

# MATERIALS USED IN WOOD WORKING

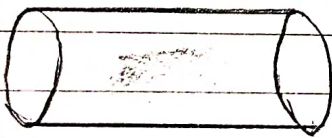
## 1. Timber (Wood)

» These are wood obtained from exogeneous trees (trees growing in outward direction) & preferably are used for different purposes of support construction & decorative materials.

Types :

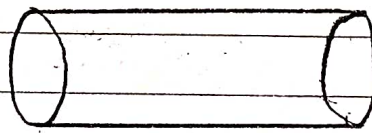
(i) Exogeneous  $\rightarrow$  Growing in outward ( $\rightarrow$ )  
ex Coniferous & deciduous type like Teak, Mango, Shisham, Pipal, Neem etc.

(ii) Endogenous  $\rightarrow$  Growing in inward ( $\leftarrow$ )  
ex Pine tree

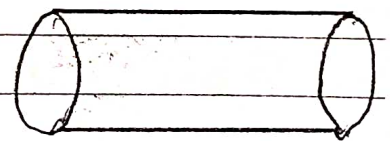


Completely Dry

X



Partially Dry



Completely wet.

X

Advantages : There are large no. of Advantages of using timber. Some of the advantages are listed below :-

(i) It is light in weight as compared to metals & metal object.

② It can be transform into any shape of desired choice with ease.

③ It is Cheap & easily available

④ It can be transported easily from one place to another.

⑤ Have hardness & Durability & is long lasting.

⑥ It easily response to paint & polishes when required.

⑦ It is good for machinability i.e procurement of nails & use of machines is done in an easy manner.

⑧ It can be used for building support, equipments or products.

⑨ It is used to make windows, chairs, tables etc (Household products) of wood.

⑩ It can be used as medicinal purposes.

⑪ It is good in appearance as compared to metals & other products.

⑫ It has low maintainance cost.

⑬ It can be used for making decorative items for home & Commercial purposes.

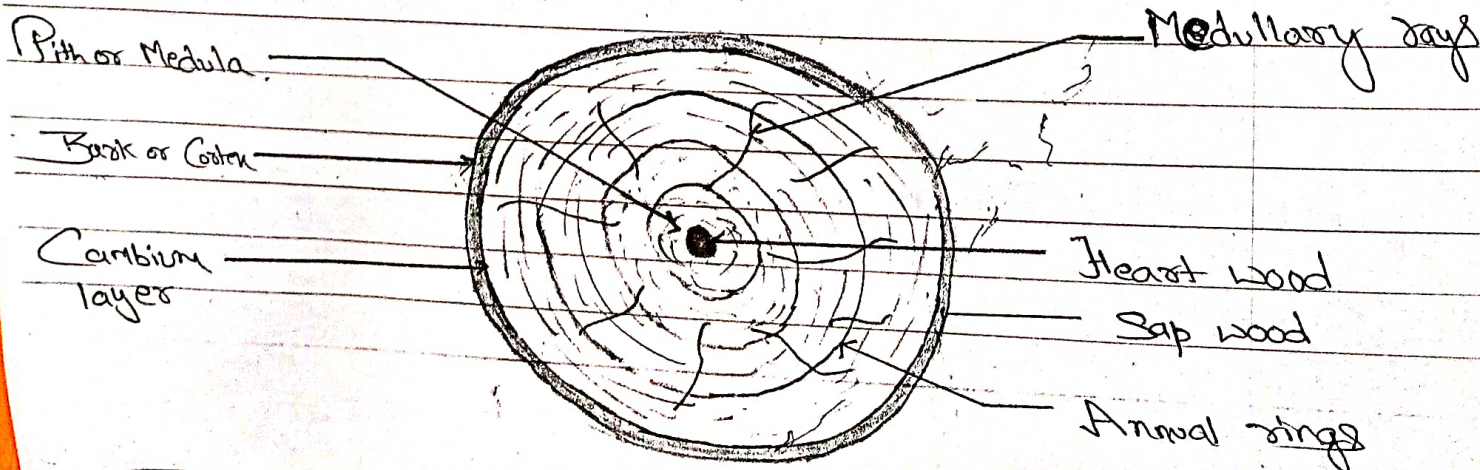
⑭ It can be used as fuel for burning.

