

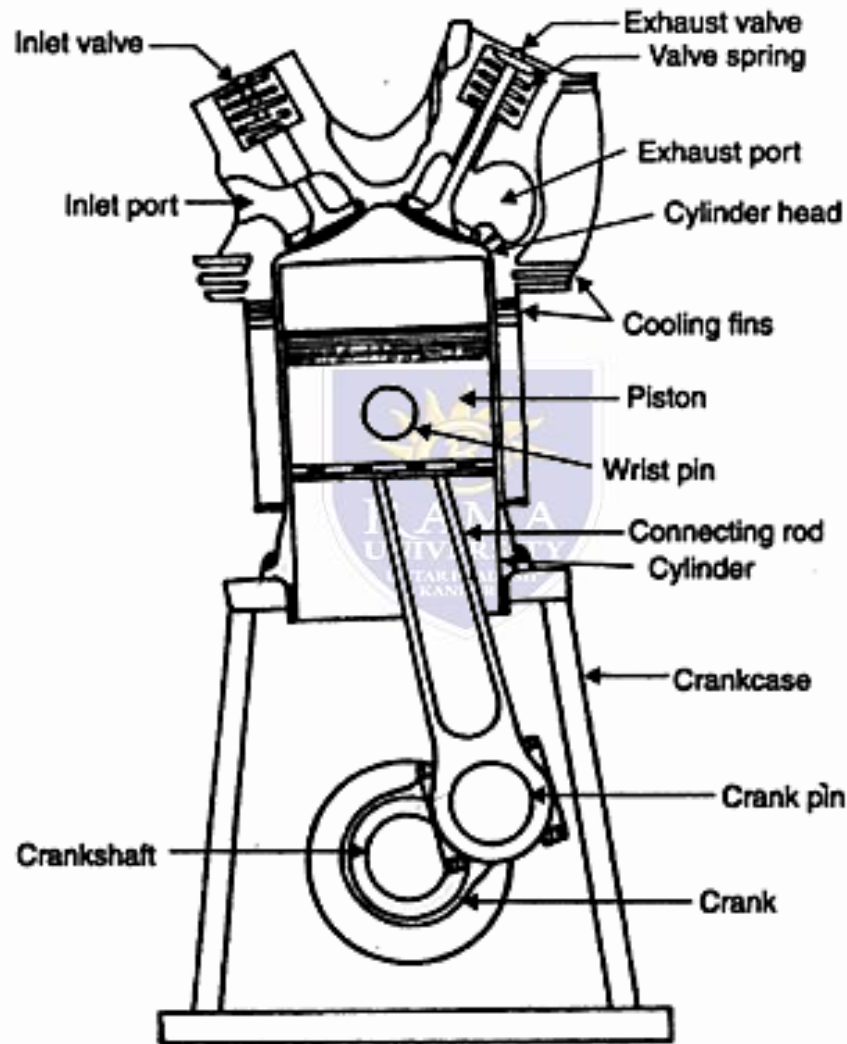
# Lecture

## Automobile engineering

### C. Parts for Diesel engine only :

1. Fuel pump.

2. Injector.



### A. Parts Common to Both Petrol and Diesel Engines :

#### 1. Cylinder :

The cylinder contains gas under pressure and guides the piston. It is in direct contact with the products of combustion and it must be cooled. The ideal form consists of a plain cylindrical barrel in which the piston slides. The movement of the piston or stroke being in most cases, longer than the bore. This is known as the "stroke-bore ratio". The upper end consists of a combustion or clearance space in which the ignition and combustion of the charge takes place. In practice, it is necessary to depart from the ideal hemispherical slope in order to accommodate the valves, sparking plugs etc. and to control the combustion. Sections of an air-cooled cylinder and a water-cooled cylinder are shown in Figs. 2.6 and 2.7, respectively. *The cylinder is made of hard grade cast-iron and is usually, cast in one piece.*

