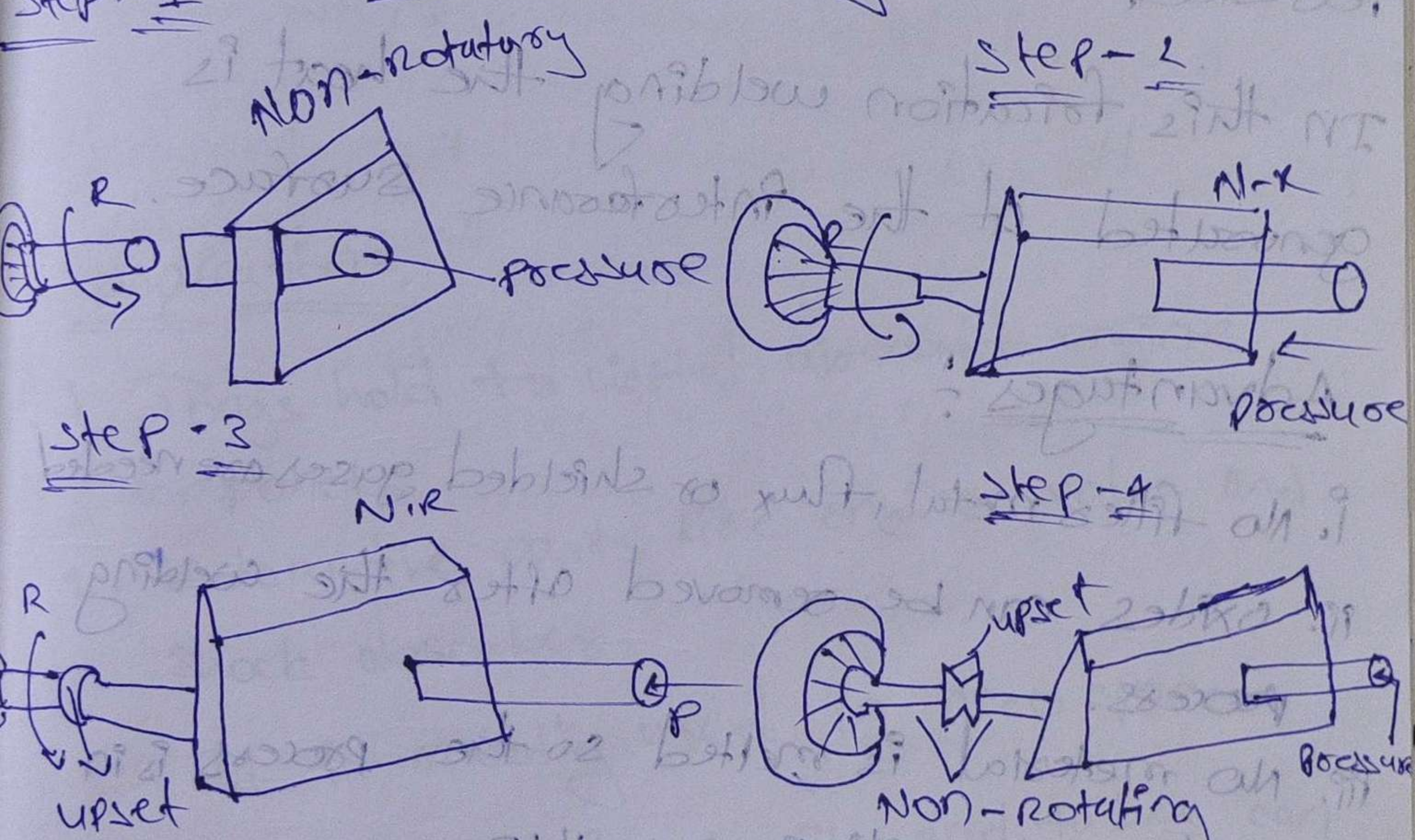
iv. carbon steel.

v. low alloy steel, stain less steel

vi. Alluminium and Alluminium alloys

VII copper and copper alloys.

Friction welding



Friction welding is a solidstate welding process that generates heat through mechanical friction b/w work piece piece it mealitive motion to one another piece week edition of lateral force called upset to elastically displays and fuse

The meutrials (upto 50mm diameter) in which the joined is created due to thermo mechanical tocatment at the contact surface.

In this welding process the friction is applied until the plastic forming temp. is archive (it is normally 900°c - 1300°c) for steel.

In this friction welding the heat is generated at the interfarance surface.

Advantages:

i. No filler metal, flux or shielded gases are needed

ii. oxides can be removed after the welding process.

iii. No material is melted so the process is in solid state with narrow HAZ

iv. Strength is High

v. High welding speed.

Disadvantages

i. Equipment and tooling cost are High

ii. free machining alloys are difficult to weld.

iii. The process is restricted to joining round bars or tubes of same diameter

iv. only round ball can be welded

v. Joint design is limited.

Applications

1. Tongs hold to vital aircraft engine components

2. Automutive parts like engine value and shock absorber.

3. It is mostly used in aero space

4. It is used in shafts and tubes can be weld above 5mm thickess.

5. It is used in automobile industry

6. It is used in medine industry.

7. It is used in 1. guces 2. drillmix
3. connecting rod.
4. Hydrolic Pistan rod.

Resistance welding :

In Resistance welding the metal parts to be joined heated by a resistance to the flow of an electric current.

In this welding no flux are employed the filler metal not used and the joints are lap joint types

The amount heat generated in the work piece $H = I^2Rt$ where H = Heat generated Heat in Joules

I = Current in amperes
R = Resistance in ohms.
t = Duration of current flow in seconds.