⑮ It is less toxic & chemical free as compared to metals.

⑯ It can be used as supportive structures.

⑰ It can be used for transforming sheets of metals such as gold & silver.

### Structure of Timber





## Disadvantage of Timber

- ① It is a natural material and may shrink or swell as it has the ability to absorb water.
- ② It left exposed to water rot can lead to loss of quality.
- ③ It is subjected to risk of fire.
- ④ It requires careful regular maintenance.
- ⑤ It is unsuitable due to durability issues.
- ⑥ It is likely to crack, warp, bend & decay, if not properly seasoned and not treated with the preservatives.

Q.1. Difference between soft wood & hard wood.

Q.2. Discuss in detail & with

- ① Natural or Air Seasoning.
- ② Water Seasoning.
- ③ Artificial or fire seasoning / kiln seasoning.

## Welding & Allied processes:

1. Difference between soft wood & hard wood.

Ans ⇒ <sup>①</sup> Hardwood originates from deciduous trees like oak, Teak, Mahogany.  
While softwood, originates from evergreen trees like pine, spruce, fir.

② Hardwood is more expensive,  
While softwood is less expensive.

(iii) Hardwood density is typically harder (not always), while softwood density is usually softer (not always).

(iv) Hardwood is generally dark in colour, while softwood is almost always light in colour.

(v) Hardwood is lower sap in structure, while softwood is higher sap in structure.

(vi) Hardwood grain is close, while softwood grain is loose.

(vii) Hardwood is good fire resistance, while softwood is poor.

(viii) Hardwood is heavy in weight, while softwood is light in weight.

## Structure of Timber in detail

1. Pith or Medulla :- The innermost central portion that contains entire cellular tissue.

2. Heart Wood :- The annual rings that surround the pith. This portion is dark in colour & it does not take part in the growth of a tree.



3. Sapwood :- The few outer annual rings are called Sapwood. This portion of the tree is active in growth.

4. Cambium layer :- The thin layer between the bark and Sapwood is termed as Cambium layer.

5. Medullary Rays :- These are vertical layers of cellular tissue and are thin radial lines from Pith to the Cambium layer. They keep the annual rings tightly gripped together.

6. Bark or Cortex :- It is the outermost cover or skin of the tree. It is further divided into the inner bark & outer bark. The layer covering the Cambium layer is called inner bark. The outer skin which is the protective layer of the tree is called bark or Cortex.

7. Annual Rings :- The layer of wood produced by a year's growth of a woody plant.

### Welding

Welding is a fabrication process whereby two or more parts are fused together by means of heat, pressure, or both forming a joint as the parts cool. Welding is usually used on metals and thermoplastics but can also be used on wood.

Casting : In casting process, metal is melted & then poured as a liquid into a prepared mold.

~~Joining of steel.~~

# Seasoning of Timber

Seasoning of timber is the process by which Moisture Content in the timber is reduced to required level. By reducing moisture content, the strength, elasticity and durability properties are developed. A well-seasoned timber has 15% moisture content in it.

## Methods of Seasoning of timber :-

There are two methods of seasoning of timber which are given below :

- ① Natural Seasoning
- ② Artificial Seasoning

### 1. Natural Seasoning of Timber

Natural seasoning is the process in which timber is seasoned by subjecting it to the natural elements such as air or water. It may be water seasoning or air seasoning.

\* Water Seasoning : It is the process in which timber is immersed in water flow which helps to remove the sap present in the timber. It will take 2 to 4 weeks of time & after that the timber is allowed to dry. Well-seasoned timber is ready to use.

