EXPERIMENT NO:

FUEL PUMP & INJECTORS

Aim:-

To study fuel pump & injectors.

Introduction:-

The fuel injection system of a diesel engine can be called as the heart of the engine as the engine performance directly depends upon the proper functioning of this system, which must supply, meter, inject and atomize the fuel.

Injector systems are manufactured with great accuracy, hence they are costly.

Diesel Engine Fuel System:-

Fuels with either of gravity or fuel feed pump is provided, which supplies fuel through the filter to injection pump which pumps the fuel to inject or which are provided in the cylinder heads. The injection system can be classified as,

1. Air Injection System
2. Solid Injection System

1. Air Injection System:-

In this system, fuel is forced into the cylinder by means of compressed air. The fuel gets atomized by high pressure air.

Advantages:-

1. In this system, mixing of air and fuel is perfect; hence it gives rise to higher mean effective pressure.
2. High viscosity fuels can be used, which are less expensive.

Disadvantage:-

It requires bulky multistage compressor. This system is not used anymore.

1. Solid Injection System:-

Three solid injection systems are in use,

a. Individual Pump System
b. Distributor System
c. Common Rail System.

a. Individual Pump System:-

The fuel is pumped from the storage tank by a low pressure pump. The fuel passes through primary and secondary filters. The pressure developed is 3 bars. This fuel is now supplied to individual pumps.

These pumps further compress the fuel and send the fuel to the injector. These pumps further compress the fuel. Large slow speed (200 kw/cylinder and above) have individual pumps mounted on each cylinder.

b. Distributor System:-

In this system, the fuel is compressed and metered by a single pump used for compressing the fuel. The metering of the fuel carried out by metering element provided for every cylinder.

c. Common Rail System:-

In this system the fuel high pressure pump serves only to deliver fuel into common rail. The metering is not handled by high pressure pump. Hence extreme accuracy in the manufacture of the pump is not required. The discharge from the nozzle is regulated by the size of the metering orifice and pressure drop in the delivery line; hence nozzles must be closely matched to ensure equal distribution amongst the cylinders.

Fuel Pump & Injector:-

Pump:-

P is rack which is connected to the governor mechanism on the accelerator through various linkages. It meshes with quadrant of the gear Q and motion of the rack rotates the quadrant Q. Q is quadrant of the gear to which hollow cylinder portion with slot at the bottom is attached. The slot engaged with the bottom of the plunger R. thus plunger will also rotate as a result of the plunger R. thus plunger will also rotate as a result of the cam mounted on the cam shaft. S is barrel in which fuel enters at the inlet and overflows from fuel overflow passage. V is valve seat. It is non return valve and is kept in position by spring T. When the pressure in the barrel exceeds a predetermined; the valve opens against the compression of the spring and pressure above the valve due to fluid inn the delivery pipe. Thus the pressure developed in the barrel depends upon the stiffness of the spring T & the fluid pressure above the valve.

Internal Combustion Engine:-

T is spring housed in the body which can be screwed in or out and vary the compression of the spring resulting in the pressure to be developed in the barrel to open the valve.

W is the delivery pipe from the pump connected to the injector or atomizer assembly.

Injector:-

A is the nozzle body. B is the nozzle valve resting on the nozzle body seat. C is the valve cap nut holding the nozzle and the body with the nozzle valve in between. D is the spindle, one end of which resting on the nozzle body valve and the other end on a seat for the spring. E is the spring. The compression of this spring control the pressure at which the nozzle valve can lift up due to fuel pressure. Thus this spring controls the injection pressure. The fuel must be injected at a pressure much higher than the pressure in the cylinder developed due to combustion of fuel air charge. The fuel continues to be injected at the maximum pressure reached in the cylinder. And the fuel to be injected must be atomized and possesses high velocity so that the atomized particles go deep in the combustion space. Thus pressure is as high as 120 and 150 bars or even more might have to be developed to ensure high velocity suitable degree of atomizing and introduction of fuel. F is spring cap nut. G is compression screw to adjust the compression of spring. H is protecting cap for the compression of spring the nut which is vital for the operation of the injector is not mishandled. I is the filling pin when the fuel is injected, the spindle will jump up. This jerking motion of the filling pin ensures injection of fuel. J is the ripple connecting the leak off from the sides of the spindle. K is fuel delivery connection. The valve lifts off the seat against compression of spring when fuel under pressure is fed to the injector.

