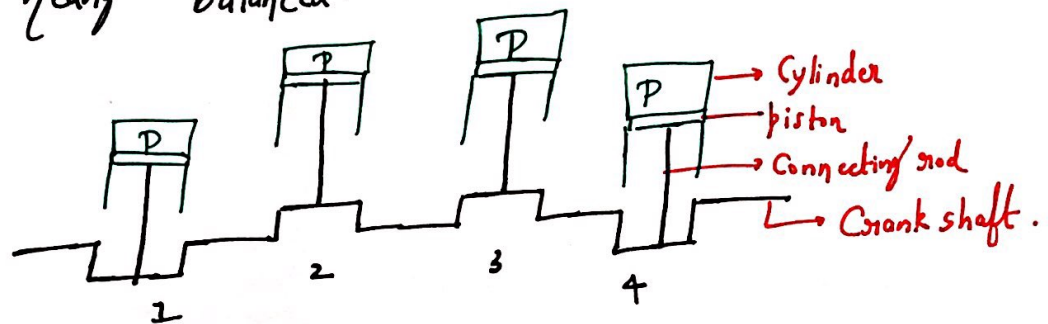


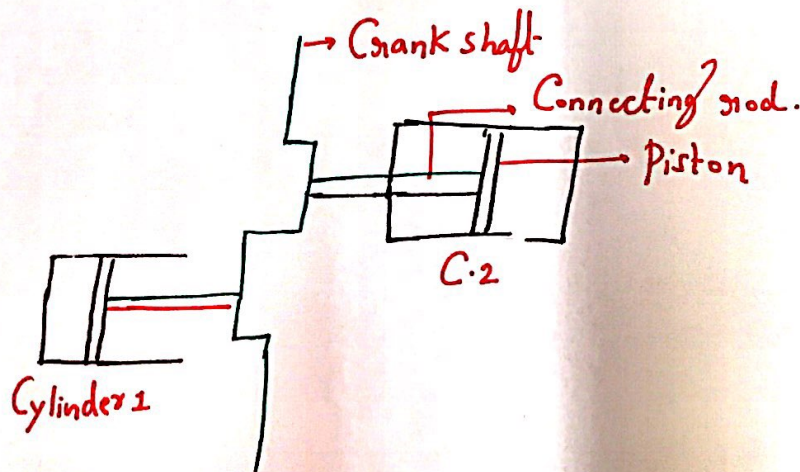
Automotive Engineering.  
IAT-1 solution (March-18).

1a). Types of Cylinder arrangement.

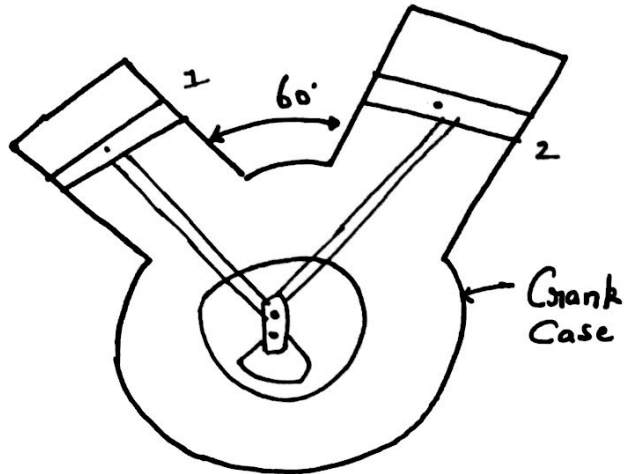
① In line arrangement:- Cylinders are placed side by side vertically with a common crank shaft. reciprocating forces are nearly balanced.



(2). Opposed Cylinder type:- Cylinders are arranged horizontally opposite to each other. 2 Cylinders are not in line. the forces in Connecting rod produces a rocking Couple.