\* Air Seasoning : In the process of air seasoning timber logs are arranged in layers in a sheet shed. The arrangement is done by maintaining some gap with the ground. So, platform is built on ground at 300 mm height from ground. The logs are arranged in such a way that air is circulated freely between logs.



By the movement of air, the moisture content in timber slowly reduces and seasoning occurs. Even though it is a slow process it will produce well-seasoned timber.

## 2. Artificial Seasoning of Timber

Natural seasoning gives good results but takes more time.

So, artificial seasoning of timber is developed nowadays.

By artificial seasoning, timber is seasoned within 4-5 days.

There are also different methods of artificial seasoning and they are as follows.

- Seasoning by Boiling
- Chemical Seasoning
- Klin Seasoning
- Electrical Seasoning

(a) Seasoning by Boiling : Seasoning of timber is also achieved by boiling it in water for 3 to 4 hours. After boiling timber is allowed to dry. For large quantity of timber ~~is~~ boiling is difficult so, sometimes hot steam is passed through timber logs in an enclosed room. It also gives good results. The boiling or steaming process develops the strength & elasticity of timber but economically it is of higher cost.

(b) Chemical Seasoning : In this process, timber is stored in a suitable salt solution for some time. The salt solution used has the tendency to absorb water from the timber. So, the moisture content is removed & then timber is allowed to dry. It affects the strength of the timber.

© Kiln Seasoning : In this method timber is subjected to hot air tight chamber. The hot air circulates in between the timber logs & reduces the moisture content. The temperature inside the chamber is raised with the help of heating coils. When the required temperature is obtained moisture content & relative humidity gets reduce & timber gets seasoned. Even though it is costly process it will give good results strength wise.

Ⓓ Electrical Seasoning : In this method of electrical seasoning timber is subjected to high frequency alternating currents. The resistance of timber against electricity is measured at every interval of time. When the required resistance is reached seasoning process is stopped because resistance of timber increases by reducing moisture content in it. It is also called as rapid seasoning and it is uneconomical.

## Welding and allied process

Welding → The process of joining two metals similar or dissimilar through fusion process without the use of adhesives (आधार एवं ई) is known as welding. It is an oldest method which is used to provide maximum strength, rigidity, toughness to a particular metal (similar or dissimilar).

The metals so welded if it is similar metal will procure (inherit) the same properties, if the metal is dissimilar will procure both properties of two metals welded together.



## Concept of Weld :-

Every particular object which can either be welded or casted has a particular concept or idea which need to be fulfilled. The welding procedures for different types of welding can differ from metal to metal but at the same time will conclude to one particular area i.e. either to join, to cut or to melt.

## Types of Welding :-

There are a large no. of welding procedures some of them which are almost at most important are as under :-

- (i) Electric arc welding
- (ii) Forge welding
- (iii) Spot welding
- (iv) Gas welding
- (v) Atomic hydrogen welding
- (vi) Inert arc welding
  - TIG Welding (Tungsten inert gas)
  - MIG Welding (Metal inert gas)

### 1. Electric arc welding :-

It is also known as fusion welding in this type of welding we use various components such as DC generator or rectifier, two conductors of electricity (Anode & Cathode), two electric cables - one connect to electrode holder & other connect to gripper.

It firstly, it melts the heat the working piece & then it will fuse two working piece, two similar or dissimilar metals joint by melting the welding position. & then it will convert into a solid.

