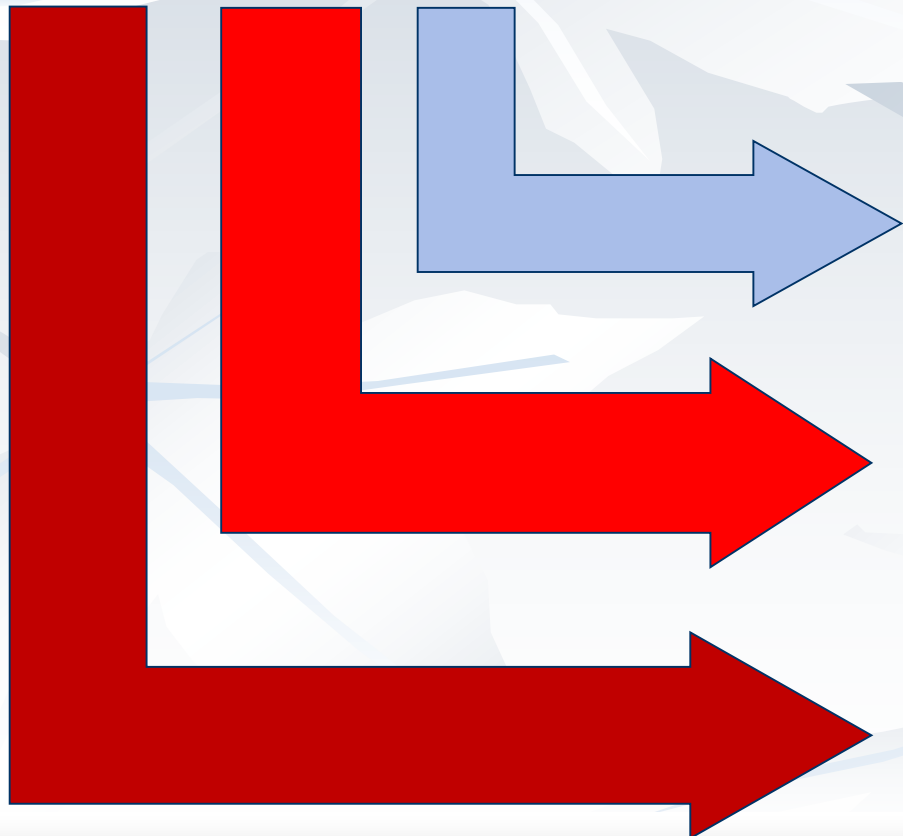


COOLING SYSTEM

Total heat generated



30% - Work output

35% - Exhaust gas

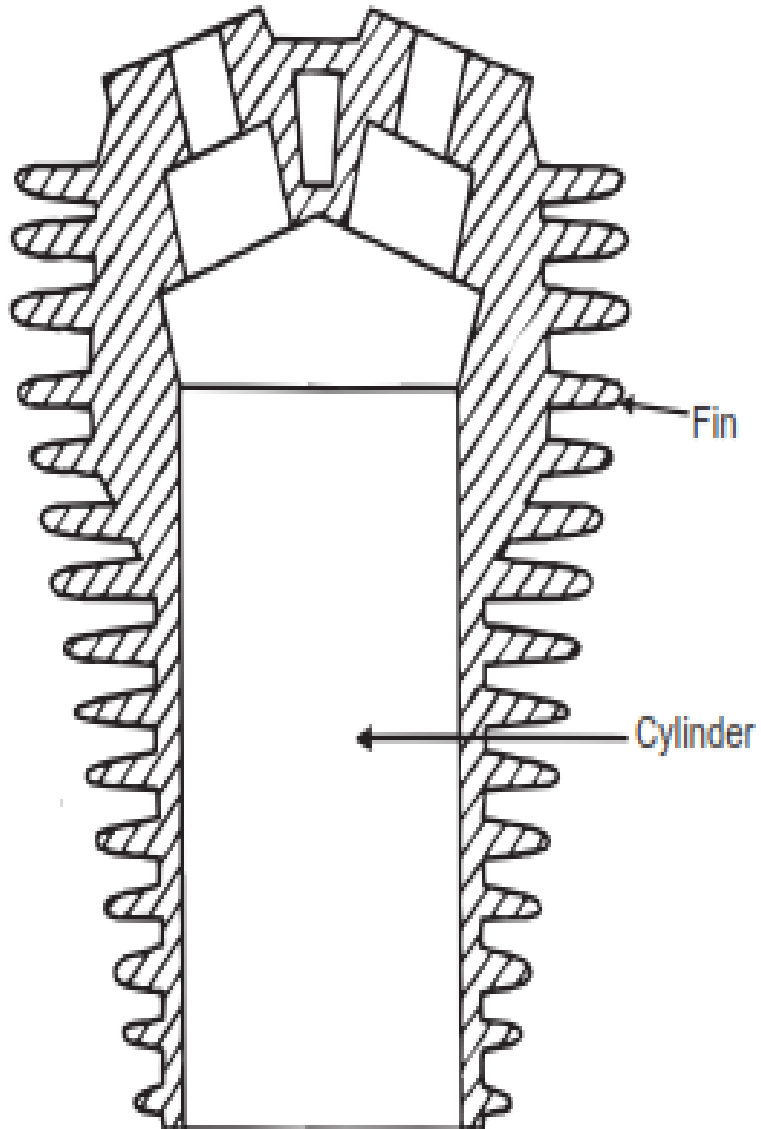
**35% - Cylinders walls,
pistons, cylinder head**

