

25 - Aug - 2022

1. An Automobile is a wheel vehicle carrying its own motive power.

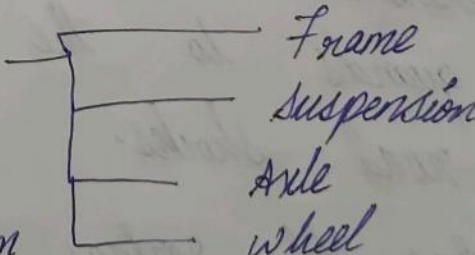
### History

World first three-wheeled automobile with otto cycle petrol engine was built Karl Benz of Germany in 1885.

In 1883 Karl Benz introduced accelerator - Speed regulation battery ignition system, spark plug, clutch, gear shift, radiator for cooling, engine

First four wheeled automobile was introduced by Karl Benz in 1883

### Components of Automobile

1. The basic structure
  2. The power unit
  3. The transmission system
  4. The Auxiliaries
  5. The control
  6. The super structure
- 
- Frame
  - Suspension
  - Axle
  - wheel

## Frame

2 types of frames

1. Conventional system
2. Composite frame

In conventional system all parts of automobiles like engine, gear box etc connected to the frame.

Frameless construction

## Suspension system

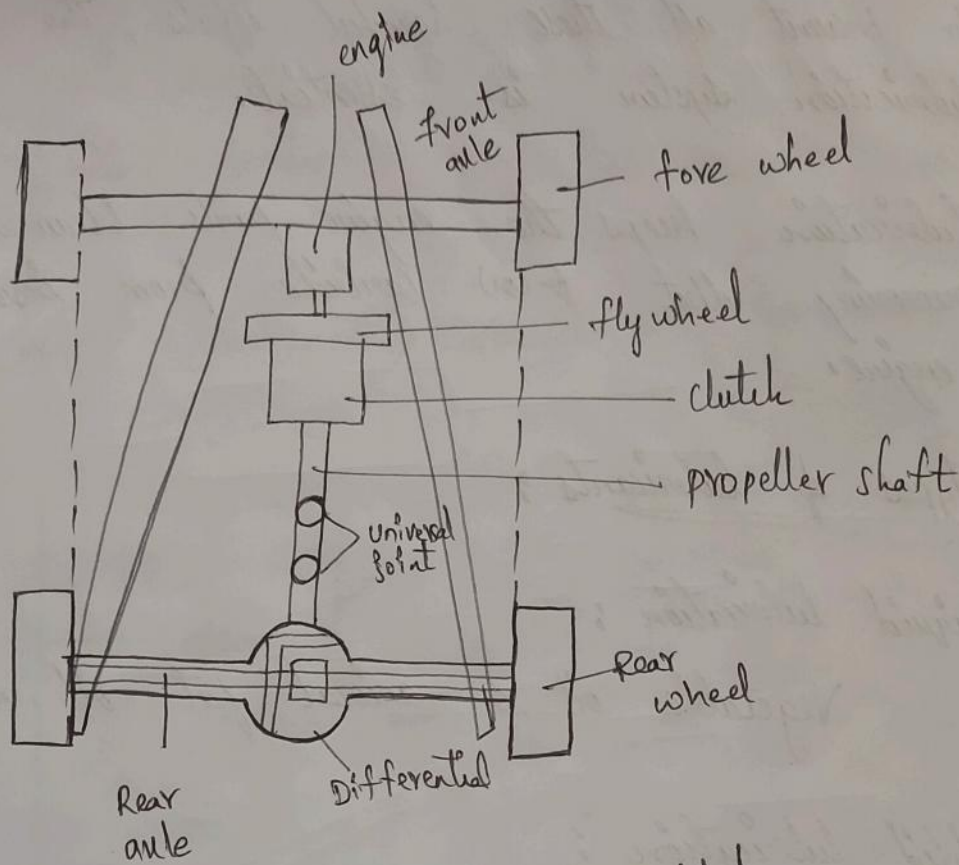
The object of suspensions are

1. To prevent the road shocks from the transmitted to the vehicle to save guards to the occupiers from the road shocks.

Ex: coil springs, torsion rods, leaf spring



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clutch  
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Internal combustion engines are made up to many moving parts.

Due to continuous movement of two metallic surface over each other, there is continuous wearing of moving parts generation of heat and loss of power in engine.

