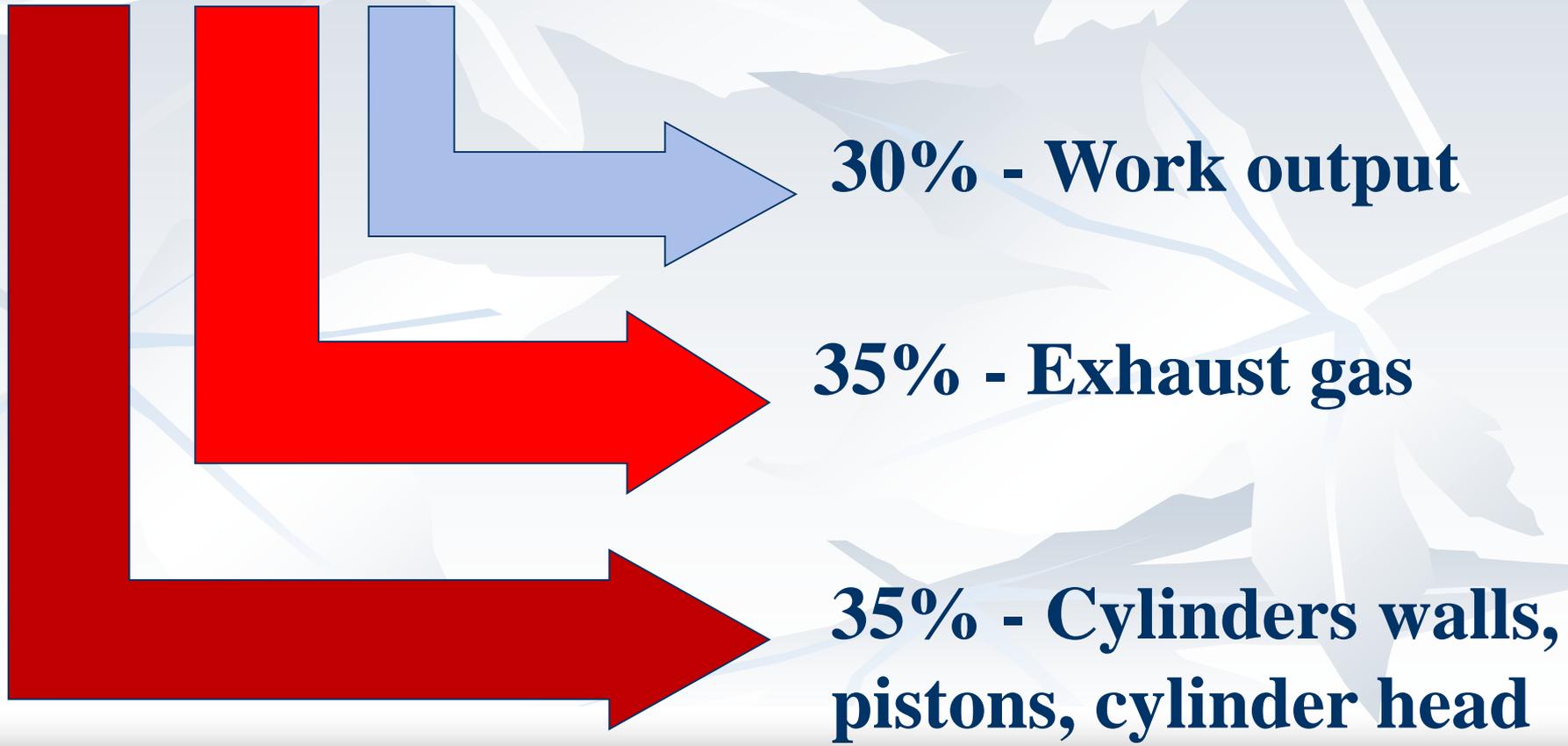


# COOLING SYSTEM

Total heat generated



**30% - Work output**

**35% - Exhaust gas**

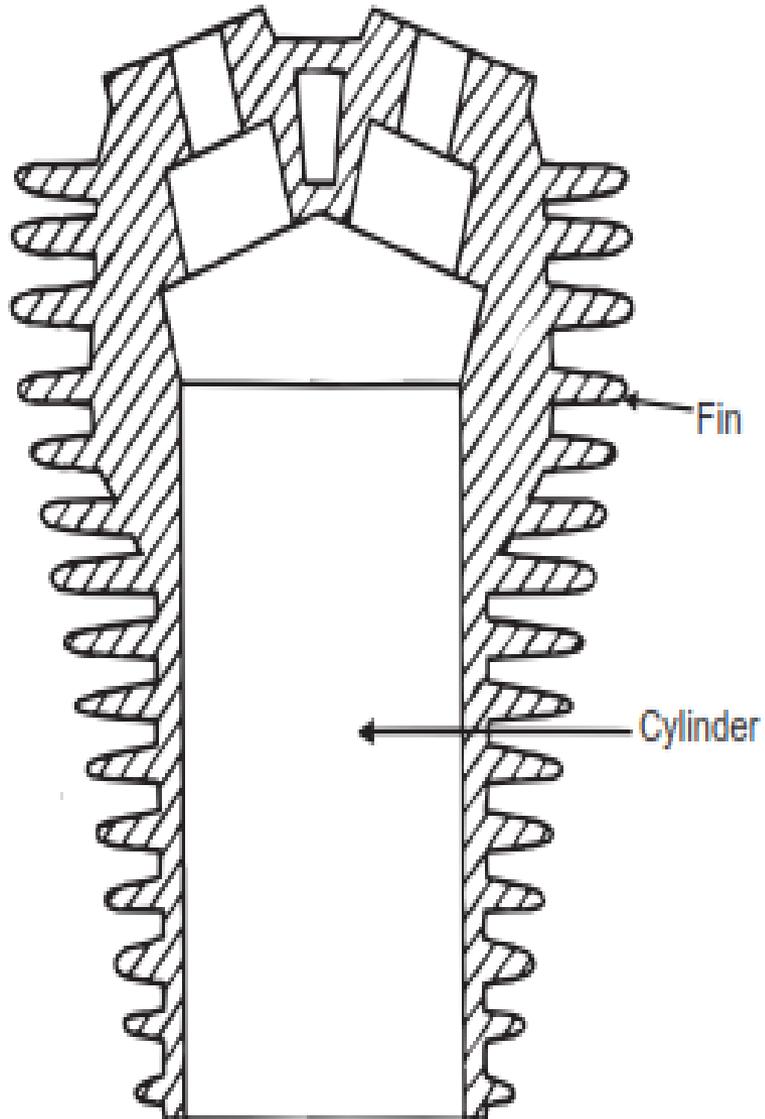
**35% - Cylinders walls, pistons, cylinder head**

# IMPORTANCE OF COOLING SYSTEM

- *The temperature range in which engine works efficiently is 150 to 200 degree Celsius*
- *Due to heating temperature could go up to 2500 degree Celsius*
- *Such high temperature could cause*
  - burning of lubricating oil*
  - Seizing of moving parts*
  - welding of moving parts*

*Objective of cooling system is to keep the engine running at its most efficient operating temperature.*

# AIR COOLING SYSTEM



## **Advantages of Air Cooled System**

- (a) Radiator/pump is absent hence the system is light and simple.
- (b) In case of water/liquid cooling system there are leakages, but in this case there are no leakages.
- (c) Coolant and antifreeze solutions are not required.
- (d) This system can be used in cold climates, where if water/liquid is used it may freeze.

## **Disadvantages of Air Cooled System**

- (a) Comparatively it is less efficient.
- (b) Difficult to control cooling rate and may suffer from non- uniform cooling.