The types of weldings are :

1. Spot welding
2. seam welding
3. projection welding

Applications :

i. sheet metal works
ii. fabrication work

iii. automobile industry
iv. medical industry

* UNIT- 3 *

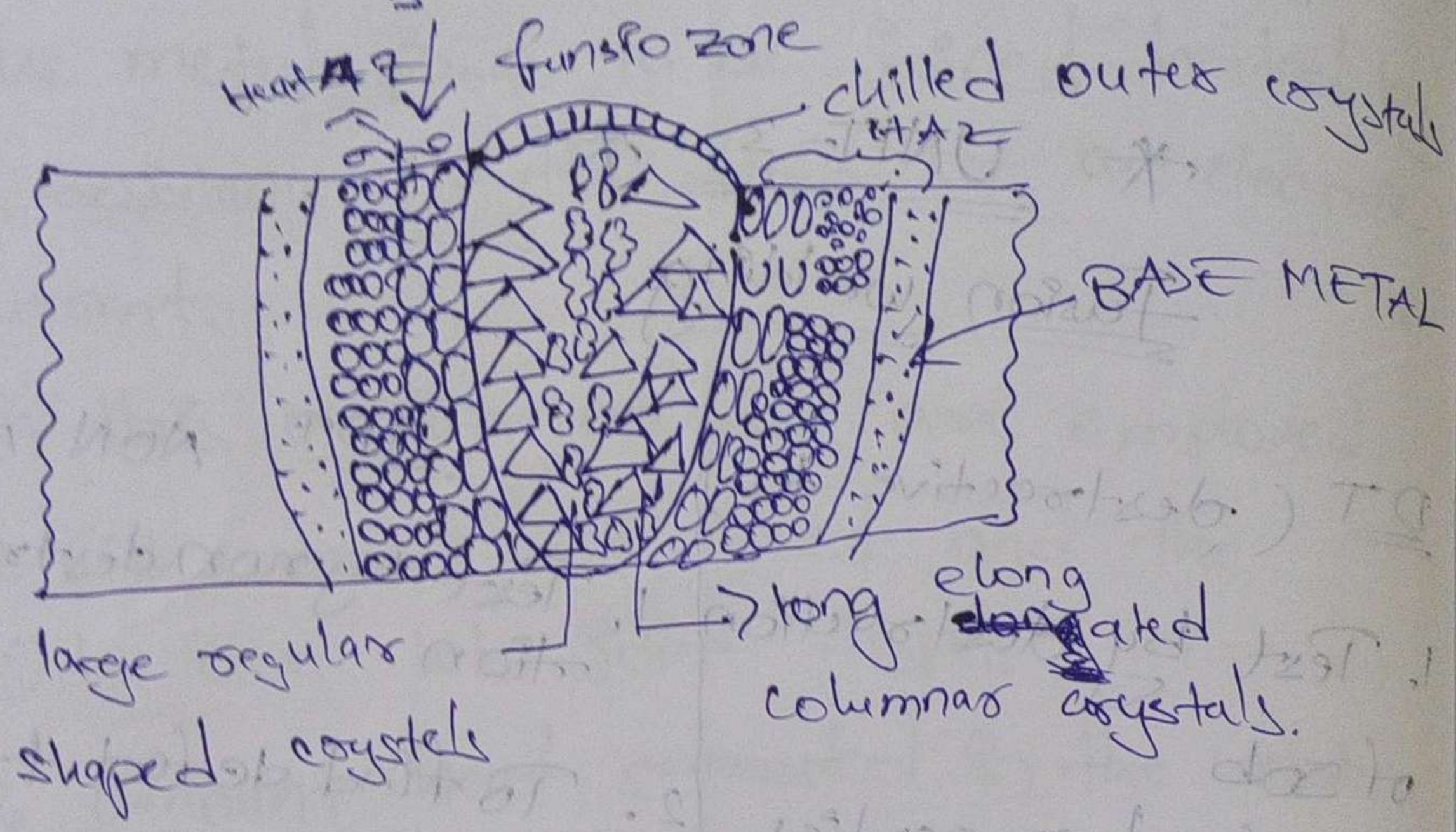
Fusion welding

DT (destructive test)	NDT NON "
1. Test by destruction of Job	1. Test by non destruction
2. To find properties of Job	2. To find defect + properties.
3. Application of load	3. No application of load
4. Damage due to load	4. No damage
5. special equipment requirement	5. No special equipment needed
6. Heavy machinery	6. Light weight machinary
7. High power consumption	7. low power consumption
8. Expensive	8. Non Expensive
9. only at lab	9. Any where
10. Good skill is required	10. less skill

XRD:
xray diffraction test

dye penetration test, ultrasonic test radiography thickness tests, microstructure test

Heat Effected Zone (H.A.Z)