To prevent all these harmful effects, the lubrication system is essential.

Lubrication keeps the engine parts clean by removing dirt & (or) carbide from inside engine.

Types of lubricants:

Liquid lubrication:

Vegetable oil & animal fat oil, mineral oil

Solid lubrication:

Graphite, talc powder, uses in NPP, mica

Semi solid lubrication: Grease

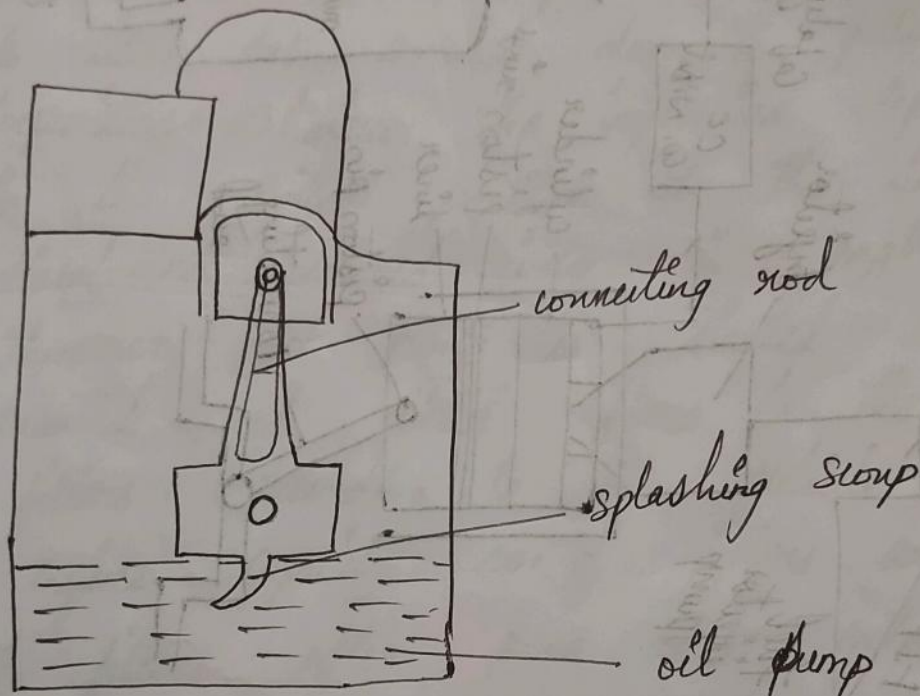
The parts which required lubrication are

1. Cylinder valves & piston
2. Piston pin
3. Crank shaft & connecting rod bearings
4. ~~crank~~ <sup>Cam</sup> shaft bearings
5. Valve operating mechanisms



6. cooling fan
7. water pump
8. Ignition system

### Splash lubricating system



Cam shaft : The function of cam shaft is to regulate the valves like inlet valve and exhaust valve with the help of rocker arm.

Crank shaft : It is directly connected to the fly wheel, the rotational motion of crank shaft finally converted to linear motion.