# **WATER COOLING SYSTEM**

*(a) Radiator*

*(b) Thermostat valve*

*(c) Water pump*

*(d) Fan*

*(e) Water Jackets*

*(f) Antifreeze mixtures*

*(a) Methyl, ethyl and isopropyl alcohols*

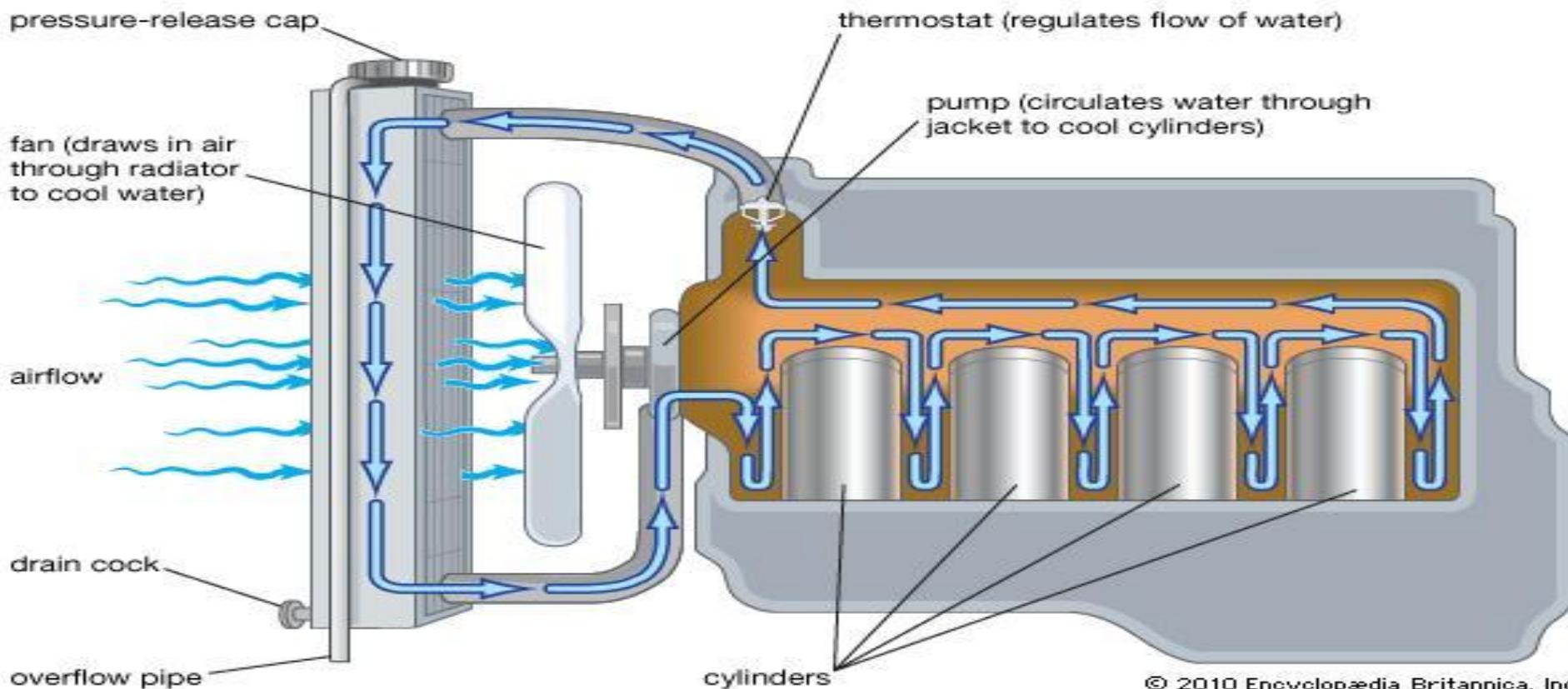
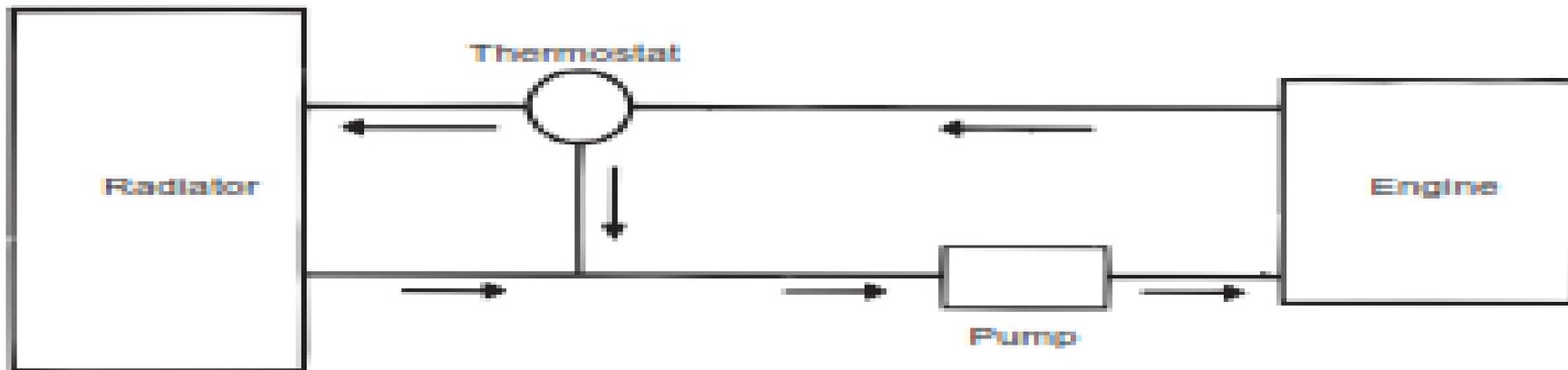
*(b) A solution of alcohol and water*