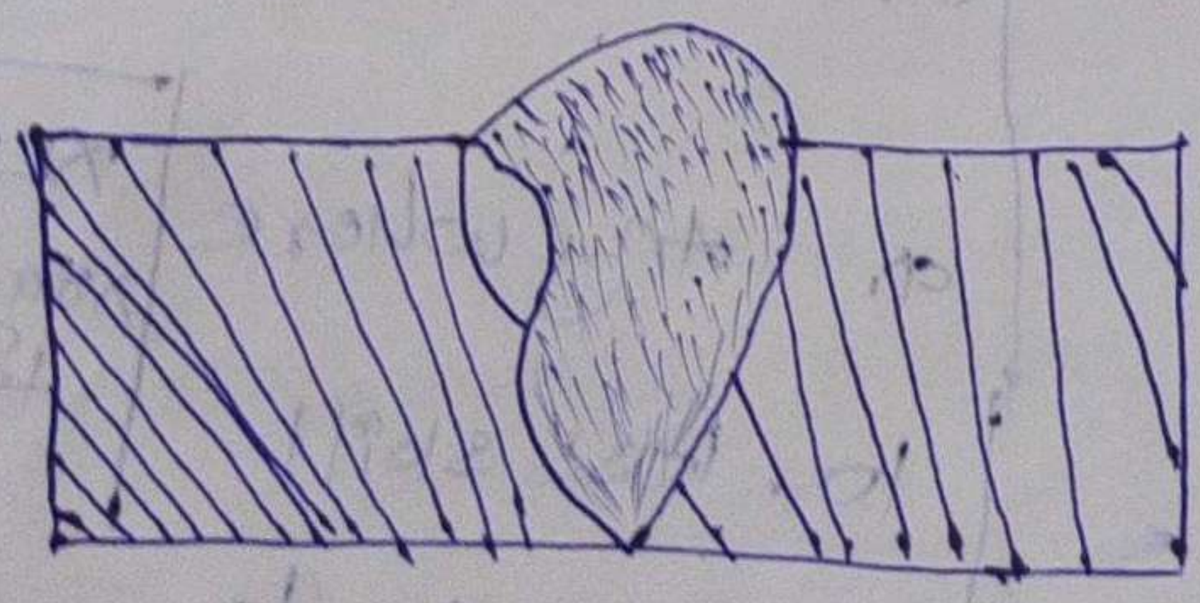


funsion zone :- Recrystalization

Heat effected zone is non melted area of metal that as under gone change in mechanil properties as a result of beeng exposed to High temp..

Incomplete fusion

WELDING-DEFECTS



incomplete fusion it is incomplete weld.

→ Discontinuty in the weld zone

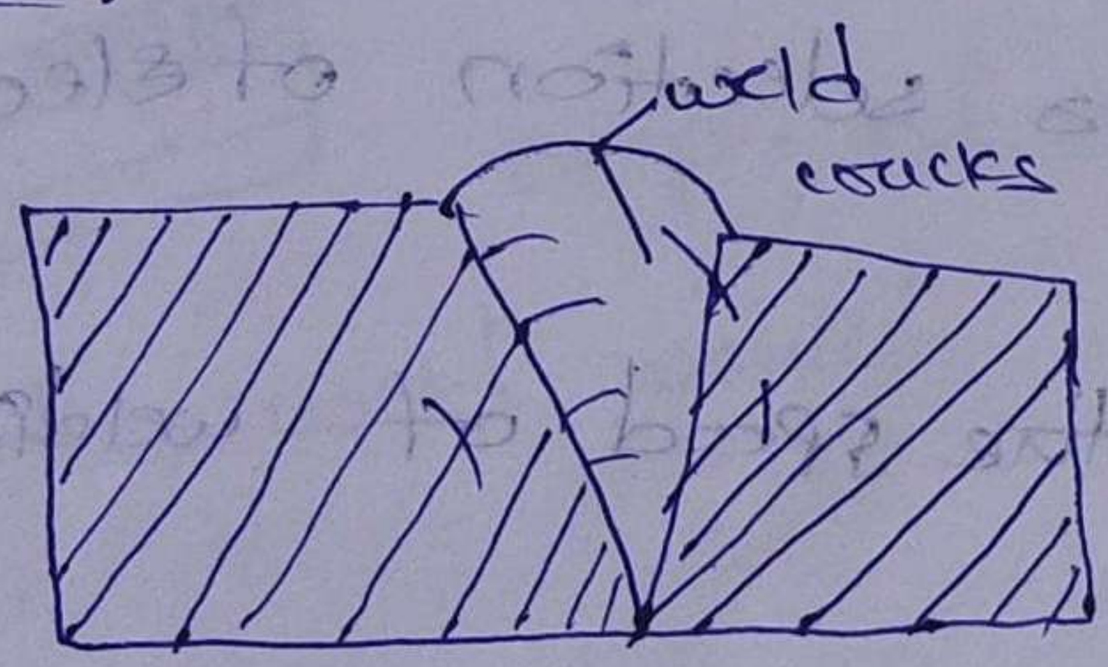
Causes:

1. Improper penetration of the joint
2. wrong design of the joint
3. In correct welding techi.

Remedy:

1. supplying low electric current
2. clean the joint properly.

Cracks:



When in proper of.

→ cracks are generated by depending on the temperature at which they accur during crystallization process.

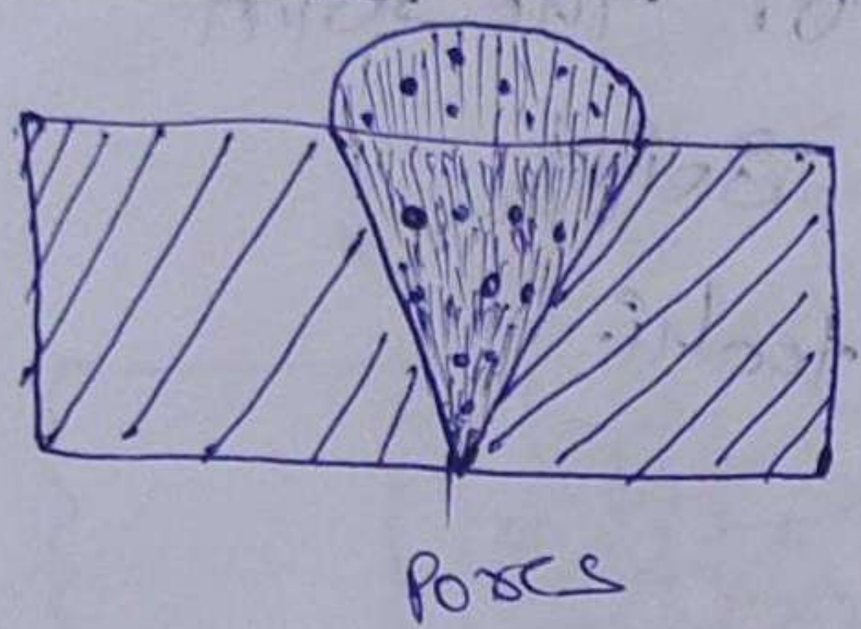
Causes:

1. A high content of sulphur and carbon in the metal.
2. use of H_2 when welding ferrous metals

Remedy:

1. Preheat the metal before welding.

Porosity :



⇒ pores caused due to intrapped gases in the molten metal during the solidification of process.