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

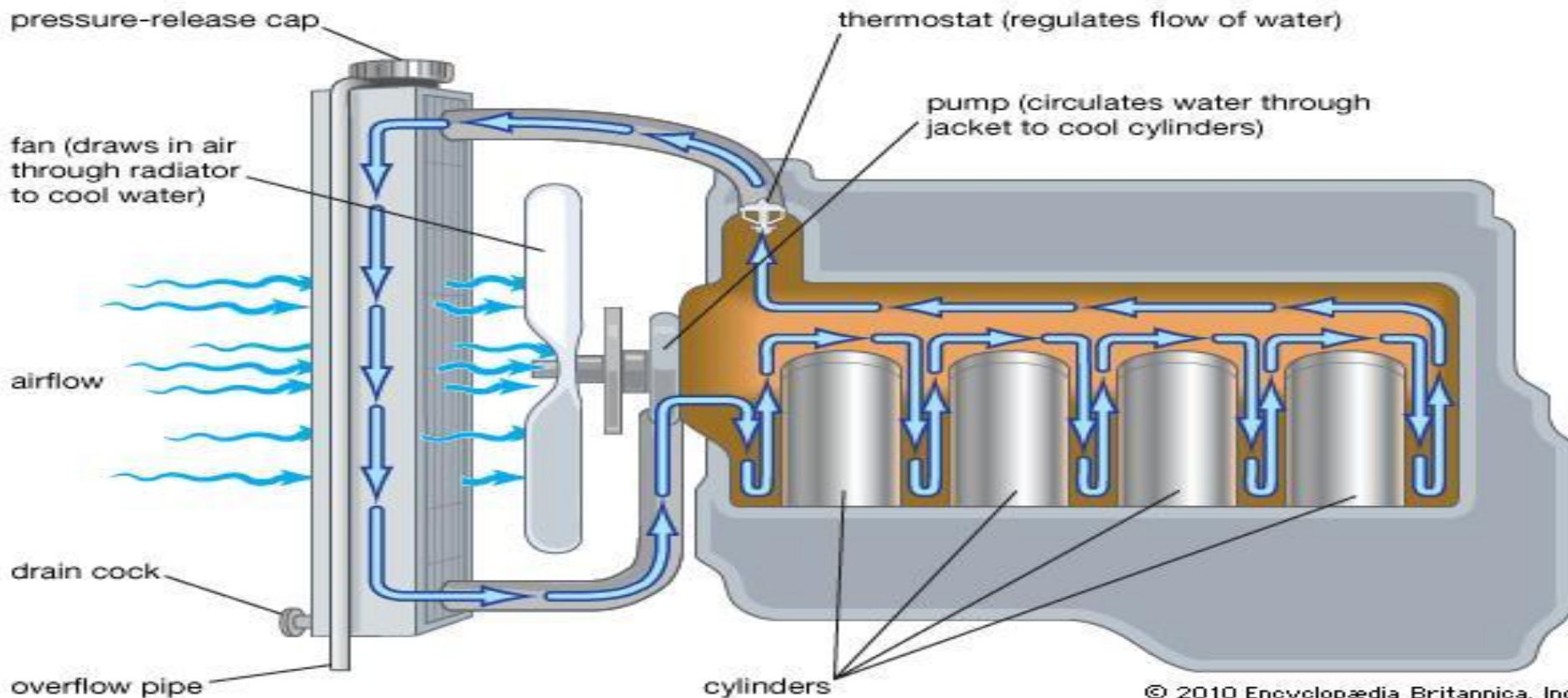
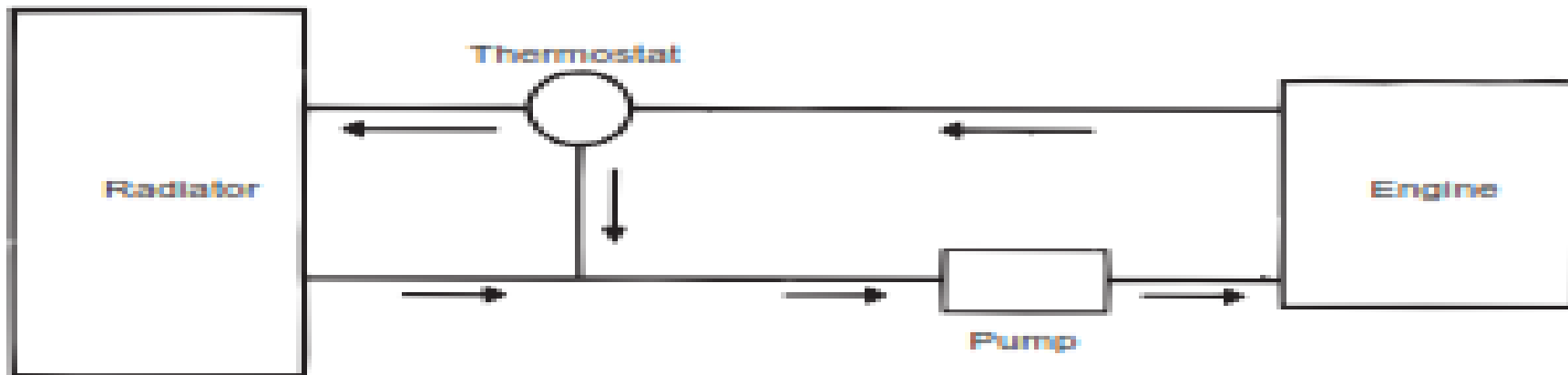
(b) A solution of alcohol and water