*(c) Ethylene Glycol*

*(d) A solution of water and Ethylene Glycol*

*(e) Glycerin along with water*

# WATER COOLING SYSTEM



## **Advantages**

- (a) Uniform cooling of cylinder, cylinder head and valves.
- (b) If we employ water cooling system, then engine need not be provided at the front end of moving vehicle.
- (c) Engine is less noisy as compared with air cooled engines, as it has water for damping noise.

## **Disadvantages**

- (a) The water pump which circulates water absorbs considerable power.
- (b) The water cooling system is costlier as it has more number of parts. Also it requires more maintenance and care for its parts.

# LUBRICATION SYSTEM

*To reduce the friction between moving parts.*

*To reduce the wear and tear.*

*To reduce the corrosion and carbon deposits.*

*To reduce the heat of moving parts.*

*To minimize the power lost due to friction*

*To reduce the noise created by the moving parts.*

*Prevention of leakage of working gases.*

**Parts which needs to be lubricated:**

**Cylinder piston and piston rings, Main bearings, Crankshaft**

**Crank pin and piston pin, Big end and small end connecting rod .**

**Cam shaft, Valves.**

## **MIST LUBRICATION**

*Used for two stroke cycle engines.*

*The lubrications oil (2 to 3 percent) is mixed with petrol in the fuel tank. The oil and fuel mixture is inducted through the carburetor.*

*The fuel -oil ratio used is important for good performance. The optimum fuel -oil ratio used is 50:1*