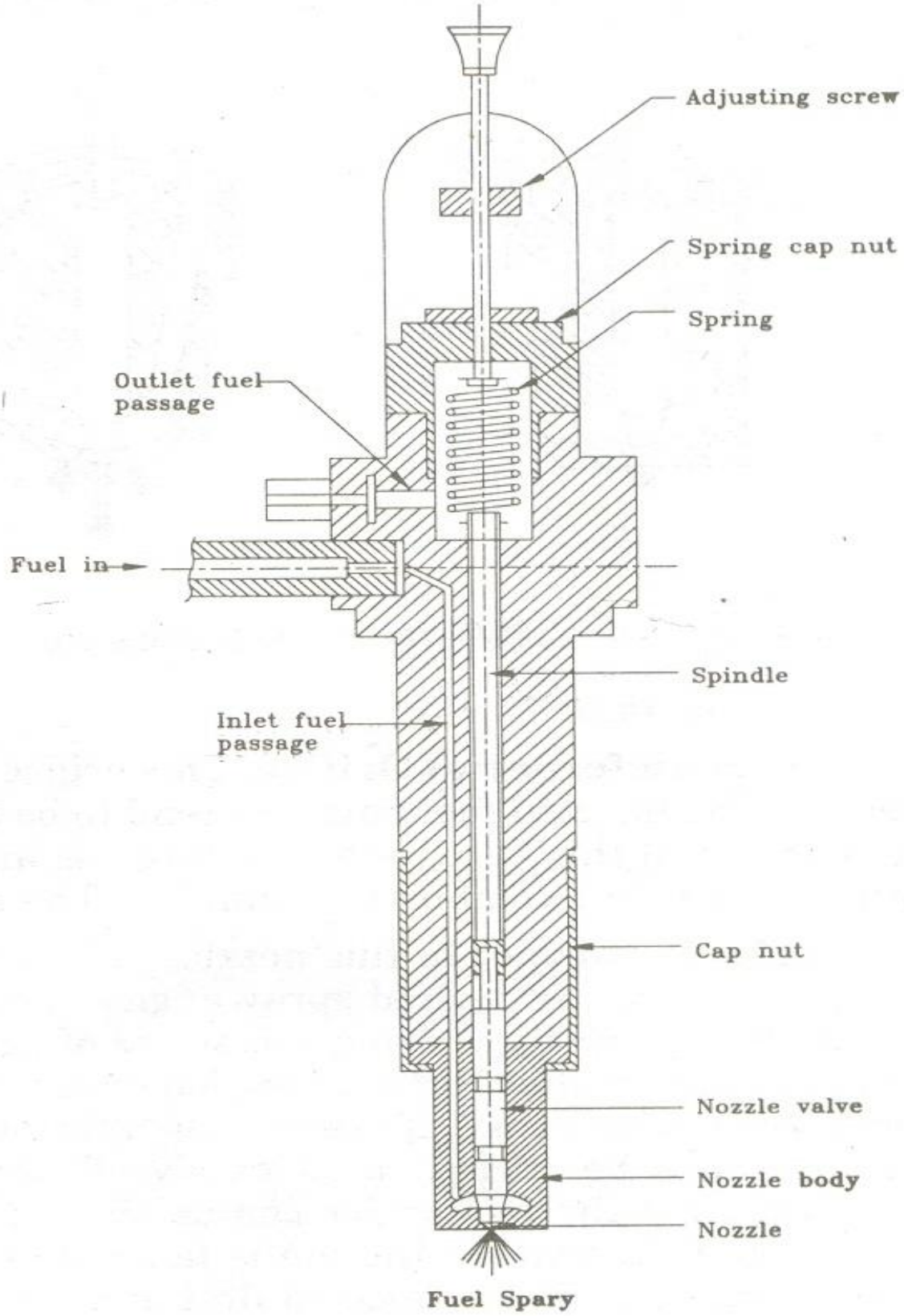

Fig. 10.15. Fuel Atomiser.