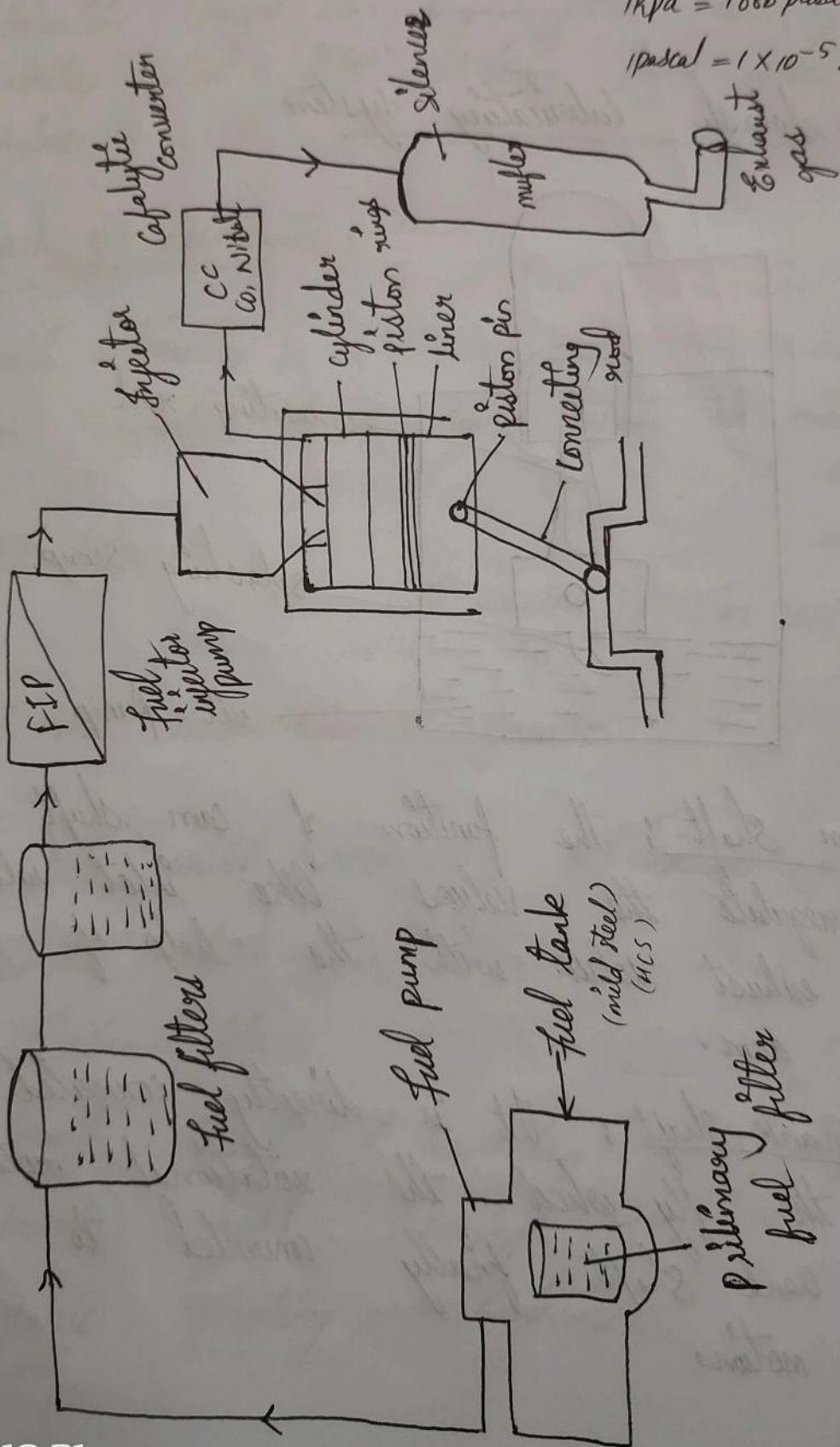
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# Fuel supply in Diesel Engine CDI fuel supply system

45Kpa

1Kpa = 1000 pascal

1pasal =  $1 \times 10^{-5}$  bar





In fuel supply diesel engine above diagram shows line diagram of Diesel fuel supply system. Diesel fuel tank placed separately at bottom of the vehicle. The material of Diesel fuel tank is mild steel to above corrosion. The bottom of the tank shape is little bit curved due to filter the impurities. Whatever the impurities deposited in the bottom portion at the same time diesel not entered into the engine block. Whenever fuel pump is started suction created and diesel flows to the fuel filters. According to the vehicle (or) engine capacity no. of filters are used. In filters after pure diesel entered into the fuel injector pump, then diesel entered in injector with the help of fuel injector pump. The piston, combustion chamber are lies in the liner surrounded by cylinder. Piston, piston rings moves up & down in the liner only. Piston rings acts as a seal to diesel not entered into the bottom portion of the engine block. At suction stroke the piston moves