(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.*

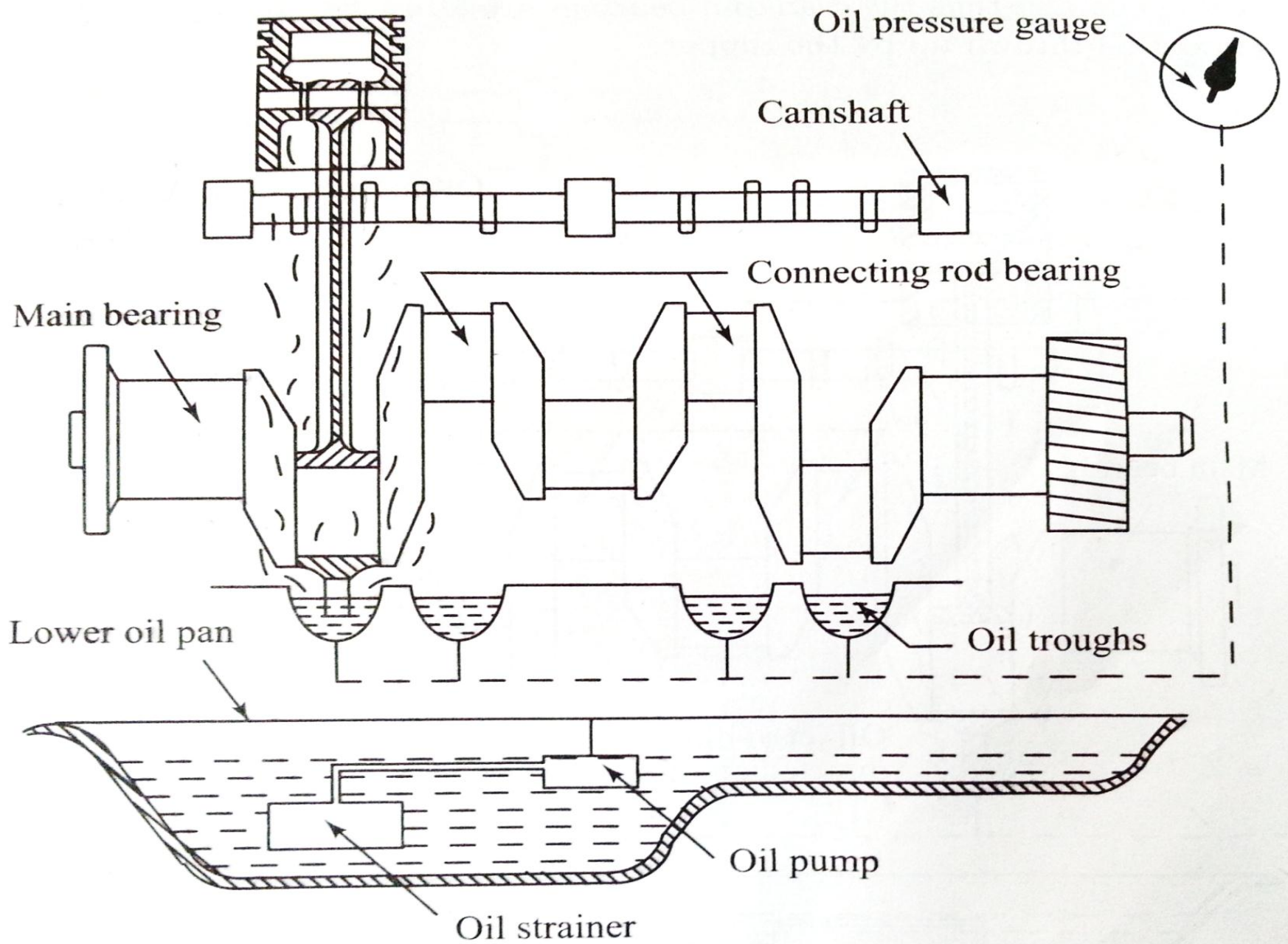