Causes :- 1. contaminated gases in the molten metal

2. Inadequate shielding

3. Unstable arc

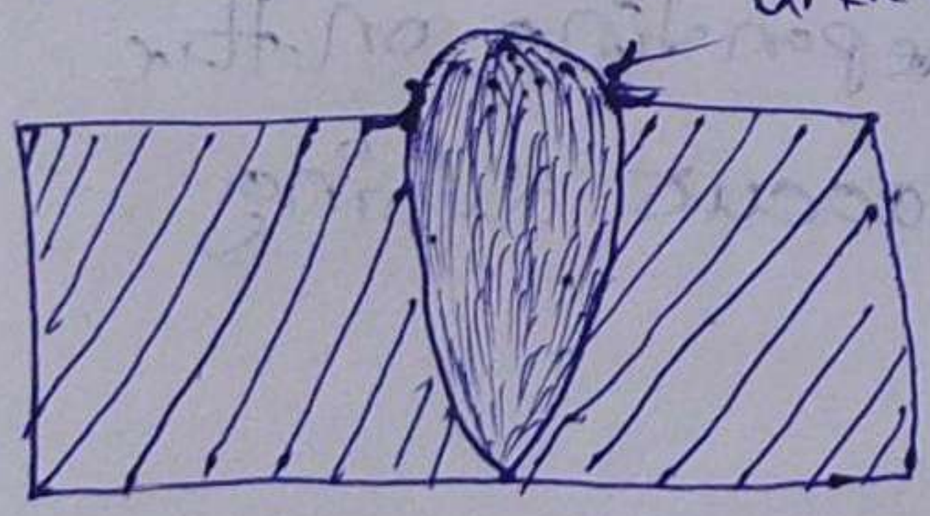
4. small arc gap

5. poor welding technique

Remedy :- 1. Proper selection of electrode & filler material

2. Decreasing the speed of welding.

Undercuts :



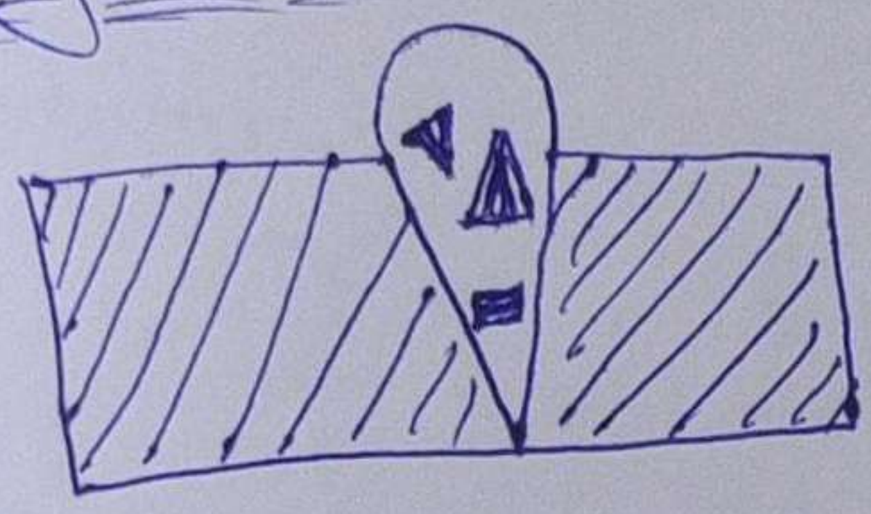
⇒ unfilled grooves present along the edges of the weld causes :-

1. Improper welding techinique
2. Excessive welding current
3. Incorrect manipulation of electrode

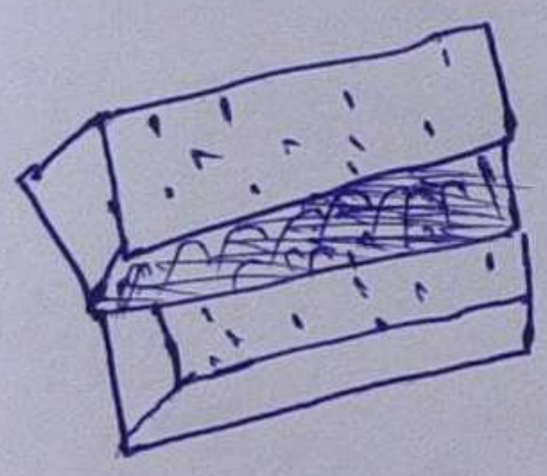
Remedy :-

1. use large electrode
2. use moderate current
3. move the torch slowly over the welding process
4. place electrode at safe distance from the interface of weld

slaginclusion :-



Spatter :-



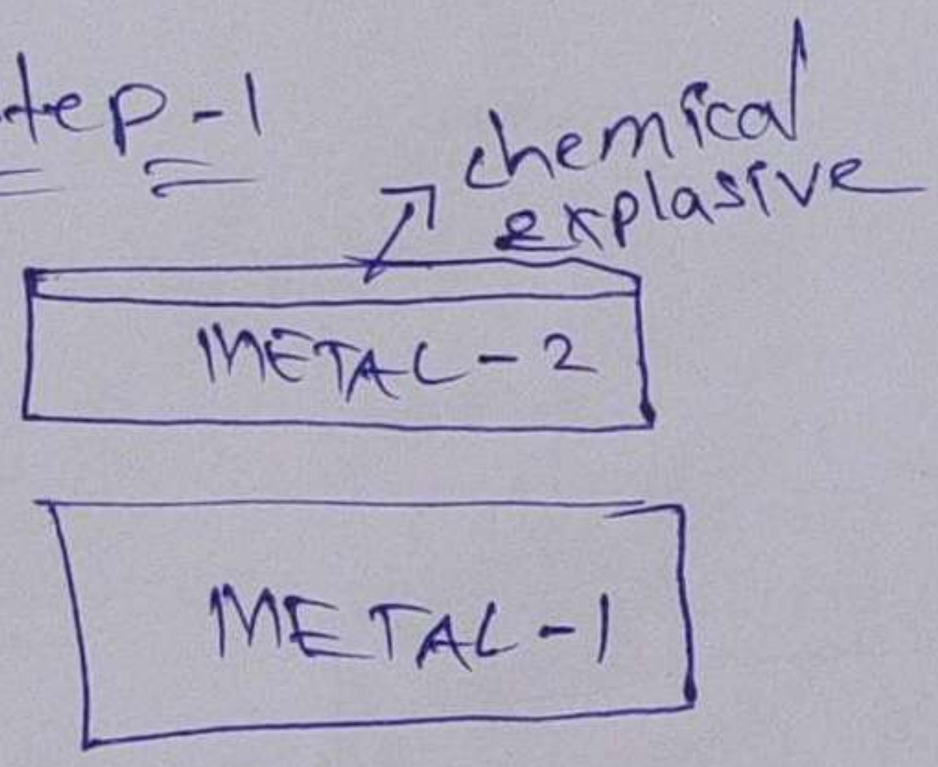
Droops of metal expelled from the weld which stick to the welding.