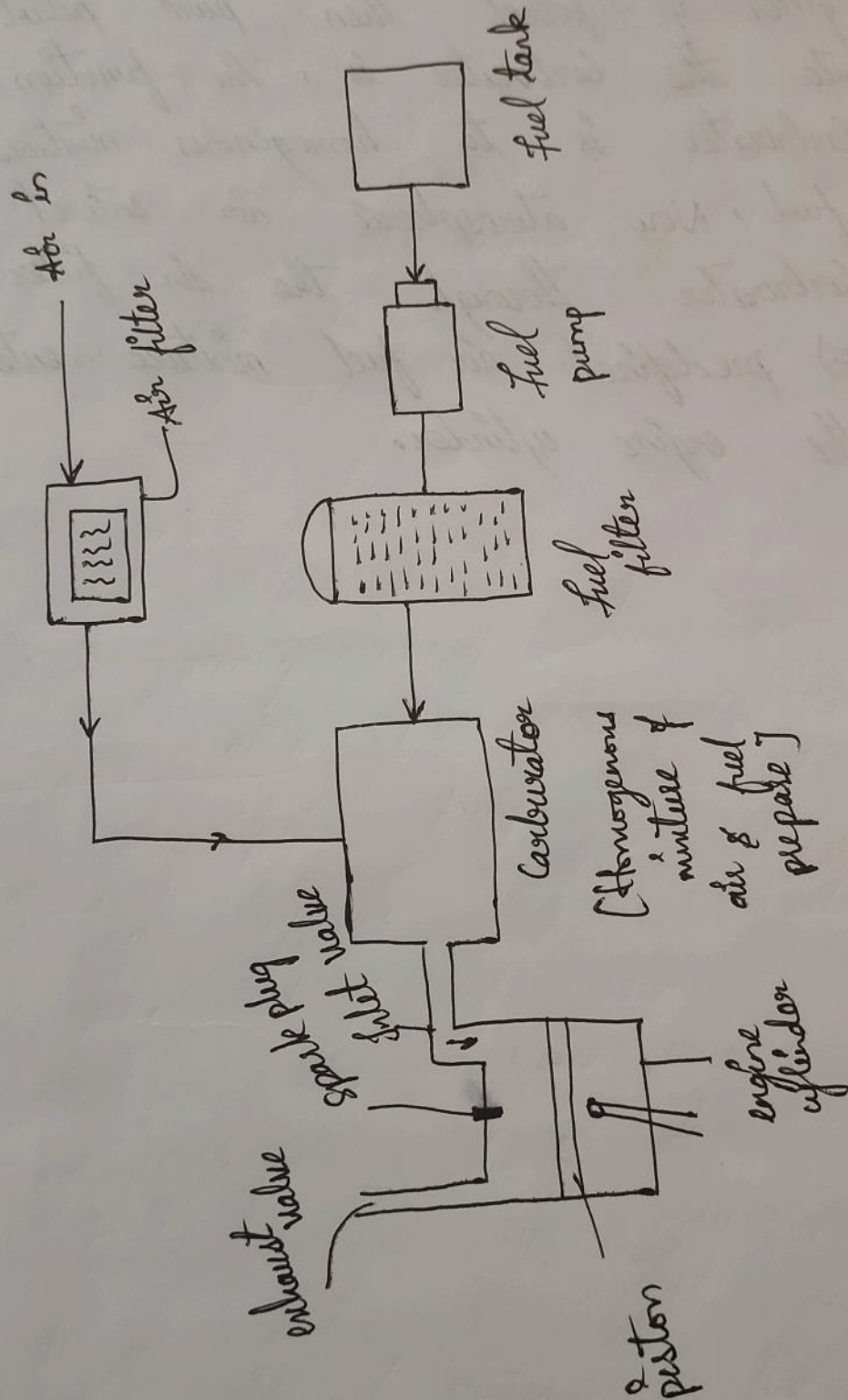


from TDC to BDC air entered into the combustion chamber, at compression stroke piston moves from BDC to TDC increase the pressure of air at the end of compression stroke maximum 45 Kpa minimum 9 Kpa. At particular pressure diesel converted into vapour, injector spray the fuel to the combustion chamber, combustion takes place maximum heat energy is converted into the mechanical energy with the help of expansion stroke. After the expansion stroke the combustion enter into CC (Catalytic converter). At CC harmful gases converted to the less harmful gases as they enter into the silencer. In the silencer with the help of muffler with the exhaust gases expelled to the atmosphere

$$A = \frac{C}{F}$$



# Fuel Injection System in petrol engine



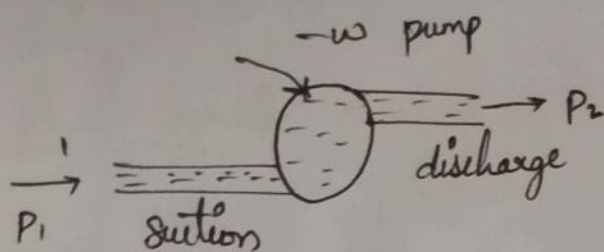
The diagram shows diagram of fuel injection system in petrol engine.