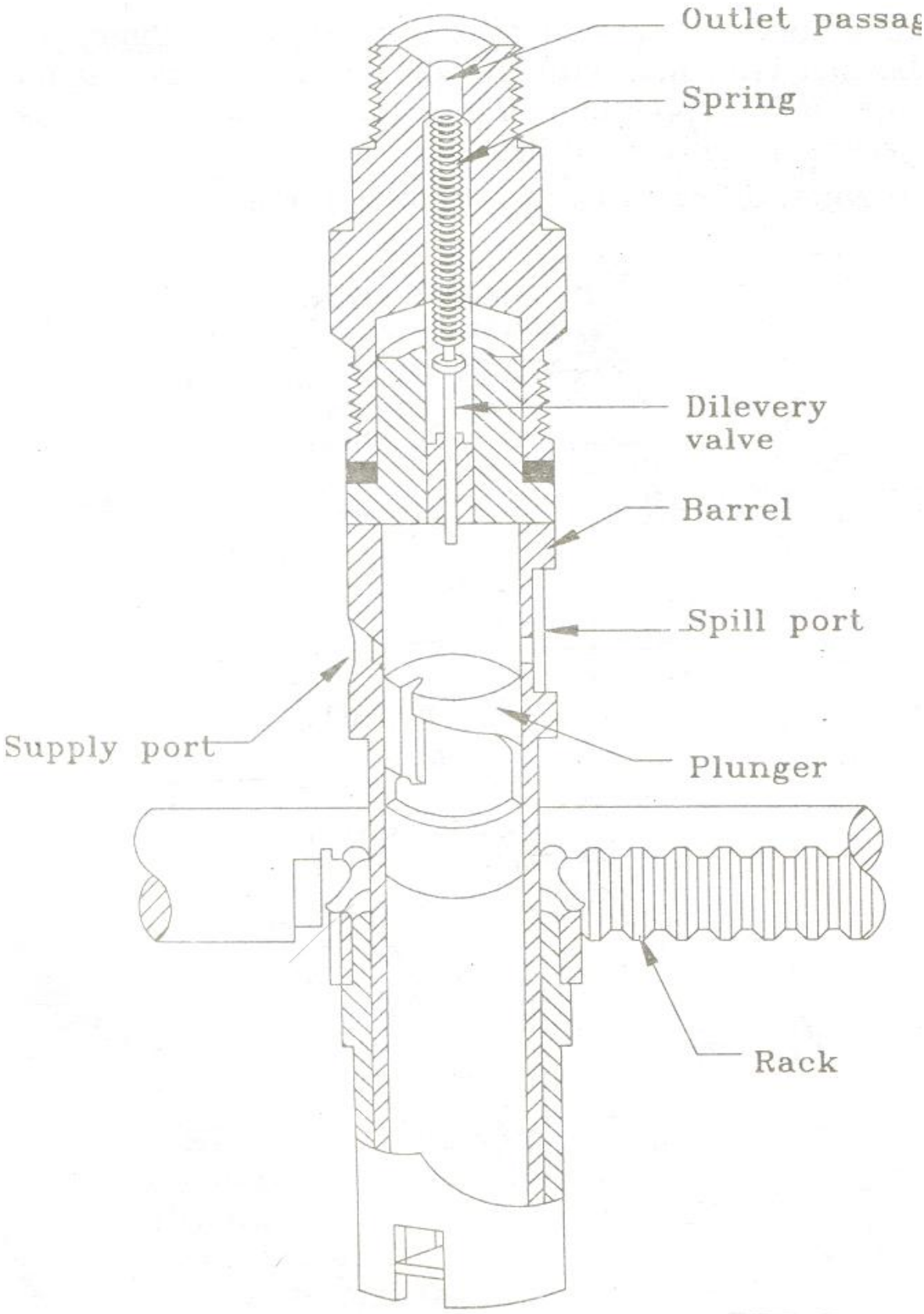

Fig. 10.12. Fuel pump.