Fig. 13.9 Splash Lubrication System

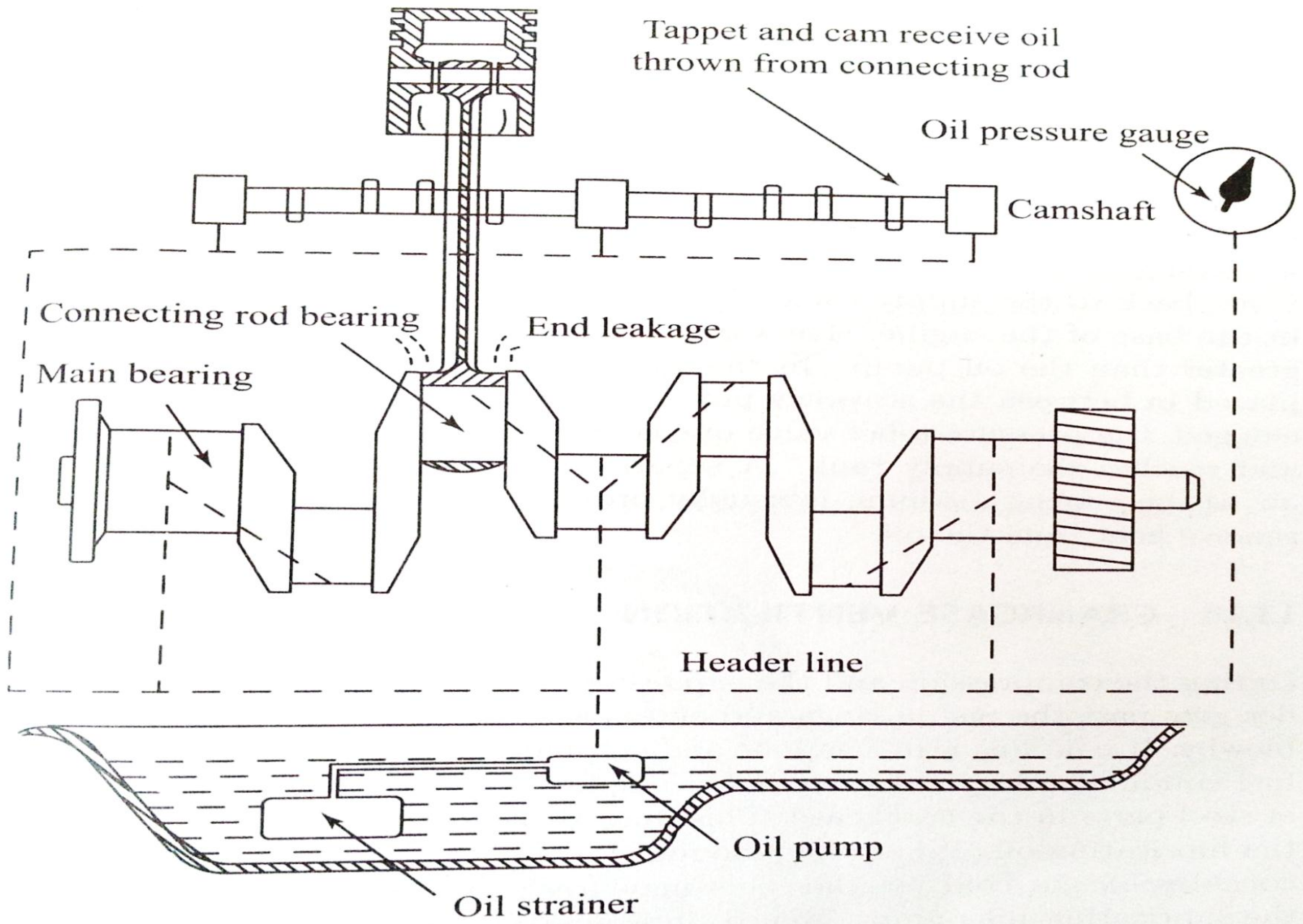


Fig. 13.11 Pressure Feed Lubrication System