causes :- 1. High welding current
2. Long Arc
3. Incorrect polarity of the arc blow
4. Improper gas sheilding

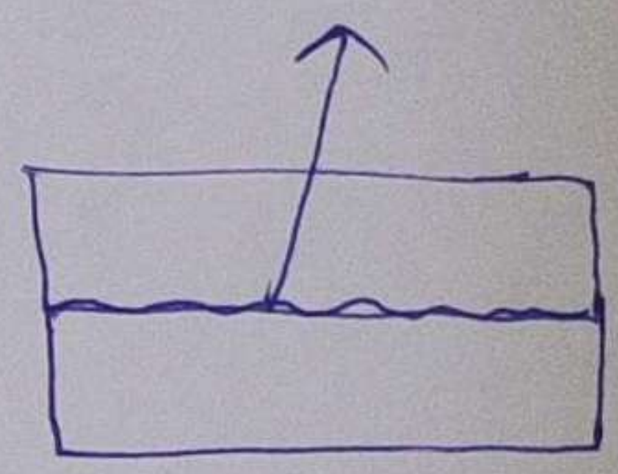
Remedy :-
1. Decreasing the weld current & Arc length.
2. using arc having correct polarity
3. checking the correct shielding gas type.

Explosion - welding

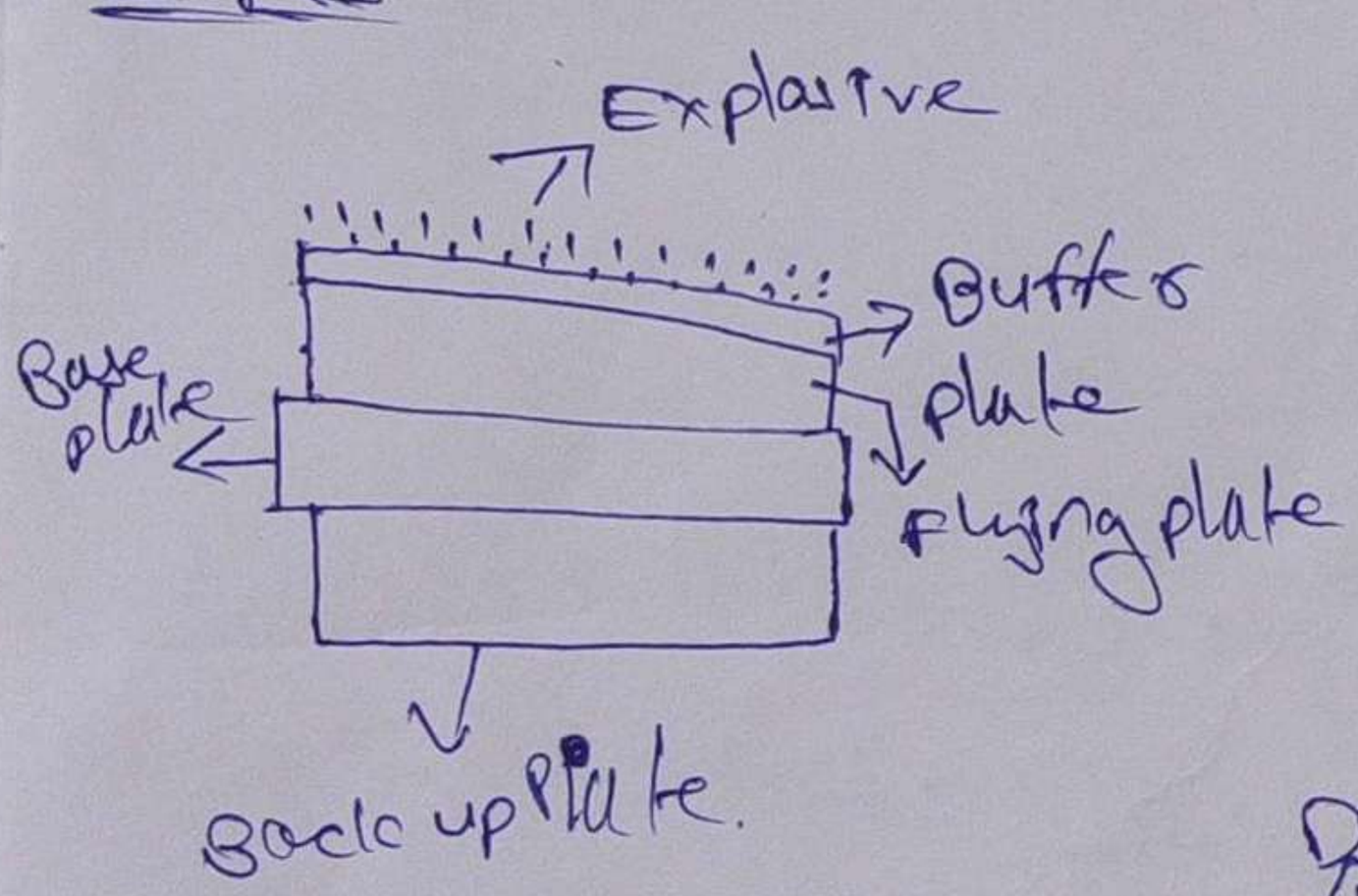
Step-1

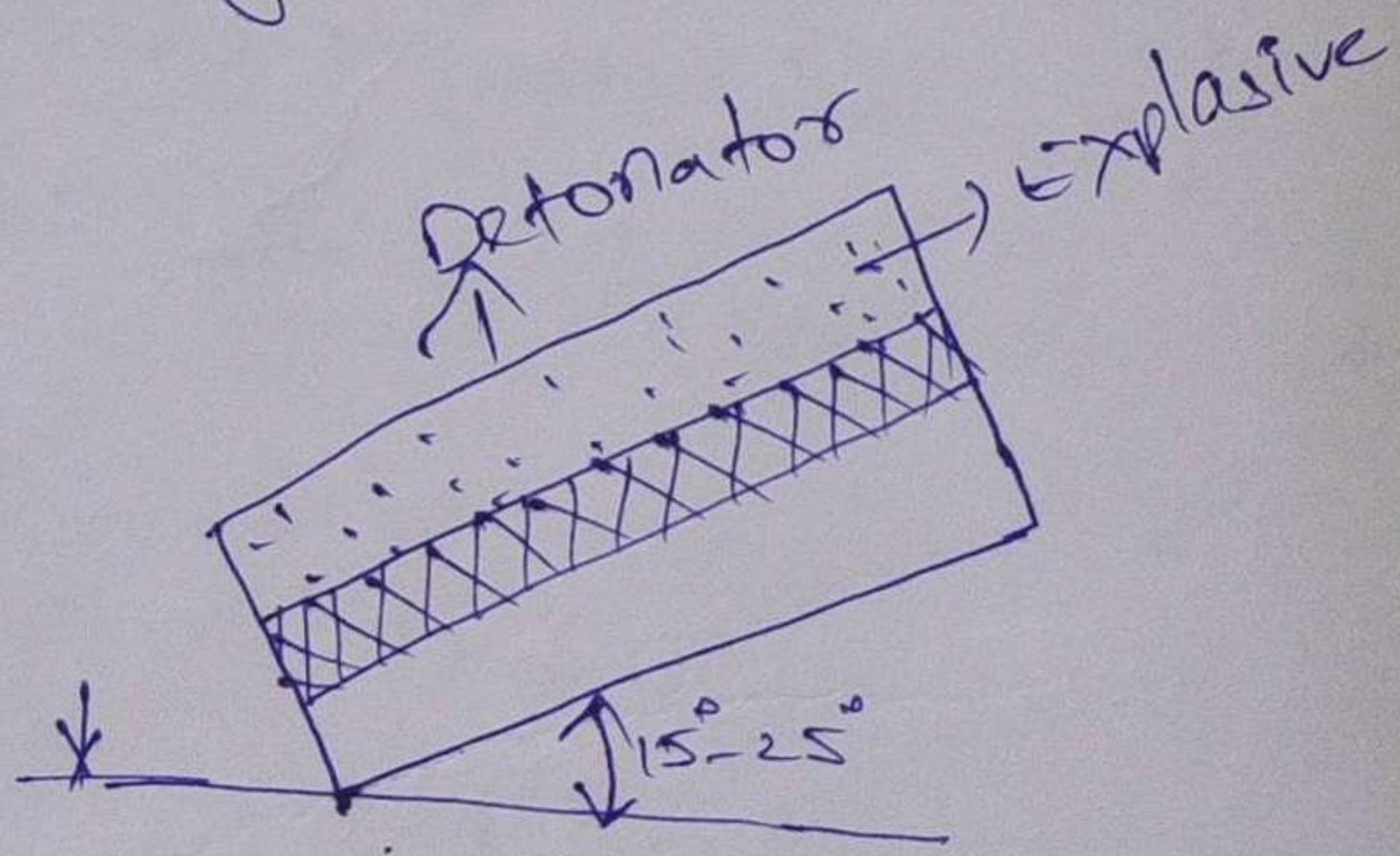


Step-2

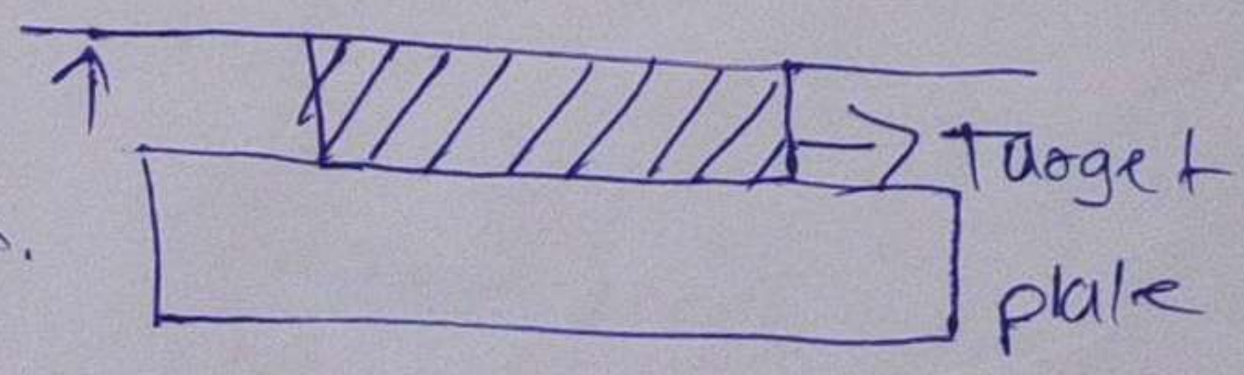


Step-3





$\frac{1}{4}$ to $\frac{1}{2}$ of the flyer.



thickness.

Explosion welding is a solid state welding process in which the welding occurs without application of external heat

No additional filler material. This welding takes place without formation of plastic state.

It is used for to joint large surface area of dissimilar material which can't be weld by other welding process.

Step:1 :- Take the similar or dissimilar metals to start the welding.

Step:2 :- After selection of similar and dissimilar metal (plate) clean without dust or grease.