### (3) V-engine.



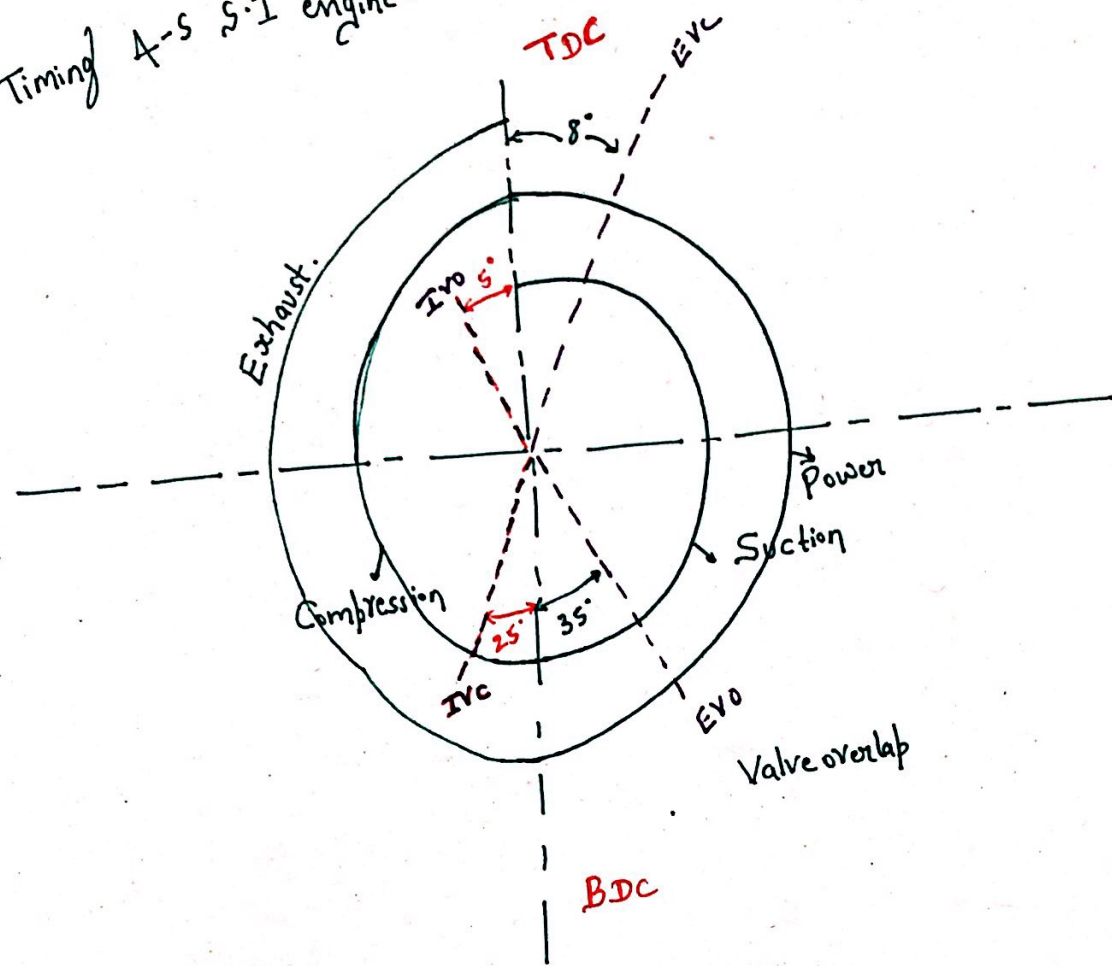
2, 2 Cylinders

- > Cylinders are placed at  $60^\circ$
- > More smooth & rigid @ high speeds
- > Cylinders have common crankshaft and crank case.