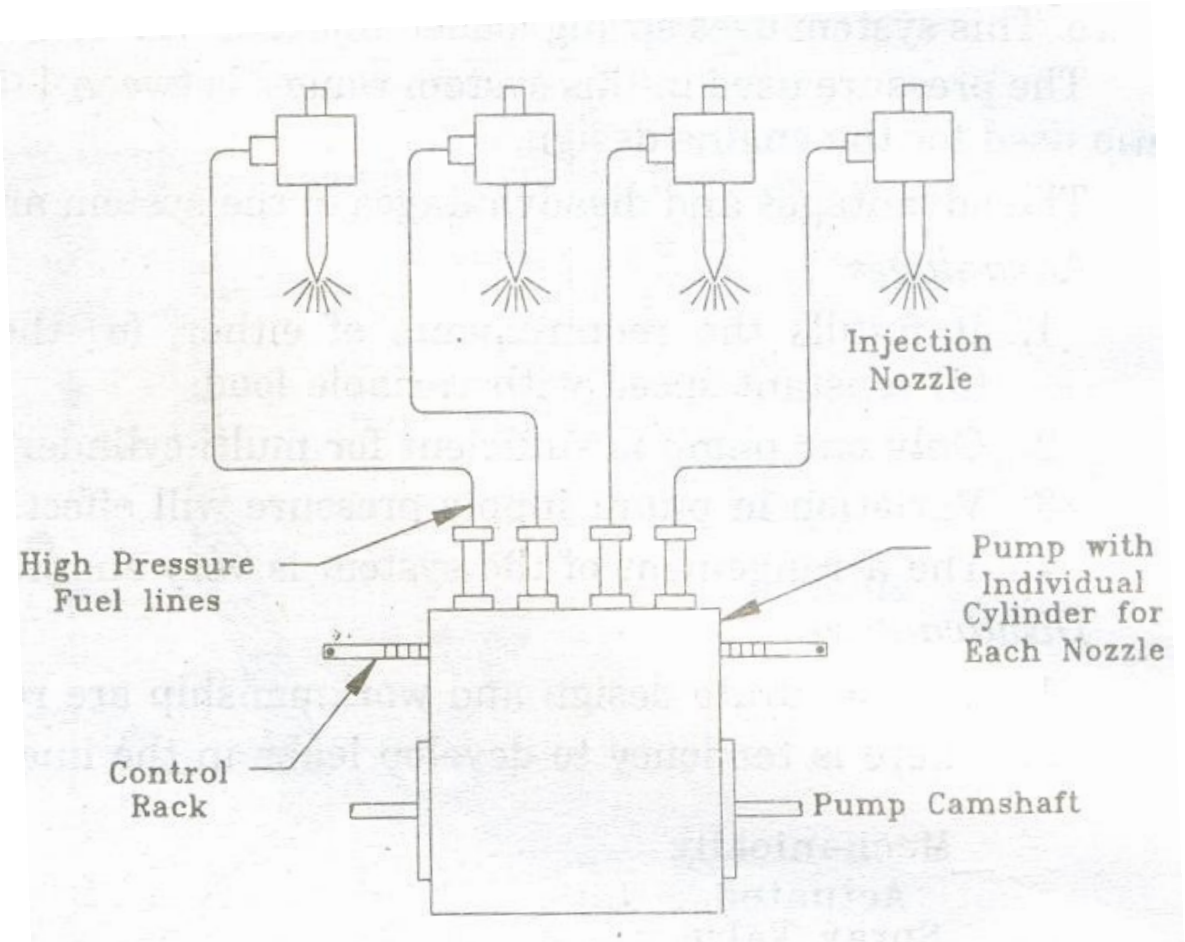

Fig. 10.8. Individual Pump System.