#### 2. Cylinder head :

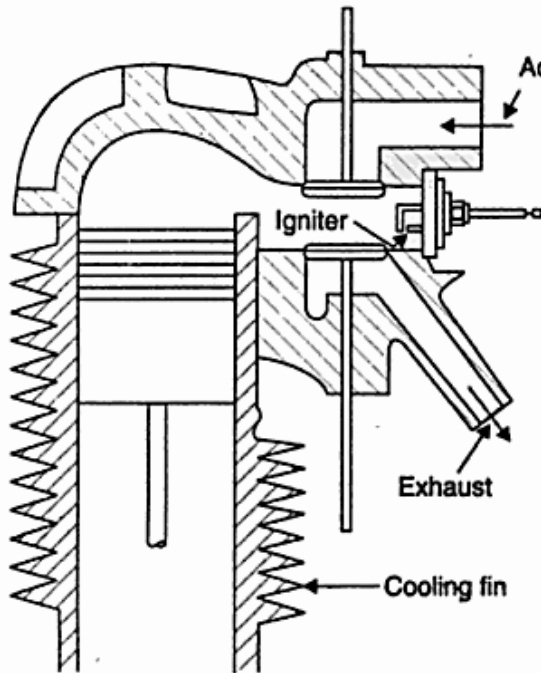


Fig. 2.6. Air-cooled cylinder.

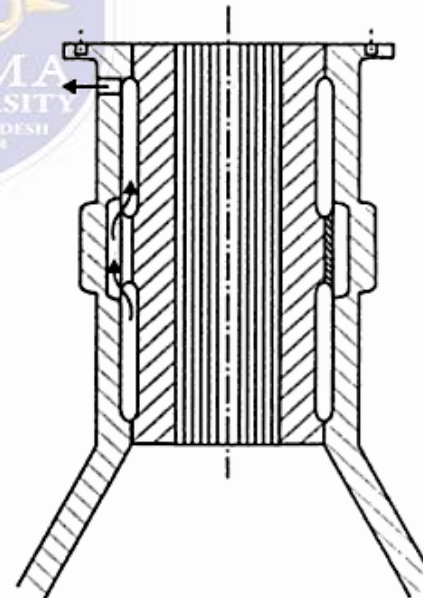


Fig. 2.7. Water-cooled cylinder.

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One end of the cylinder is closed by means of a *removable cylinder head* (Fig. 2.6) which usually contains the inlet or admission valve [Fig. 2.8 (a)] for admitting the mixture of air and