Fuel pump collect the petrol from fuel tank and send to petrol to fuel filter. After filter of petrol then pure petrol entered into the carburetor is, The function of carburetor is to homogenous mixture of air + fuel, Now atmospheric air entered into the carburetor through the air filter. Designed (or) predefined air fuel mixture entered into the engine cylinder.

$$\frac{1}{P_1} \rightarrow \text{static}$$

$$h_1 + \frac{v_1^2}{2}$$





Steady flow Steady  
state eq<sup>n</sup>

$$h_1 + \cancel{\frac{V_1^2}{2}} + \cancel{gZ_1} + \cancel{q} = h_2 + \cancel{\frac{V_2^2}{2}} + \cancel{gZ_2} + w_p$$

$$V_1 \approx V_2$$

$$h_1 = h_2 + w_p$$

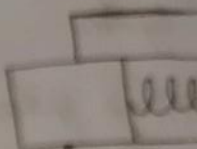
$$w_p = h_1 - h_2$$

$$w_p = (U_1 + P_1 V_1) - (U_2 + P_2 V_2)$$

$$w_p = (U_1 - \cancel{U_2}) + (P_1 V_1 - P_2 V_2)$$

$$w_p = (P_1 - P_2) V$$

Fuel injector



back off

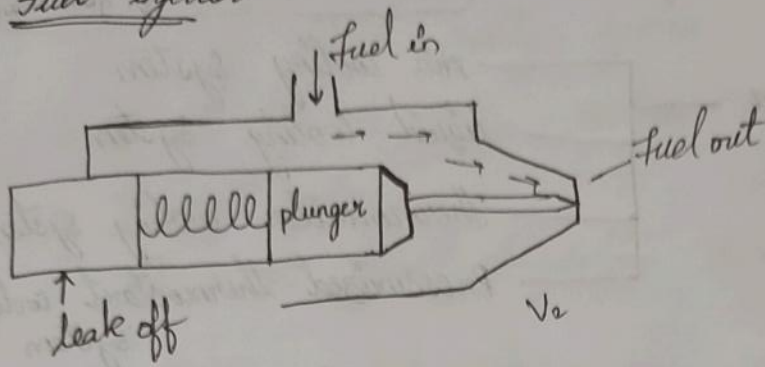
Fuel injector  
send the  
proper  
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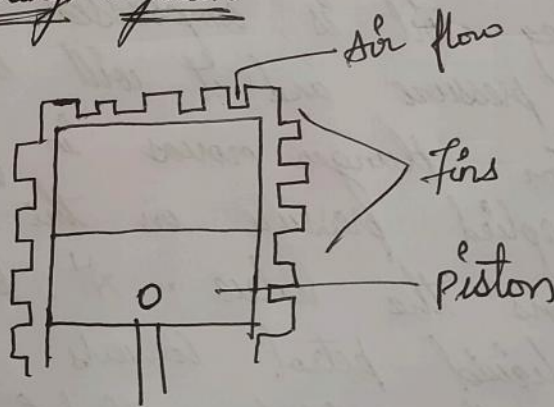
Fuel injector

Fuel injector collect the fuel from fuel tank and send the fuel to the engine cylinder with proper velocity at the beginning the fuel deposit at the end of nozzle and return back to the plunger and apply the pressure on the plunger. This plunger is now moves to backward direction applied the pressure on spring coil, the spring coil is compressed itself within certain pressure and it will expand. particular situation plunger moves in forward direction and applied pressure on the needle automatically opens the valve. At particular pressure the liquid petrol converts into vapor (spray form) to the cylinder. Fuel injector apply's pressure on diesel is exactly designed saturation pressure (without application of pressure phase must be change).

Topics

1. cooling system —
- Air cooling system
  - liquid cooling system
  - Therminwater cooling system
  - Pressurized thermostat cooling system