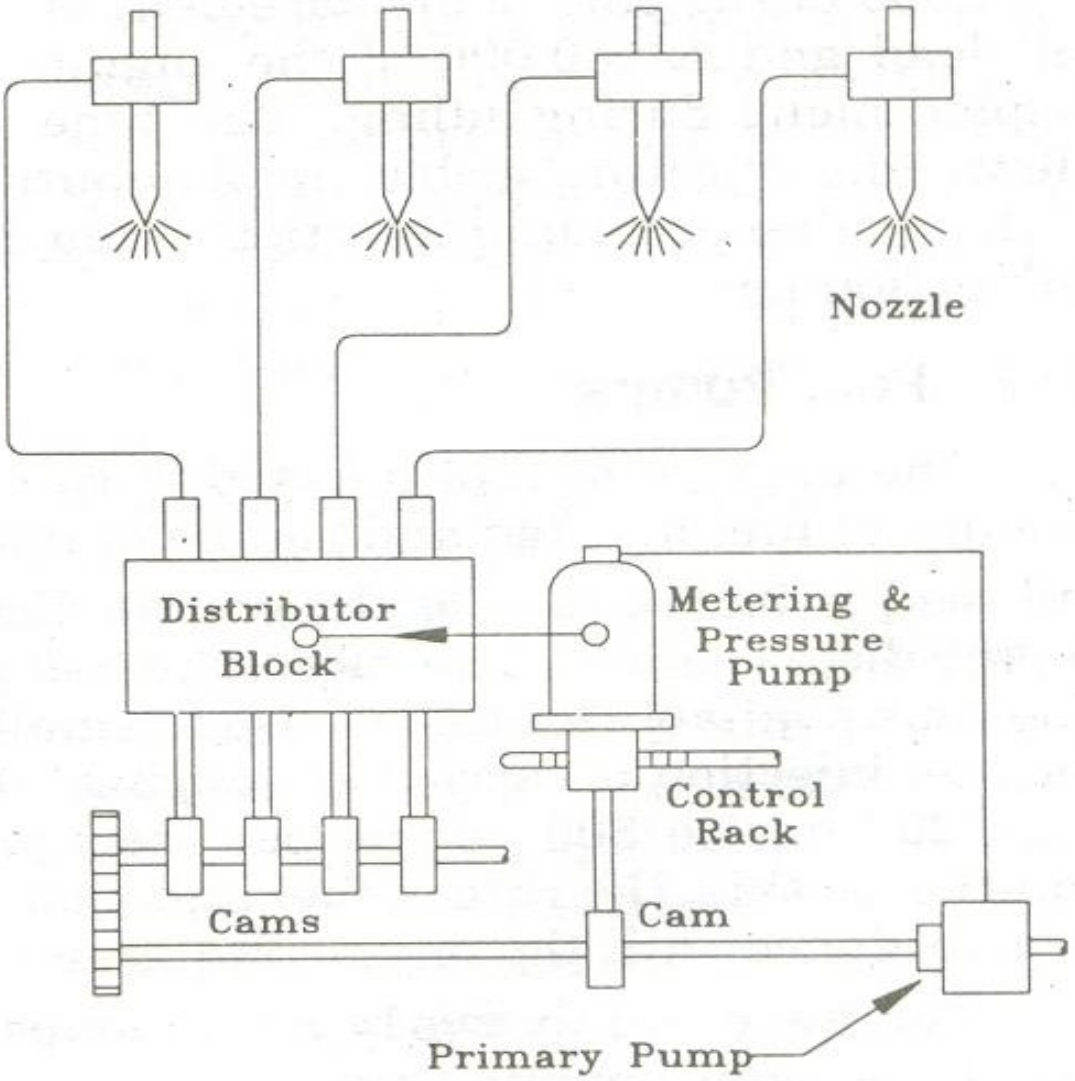

Fig. 10.7. Distributor System.