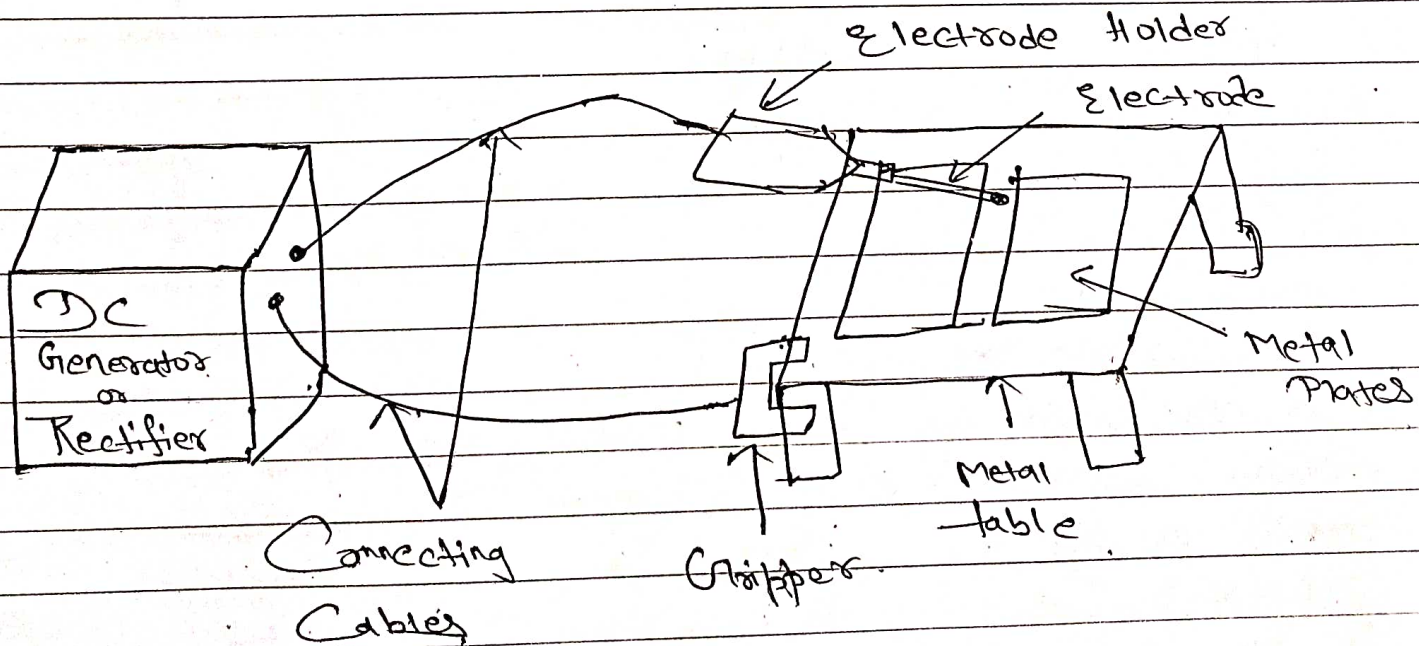
## Advantages :

- ① It is suitable for high speed welds
- ② It is a simple welding apparatus.
- ③ It can work on AC or DC.
- ④ Superior temperatures
- ⑤ Less smokes or sparks are involved.
- ⑥ It is fast welding process as compared to others.
- ⑦ It offers strong joints

## Disadvantages :

- ① Require skilled welders
- ② Cannot be used for reactive metals like Al or Ti
- ③ Not suitable for welding thin metals
- ④

## Diagram





## 2. Forge Welding:

It is the oldest type of welding, in this metals will be heated in a furnace to the red hot level & then hammering them together on the anvil through hammer to form a welded joint. It is also called Smithy welding. It is used to join steels or iron, gates, prison cells etc, used to weld weapons like sword, shotgun barrels etc.