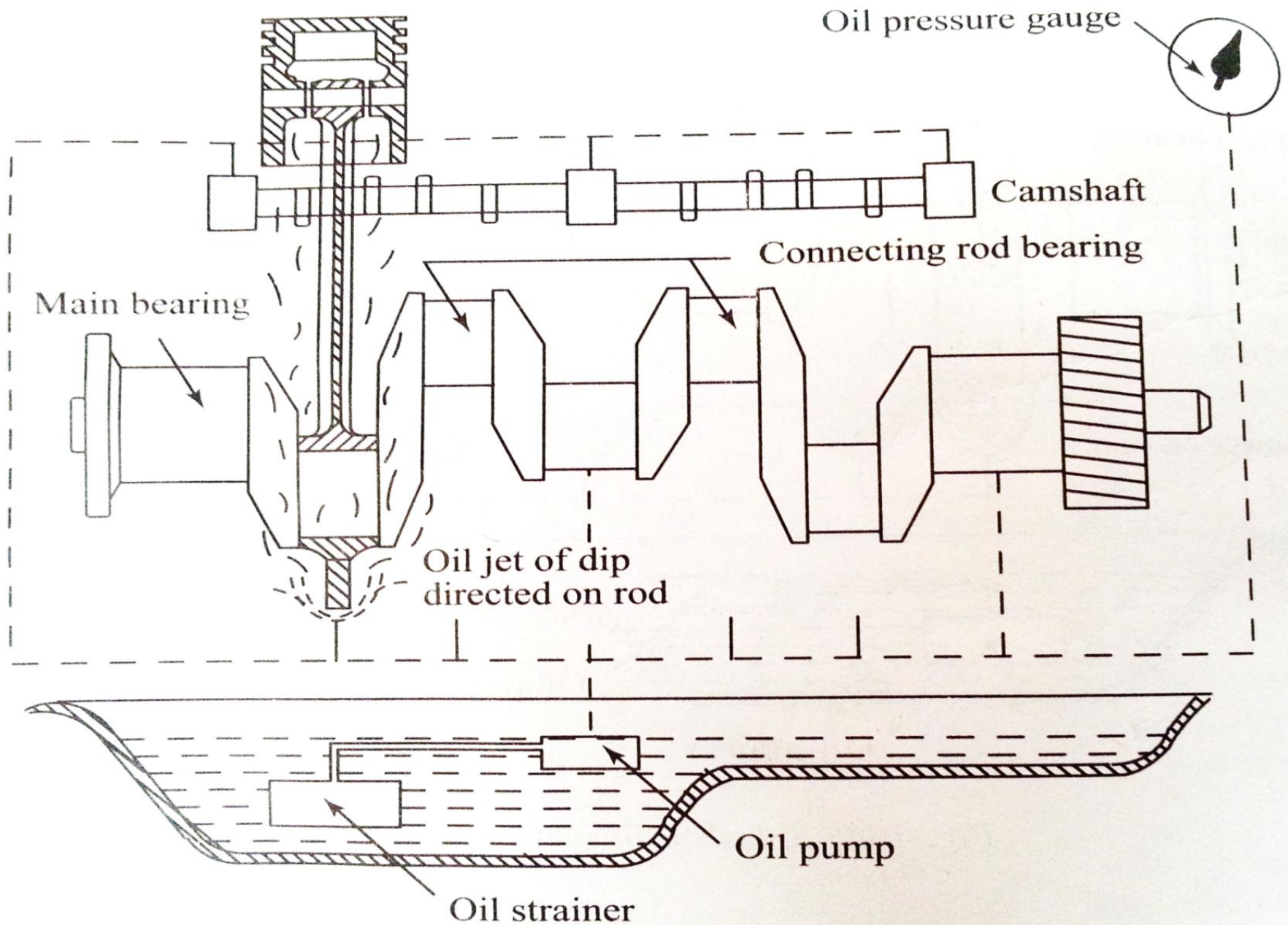


Fig. 13.10 Splash and Pressure Lubrication System