### **ADVANTAGE**

*Separate lubricating system is not needed*

*No maintenance cost for lubrication system*

*Weight of engine is reduced by avoiding separate lubricating system*

### **DISADVANTAGE**

*If oil is less there is chance for seizure of engine*

*More oil makes excess smoke in the exhaust*

## WET SUMP LUBRICATION

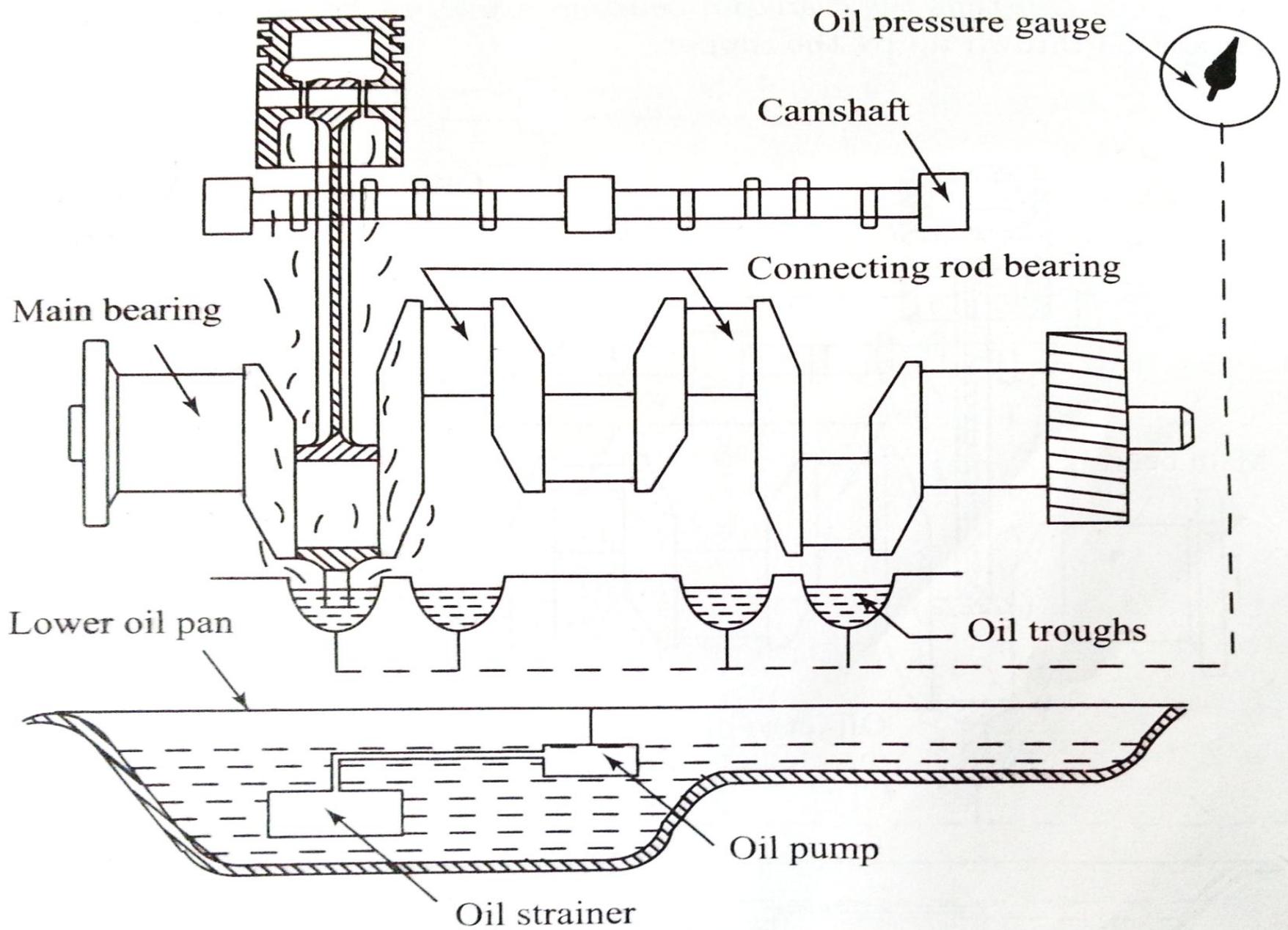
*Oil sump is provided at the base of crank case. From the sump the oil is pumped to different parts of the engine.*