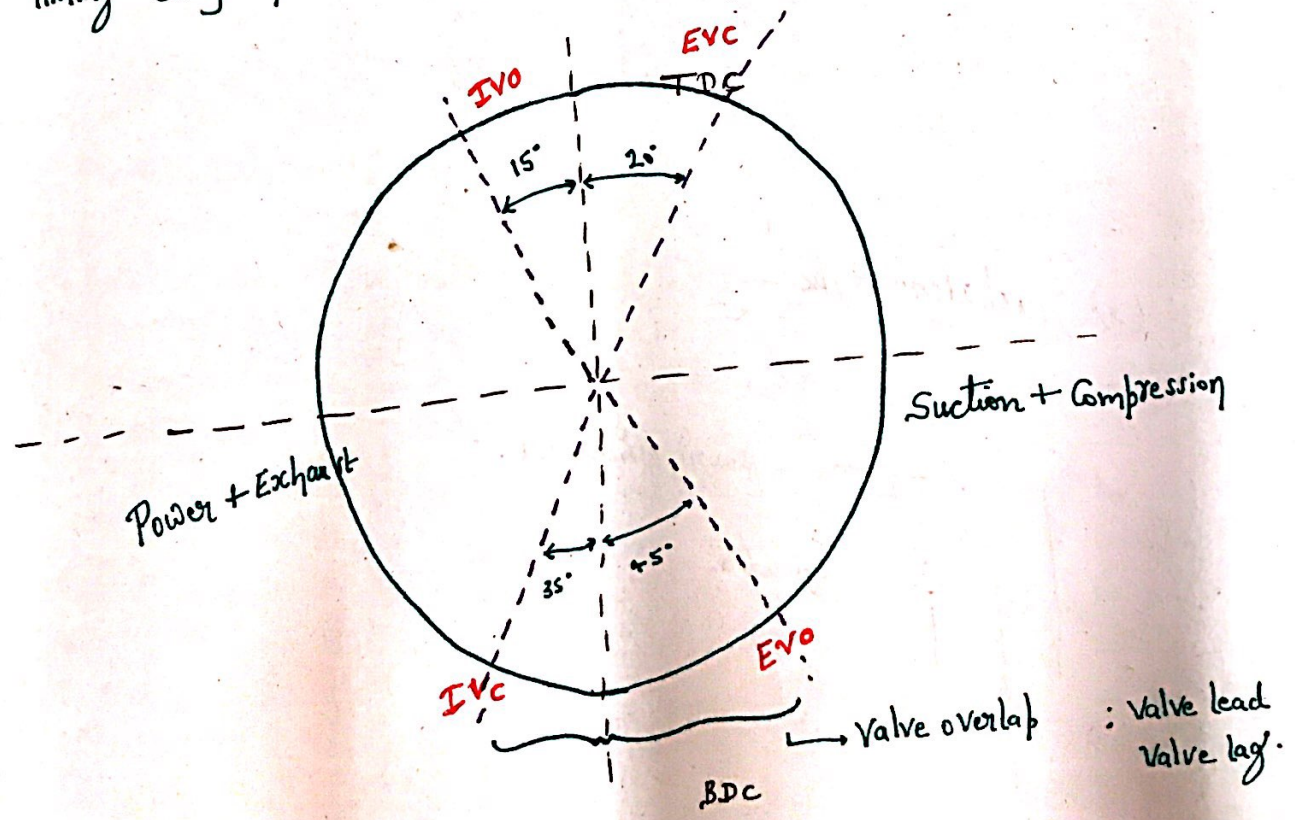
### > b) Lubrication System:-

- > Petro oil or Mist lubrication:- In this method lubricating oil is directly mixed with petrol about 30ml for 1000ml of petrol.
- > If more oil is added it may cause more carbon deposition in cylinder head with poor emission. This is used in 2-stroke engines.

2A) Valve Timing 4-s S-I engine.



→ Valve Timing diagram for 2-s petrol/SI Engine:-





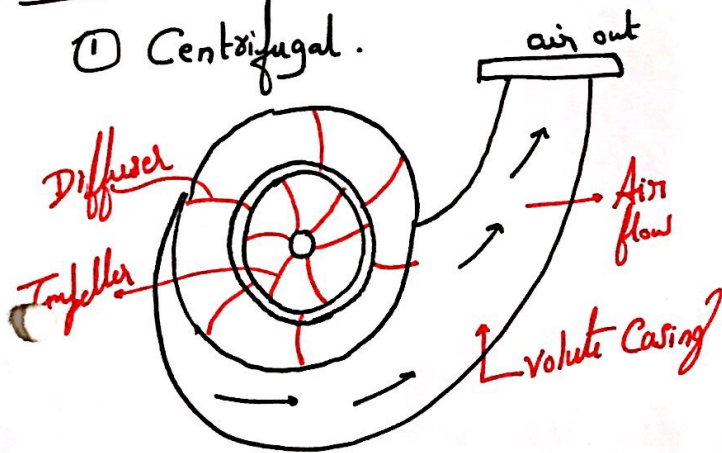
### 3). Supercharging:-

- > Is a process of increasing power output in a engine by supplying high pressured air during Combustion.
- > Increases Volumetric Efficiency of engine; Increases air density
- > Supercharging also called boosting.