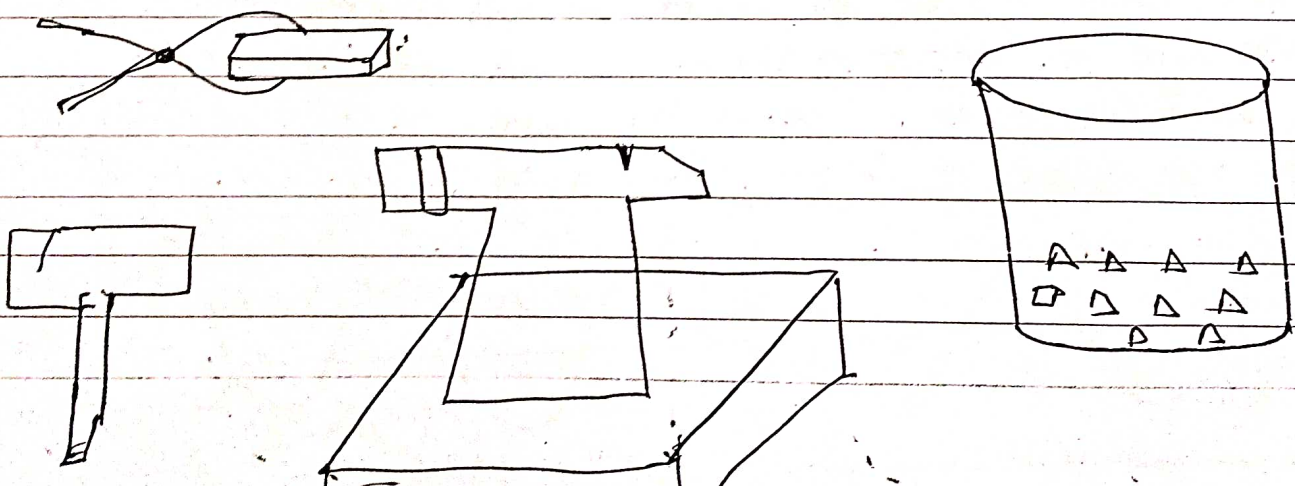
### Advantages:

- ① It is simply and easy.
- ② It does not require any costly equipment for weld small pieces.
- ③ It can use both similar or dissimilar metals.
- ④ No filler material required.

### Disadvantages:

- ① It is slow welding process.
- ② High skills required because excessive hammering can damage the welding plates.
- ③ High welding defects involve.
- ④ It cannot use as a mass production.

### Diagram:



### 3. Spot Welding :

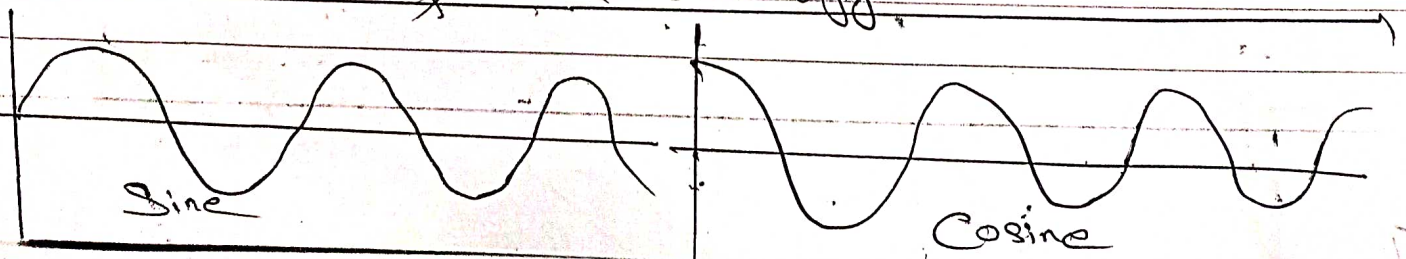
In Spot Welding procedure, the machine has two jaws upper & lower - the upper jaw is movable & the lower jaw is fixed, which are connected by a foot paddle. The spot welding process is basically used to weld sheets with the help of sine waves i.e. the sheets to be welded are put in the line of action of the two jaws which generate high current and tremendous rise in temperature. Due to the high available current & low voltage the sheets are welded together at particular points, it is a type of permanent weld which then need not be separated apart through external pressure applied to it.