### Types:

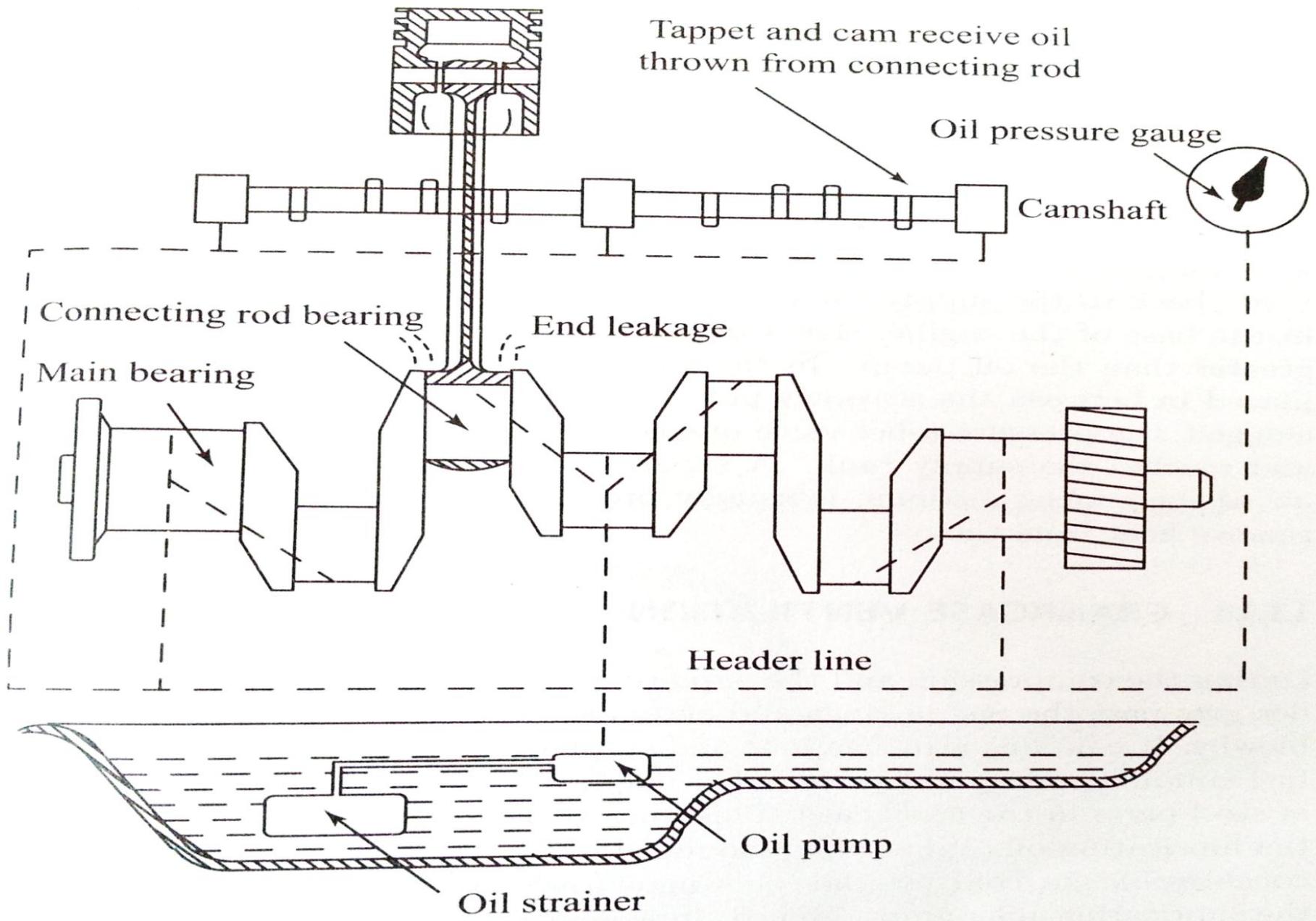
- a) Splash lubrication system.*
- b) Pressure lubrication system.*
- c) Splash and Pressure lubrication system.*