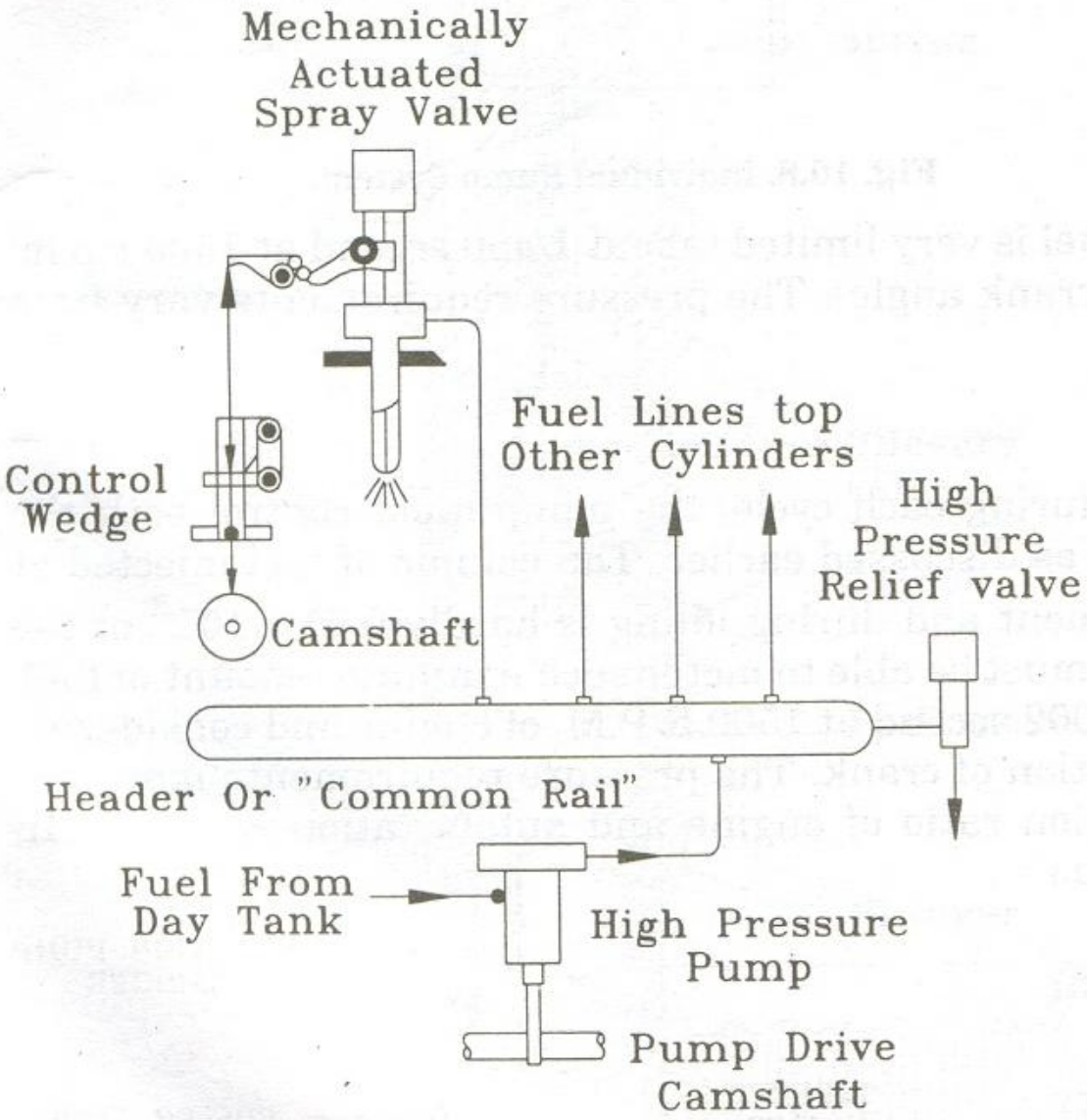

Fig. 10.6. Common Rail System.