Step:3 :- we have to distribute (or) put

Step:4 :- Arrange the back up plate and base metal buffer plate in 15-25° angle.

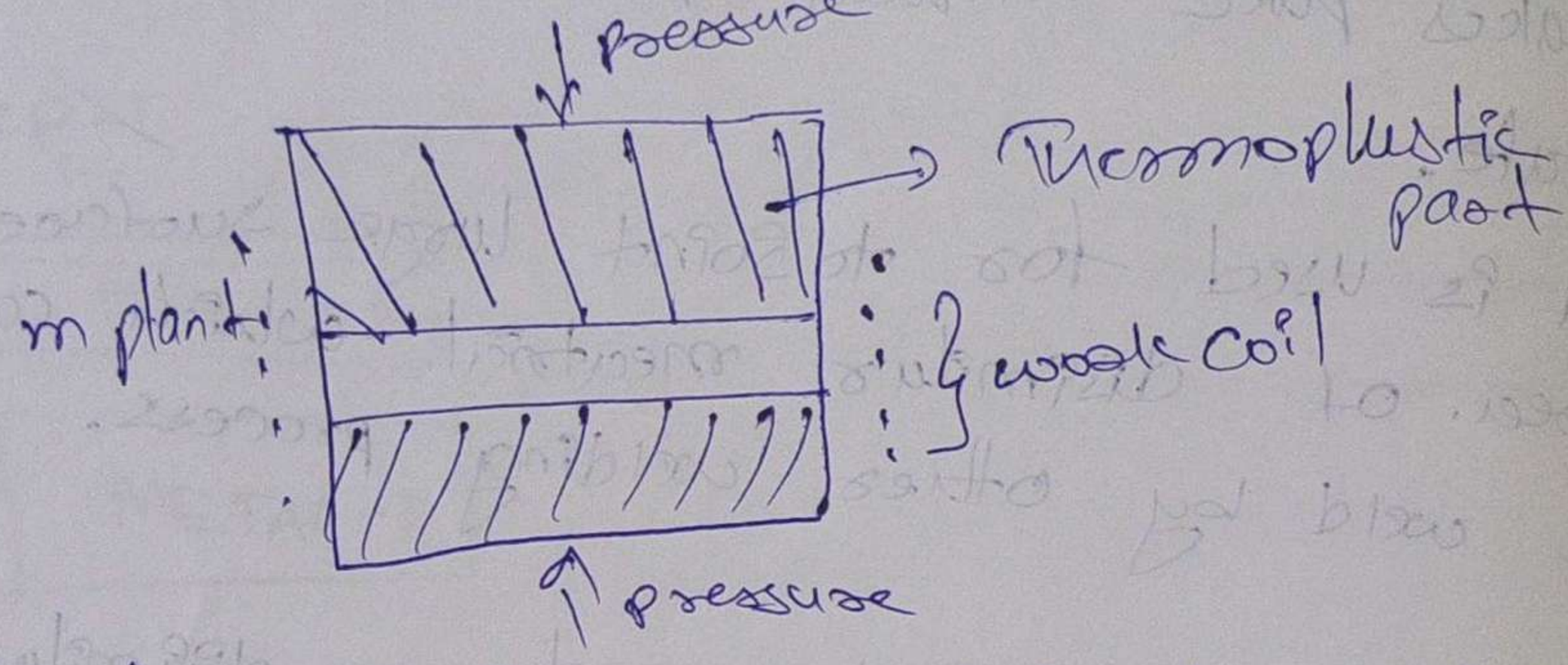
Step5 :- The thickness of the plates $\frac{1}{4}$ to $\frac{1}{2}$ of the flyer. Base of Target plate.

* Step6 :- The cemical name is RDX (Risearch department explosive.

* Step 7 :- TNT (Trinitro toline)

→ PETN - Pentaerythritol tetranitrate.

INDUCTION-WELDING.



Induction welding can be defined as fit heating from radio frequency alternating current (AC) to magnetically exite and implant placed at the joint inter phase of the two parts being welded.

~~Discription:~~ (or)

Induction welding is type of welding that ~~process~~ fuses two or more metals using resist to heat caused by chaining electro magnetic field or induction.

step 1:- select the similar or dissimilar metal to start the welding.

step 2:- check to clean

Disadvantages

1.

2. water cooling to be provided (medium projects)

applications

1. Aerospaces
2. Marine
3. Automotive (or) Automobile.
4. military

Advantages: Explosion-welding

1. welding large sheets together
2. welding similar and dissimilar metals
3. Dosnot effects the property of the material.
4. welding large. varity of metals
5. It is easy to maintain
6. It is easy to compact and potable

Disadvantages:

1. It produce very much Noise while explossive
2. It can bend rolling the time and tuff materials.
3. Ductility of the material is welded to be limited.

Applications:

1. To join large surface of metals
2. cladding one to another.
3. plugging heat exchanger.
4. Joint various electric connectors
5. It can join Alluminum to stainless steel.

cold working process the metal are given desire shape by subjecting them more forces than hard working process.

Because in cold working the metals are not deformed permanently still the elastic limit is exceeded. It results increased strength and hardness of metal below the recrystallization temperature.

Advantages:

* It can be used for most of the metals. Because it give the more strength and hardness it give
* It give the improved surface and close dimensional.

Limittations:

* The crown structure is not refined and residual stresses have harmfull effects on current mechanical properties of the metal.

many of the metals having less ductility example:- carbon steel, certain Alloy steels.

Applications:-

* Auto mobiles * Aviation
* Iron and steel.
* Ductile metals.
*

Hot working:- The metal are given desire shape in hot working process by subjecting them to undergo plastic deformation while above the recrystallization temperature.

The recrystallization temperature is 400 to 600 °C

Advantages:-

* It is rapid and economical process
* The power required to finish the part from ingot is very less.
(Ingot = Impurities (ingots))
*

Limitations:- * cooling and handling cost are very high
*

Applications:-

* extrusion
* hot drawing
* forging.
* extrusion.