- > Objectives:-
  - > mainly to Induce more air into Cylinder per unit time.
  - > To obtain better Engine performance
  - > Compensates for loss of Power @ high altitudes for aircraft engine.

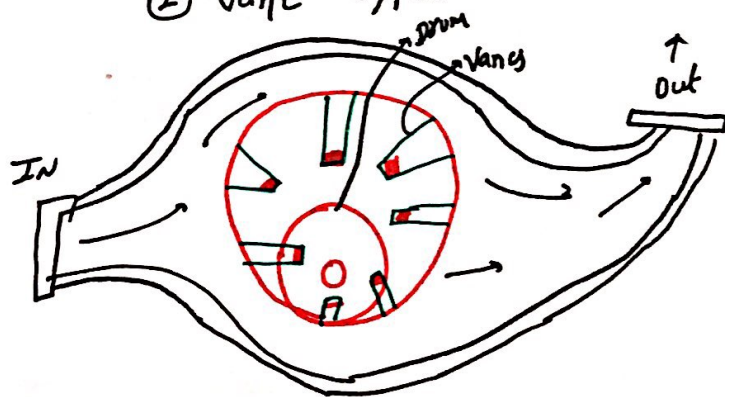
#### 2 Types:-

##### ① Centrifugal.



- > Impeller rotates about 80,000 rpm air enters axially.
- > air gets trapped in diffuser thereby reducing volume; Increasing pressure.

##### ② Vane type:-



- > positive displacement rotary type supercharger
- > Drum rotates eccentrically Compresses the air increasing pressure, reducing volume.

#### 4) Main Components of IC Engine:-

- > Cylinder
- > piston
- > Connecting rod
- > Valves.
- > Crank shaft

> **Cylinder:-** The heart of an engine. where piston reciprocates. Inside cylinder power is developed. Generally Cast Iron is used for manufacturing cylinder.

> **Piston:-** Is the reciprocating part inside cylinder. Converts combustion pressure in cylinder to force on crank shaft. diameter is slightly lesser than cylinder the space is called clearance.

> Aluminium Alloys are used for manufacturing piston.

> **Connecting rod:-**

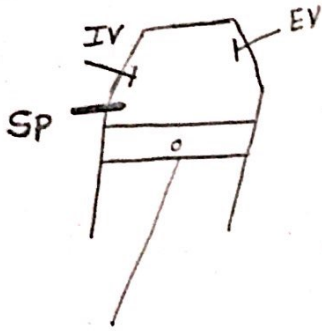
Connects Piston and Crank shaft.

It converts reciprocating motion of piston to rotational motion of crank shaft.

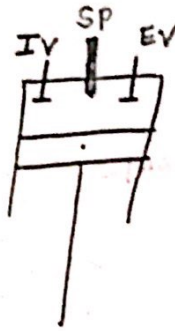
> Made by drop forging of steels.

6(a) Combustion Chambers in S.I Engines:-

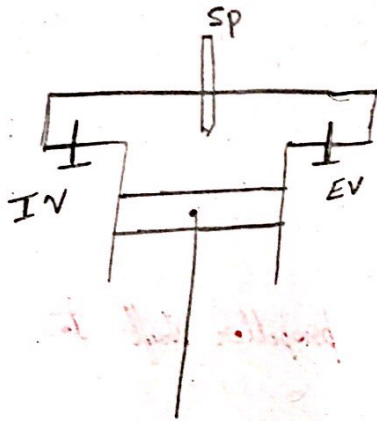
(1) Spherical shape.



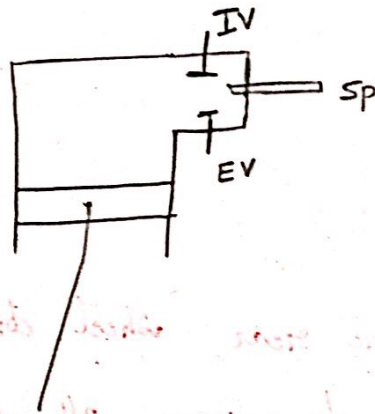
(2) I - shaped.