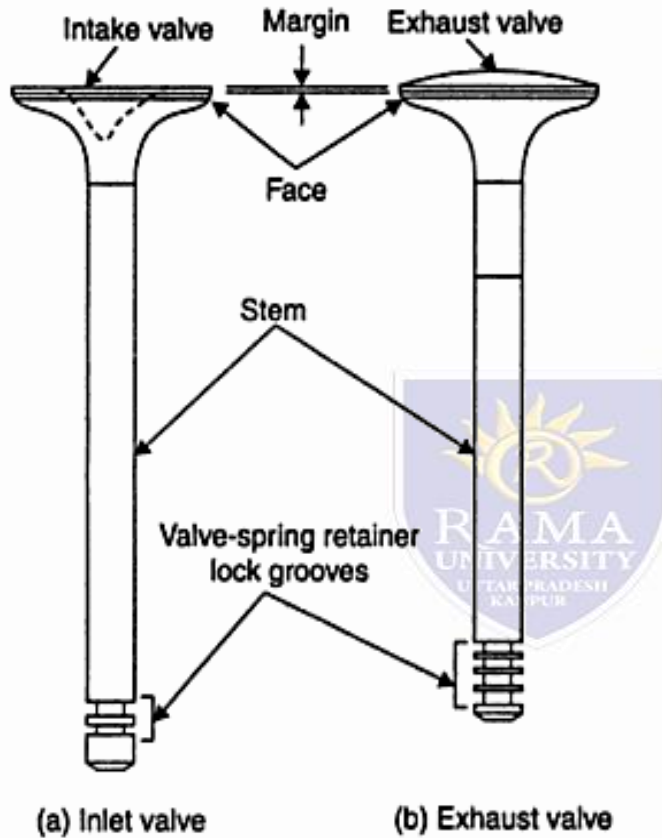


Fig. 2.8

fuel and exhaust valve [Fig. 2.8 (b)] for discharging the product of combustion. Two valves are kept closed, by means of cams (Fig. 2.9) geared to the engine shaft. The passages in the cylinder head leading to and from the valves are called *ports*. The pipes which connect the inlet ports of the various cylinders to a common intake pipe for the engine is called the inlet *manifold*. If the exhaust ports are similarly connected to a common exhaust system, this system of piping is called *exhaust manifold*.

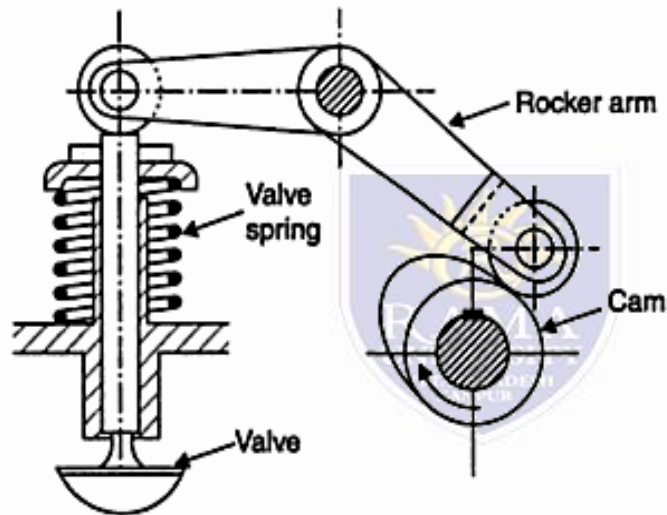


Fig. 2.9. Cam and rocker arm.

*The main purpose of the cylinder head is to seal the working ends of the cylinders and not to permit entry and exit of gases on cover head valve engines. The inside cavity of head is called the combustion chamber, into which the mixture is compressed for firing. Its shape controls the direction and rate of combustion. Heads are drilled and tapped with correct thread to take the*

ignition spark plug. All the combustion chambers in an engine must be of same shape and size. The shape may be in part controlled by the piston shape.

*The cylinder head is usually made of cast-iron or aluminium.*

### 3. Piston :

A piston is fitted to each cylinder as a face to receive gas pressure and transmit the thrust to the connecting rod.

The piston must (i) give gas tight seal to the cylinder through bore, (ii) slide freely, (iii) be light and (iv) be strong. The thrust on the piston on the power stroke tries to tilt the piston as the connecting rod swings, side ways. The piston wall, called the skirt, must be strong enough to stand upto this side thrust. *Pistons are made of cast-iron or aluminium alloy for lightness.* Light alloy pistons expand more than cast-iron one therefore they need large clearances to the bore, when cold, or special provision for expansion. Pistons may be solid skirt or split skirt. A section through a split skirt piston is shown in Fig. 2.10.

### 4. Piston rings :

The piston must be a fairly loose fit in the cylinder. If it were a tight fit, it would expand as it got hot and might stick tight in the cylinder. If a piston sticks it could ruin the engine. On the other hand, if there is too much clearance between the piston and cylinder walls, much of the pressure from the burning gasoline vapour will leak past the piston. This means, that the push on the piston will be much less effective. It is the push on the piston that delivers the power from the engines.

To provide a good sealing fit between the piston and cylinder, pistons are equipped with piston rings, as shown in Fig. 2.10. The rings are usually made of cast-iron of fine grain and high elasticity which is not affected by the working heat. Some rings are of alloy spring steel. They are