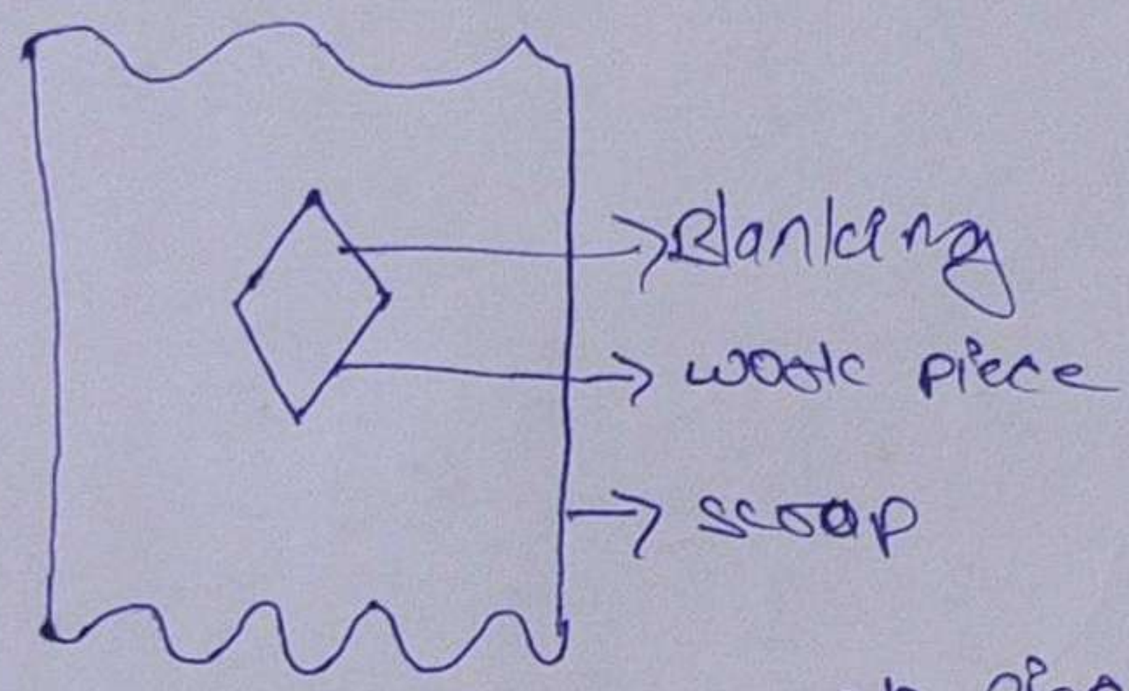
Cold working	Hot working
1. Below recrystallization temp	1. Above recrystallization temp
2. Increases strength but decreases ductility and corrosion resistance	2. Allow for large deformation
3. Better control of dimensions	3. less energy required than cold working
4. Better surface finish	4. May result in surface oxidation
5. Material is not uniform after this working	5. Material is uniform throughout
6. There is more risk of cracks	6. There is less chance of cracks
7. Decreases mechanical properties	7. It increases mechanical properties
8. Internal residual stresses are produced	8. Internal residual stresses are not produced
9. Doesn't required pickling	9. Heavy occurs during Hot working so pickling is required to remove oxide.

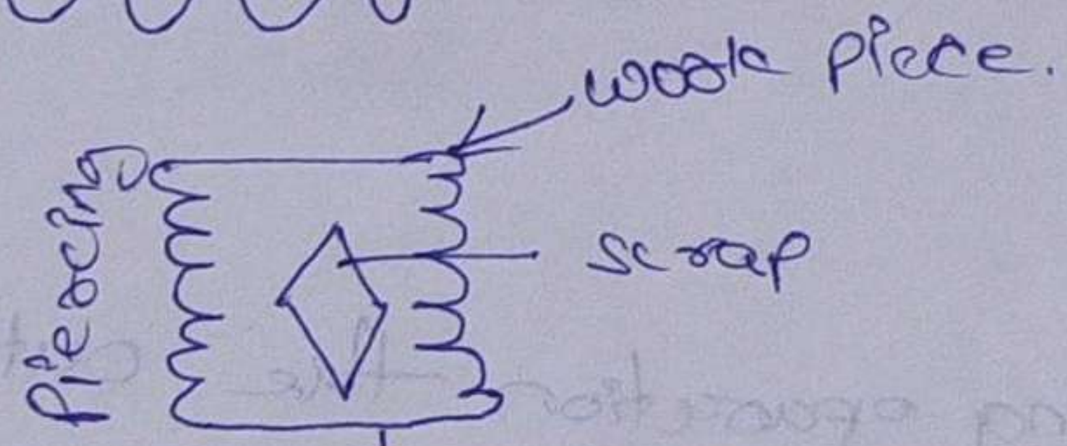
BLANKING: It is a process in which the punch removes in position of material from a stock (sheet metal

ii. The removed position is called blank or

the process is known as blanking process.

BLANKING





Piercing can be defined as a process to use to produce holes in a work piece.
Here the removed portion is called scrap

Discription:

Blanking piercing are shearing process in which a punch and die are used to modify sheet metal.

→ The tooling and process are same for both (blanking piercing) only terminagy is different.

→ In Blanking the punched out piece is used as Blanking

→ In piercing the punched out piece is scrap

Welding processes

- Pressure welding
  - Heat created by
    - Black smith fire
      - forge welding
        1. lap welding
        2. Butt welding
    - Electric current
      - Resistance welding
        1. spot welding
        2. seam welding
        3. projection welding
    - chemical reaction
      - Thermal welding pressure
- fusion welding
  - Heat created by
    - Brazes
      1. oxy. acetylene welding
      2. oxyhydrogen
      3. Ar. Acetylene
      4. Air - propane
    - Electric Arc
      1. metal arc welding
      2. carbon Arc welding
      3. Tungston arc welding
      4. Argon arc "
      5. submerge Arc "
      6. Atomic Hydrogen "
    - chemical Reaction welding