(3) T-shaped

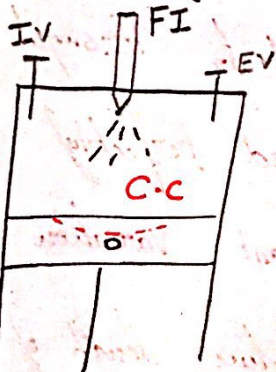


(4) F-shaped.

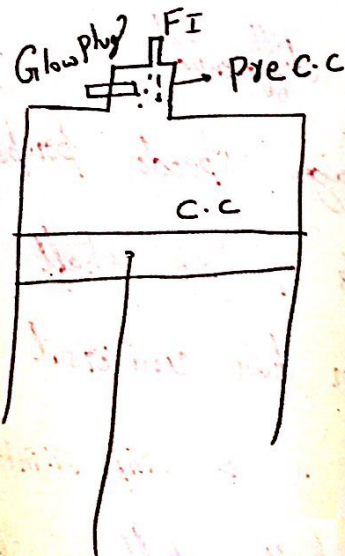


Combustion Chambers in C.I Engines:-

Open Combustion Chamber

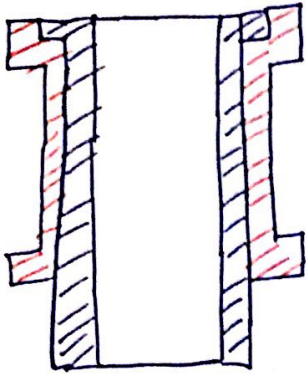


pre-Combustion Chamber



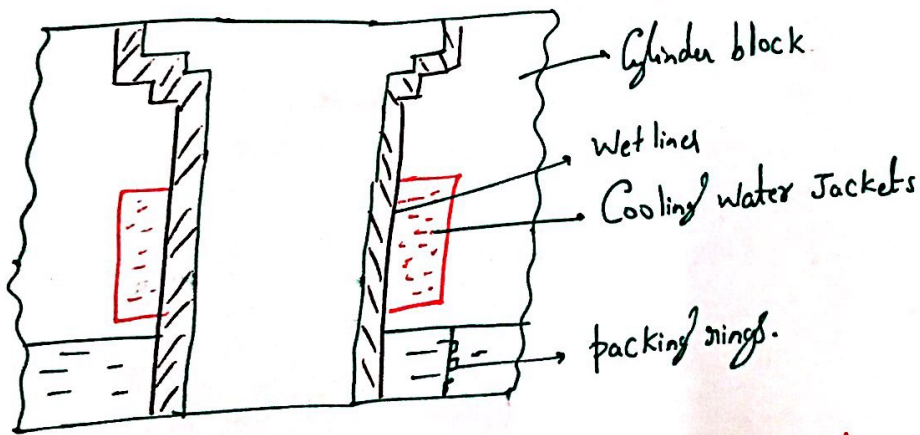


## 6(b). Dry liners:-



- > provides a leak proof joint.
- > These liners are made in form of a barrel
- > outer surface of liner makes contact with cylinder bore.

## Wet liners:-

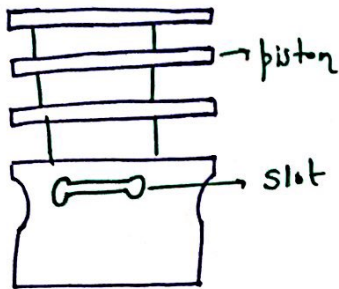


- > liner has cooling water jackets outside.
- > A flange is provided at top to fit inside cylinder groove.
- > Made from Aluminium.

7(a)

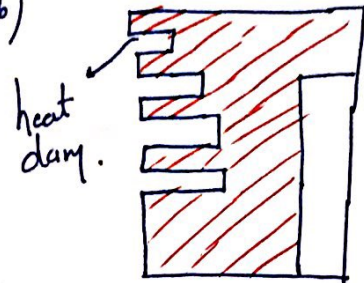
2 Types of Piston design to keep heat away.

(a)



(a) horizontal slot

(b)



(b) Heat dam.

7(b).

The use of Aluminium Alloy piston with Cast Iron has a draw back of piston slap. So control of piston slap is by following methods.

- (a) Cutting horizontal slot
- (b) T-slot @ top
- (c) providing heat dam.