#### Advantages :

- ① It does not require any filler metals & gases for joining the metal piece
- ② It does not require any high skilled labours
- ③ Simple operation & fast welding process
- ④ The power required to operate is low & no life risking.
- ⑤ Can be used for heavy production purposes

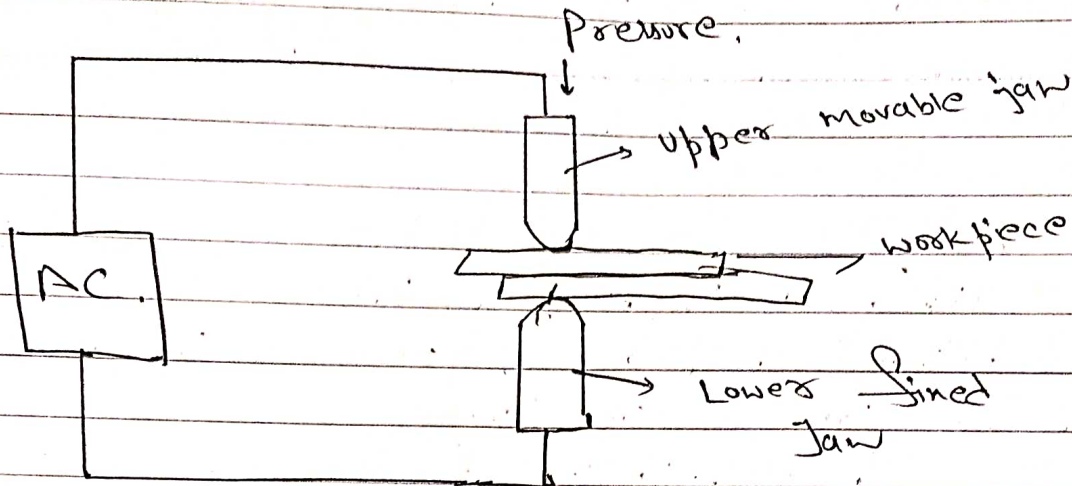
#### Disadvantages :

- ① It cannot be used to weld the thick workpieces.
- ② Cannot use the coolants in other welding process as we do
- ③ The weld will be broken or fail if the permissible pressure on the work piece is not achieved.
- ④ If the pressure or current is overflow then the weld spot will appear black and ugly.





## Diagram :



## 4. Gas Welding :

It is also called oxygen Acetylene welding, it is a type of welding in which fuel gas burn to generate heat. i.e. acetylene gas with oxygen produce heat to weld or melt the object. Object will be melt due to high temperature.

For Cutting  $\rightarrow$  Plasma Cutter.

for welding  $\rightarrow$  Gas Welding.

$\rightarrow$  The temperature of the gas can be controlled, at  
 $\rightarrow$  at the time of cutting, the flame is straight at a particular line.