### *a) SPLASH LUBRICATION SYSTEM*

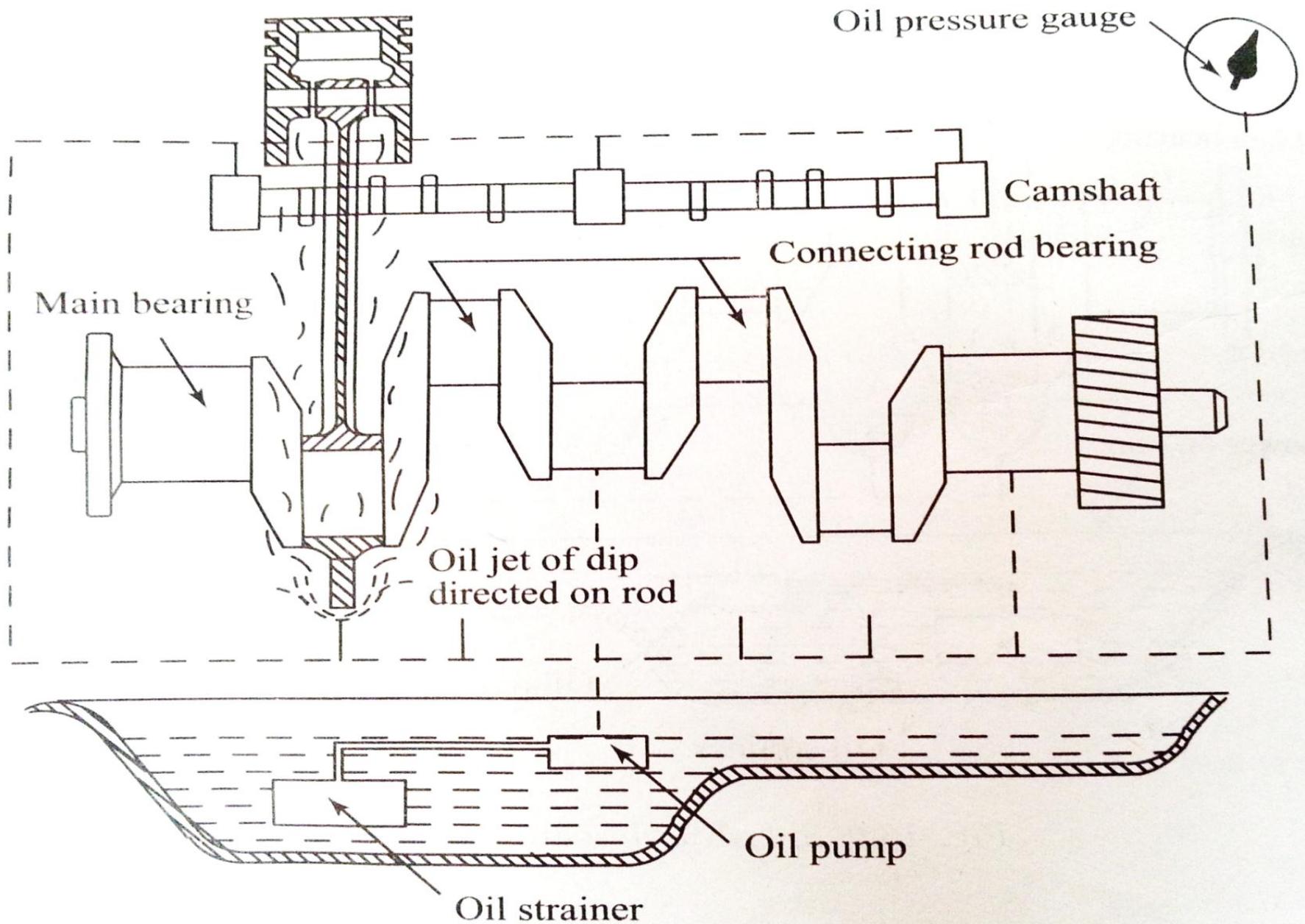
- The simple sketch of splash lubrication system is lubricating oil is filled in the sump. scoop are attached to the big end of connecting rod.*
- When every time the piston reaches bottom dead center (BDC) the scoop dip into the sump and carries the lubricating oil . The lubricating oil is splashed to the piston, cylinder , small & big end of connecting rod, main bearing and cam shaft bearing. The splashed oil settle on the engine parts and then falls into the sump.*



*Fig. 13.9 Splash Lubrication System*



*Fig. 13.11 Pressure Feed Lubrication System*



*Fig. 13.10 Splash and Pressure Lubrication System*