2. Ignition system —
- Battery Ignition system
  - magneto Ignition system
  - Electrical Ignition system

Air cooling system

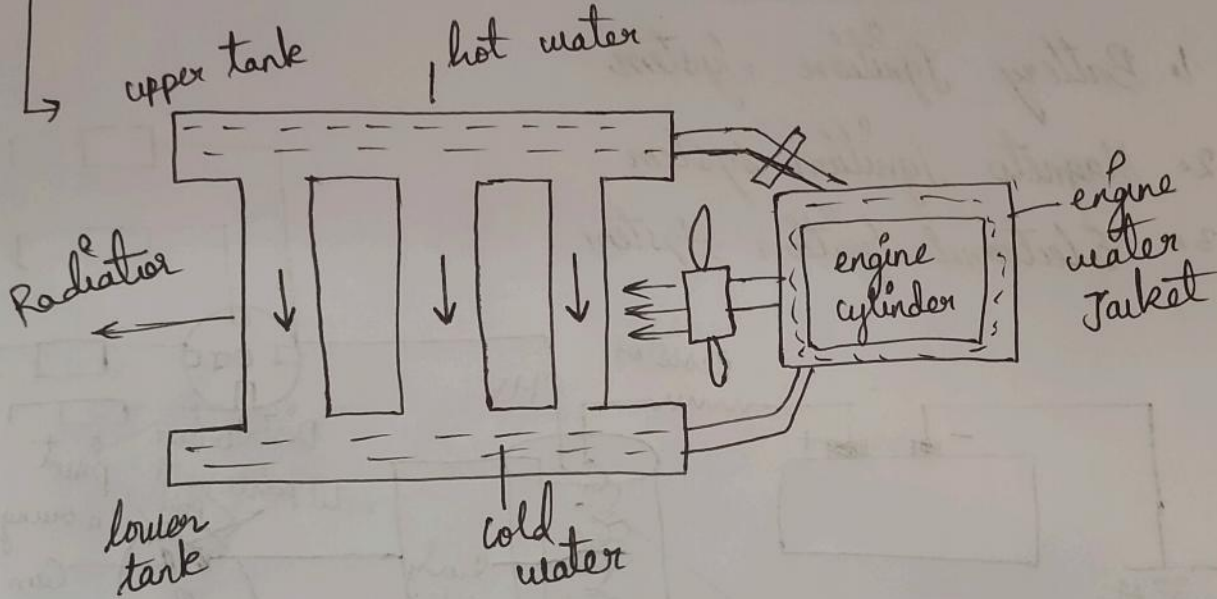
1. Fin surface area
2. Velocity and amount of air cooling
3. Temperature of fins
4. less horse power, tractors, motorcycle, scooters
5. used in small cars



## Liquid cooling system

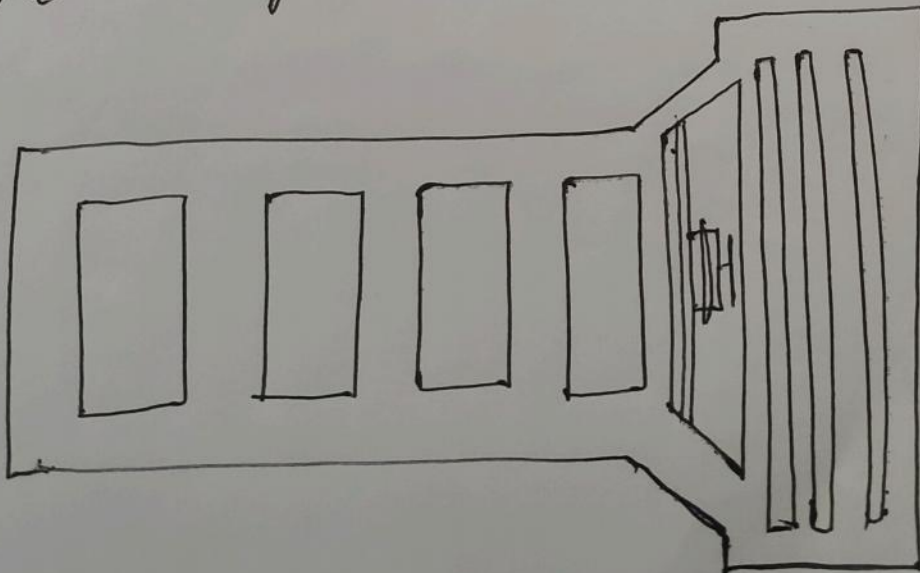
### Types of liquid cooling system

1. Direct (or) Non return system
2. Thermo-siphon system
3. Pump (or) forced circulation system



### Limitations

1. It totally depends on atmosphere.
2. The rate of water circulation is too slow.



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## Ignition system

Ignition system is a system to provide heat (or) spark in the cylinder.

## Types of Ignition system

1. Battery Ignition System
2. Magneto Ignition system
3. Electronic Ignition System