Temperature =  $2000 - 2300^{\circ}\text{C}$

burn  $\rightarrow 10^{\circ}\text{C}$

Coolant gas  $\rightarrow$  Acetylene

## Advantages :

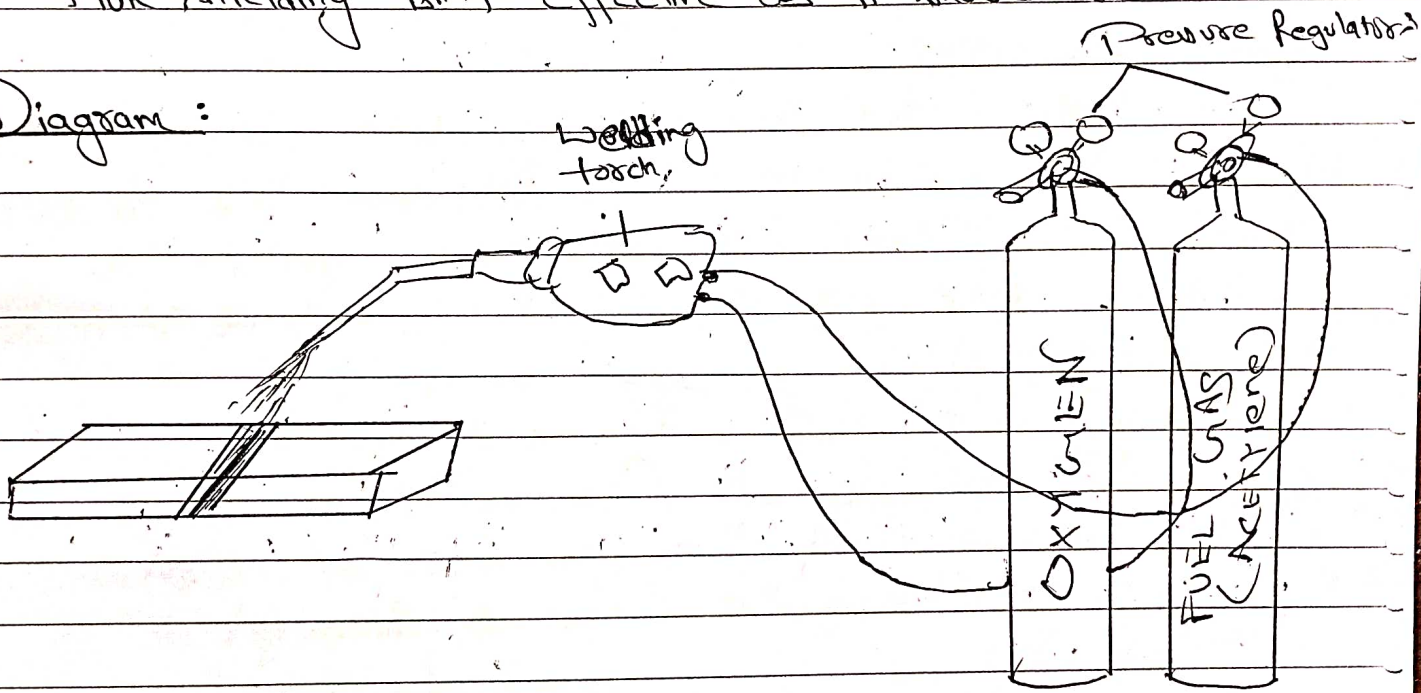
- ① It may be used to link a variety of metals.
- ② It does not need electricity.
- ③ Improved temperature control.
- ④ Greater control over the ~~temperature~~ <sup>rate</sup> of the filler metal deposition.

- ⑤ Low Cost equipment
- ⑥ Does not need specialist / Professional labor
- ⑦ Gas welding equipment is extremely portable.

### ① Disadvantages :

- ① Slow heating rate
- ② Not appropriate for heavy sections
- ③ Incompatible with refractory and reactive metals.
- ④ Lower Gas flame working temperature.
- ⑤ Increased heat affected area.
- ⑥ Issues with Gas storage & handling.
- ⑦ Flux shielding isn't effective as it should be.

### Diagram :



### 5. Atomic hydrogen welding :

It is an arc welding process that uses an arc between two non consumable tungsten electrodes in a shielding atmosphere of hydrogen. The electric arc efficiently breaks up the hydrogen molecules, which later recombine with tremendous release of heat, reaching temperatures from  $3400$  to  $4000^{\circ}\text{C}$ . Without an arc, an oxyhydrogen torch can only reach  $2800^{\circ}\text{C}$ .



In atomic hydrogen welding, filler metal may or may not be used, in this process, the arc is maintained entirely independent of the work or parts being welded. It is used in launching rocket.

### Advantages :

- ① It is used to weld quite thick sections.
- ② It gives strong, ductile & sound welds.
- ③ It can be used for materials which are too thin for gas welding.
- ④ The arc & the weld zone are surrounded by burning hydrogen which protects them from atmospheric contamination.
- ⑤ The tungsten electrodes remain cool because of the flow of the hydrogen gas, it increases the life of the electrodes.

### Disadvantages :

- ① It is expensive than the other types.
- ② It requires skilled operator.
- ③ It can be used in flat position only.
- ④ As the hydrogen is highly inflammable, hence this process is riskier.

### 6. Tinnest Arc Welding :