3.17.7 Blow-off Cock

The functions of a blow-off cock (shown in Fig. 25) are:

(i) to empty the boiler if required

(ii) discharge the mud and scale accumulated at the bottom of the boiler.

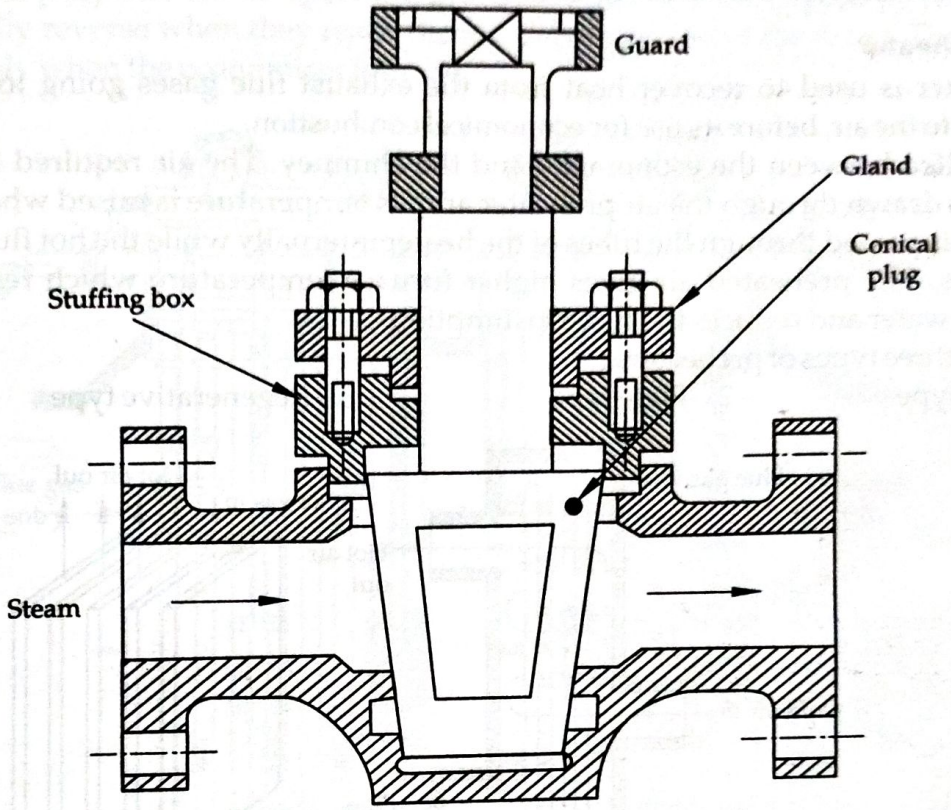

Fig. 25 Blow-off Cock

The cock is fitted to the bottom of a boiler drum and consists of a conical plug fitted to the body. The plug stem passes through a gland and stuffing box. There are two vertical slots on the inside of a guard for the box spanner to be used for operating the cock.

3.17.8 Man Hole

The function of man hole is to provide an opening through which a man can enter a boiler for cleaning and inspection purposes.

The man hole is provided on the boiler shell at a convenient place.

3.18 BOILER ACCESSORIES

These are those machine components which are installed either inside or outside the boiler to increase the efficiency of the plant and or to help in the proper working of the plant.

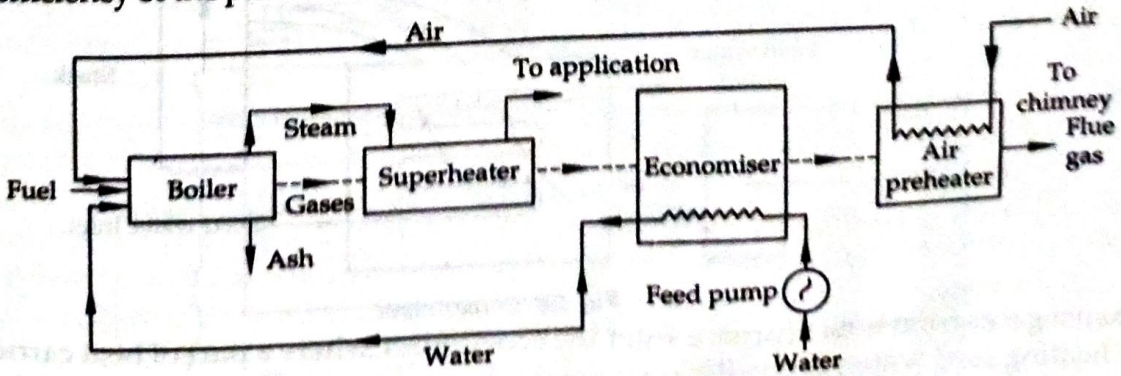

Fig. 26 Boiler Accessories

The following accessories are generally used in the boiler.

(i) Air preheater (ii) Economiser (iii) Superheater
(iv) Feed pump (v) Steam trap (vi) Steam separator
(vii) Pressure reducing valve (viii) Steam injector

Boiler Accessories are shown in Fig. 26.

3.18.1 Airpreheater

An airpreheater is used to recover heat from the exhaust flue gases going to the chimney and transferring it to the air, before its use for economical combustion.

It is installed between the economiser and the chimney. The air required for the purpose of combustion is drawn through the air preheater and its temperature is raised when passed through ducts. The air is passed through the tubes of the heater internally while the hot flue gases are passed over the tubes. The preheated air gives higher furnace temperature which results in more heat transfer to the water and reduces the fuel consumption.

There are three types of preheaters:

1. Tubular type 2. Plate type 3. Regenerative type

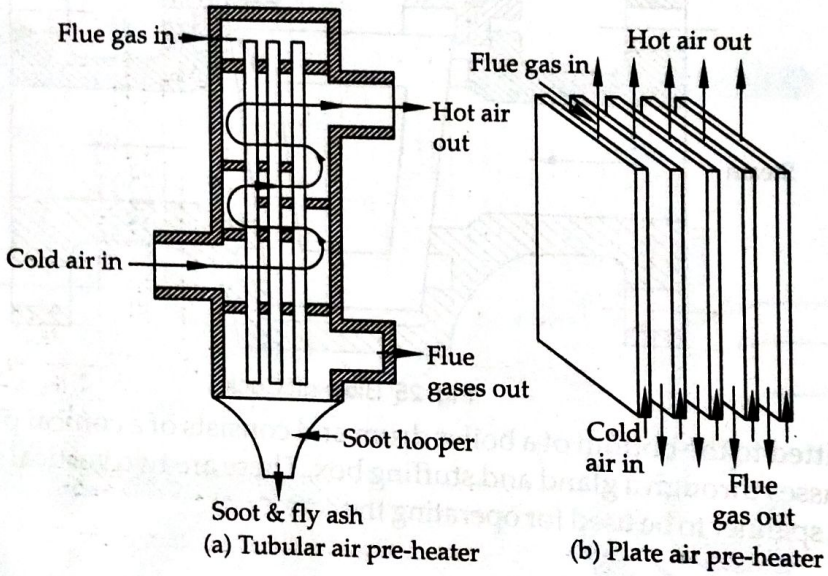

Fig. 27

3.18.2 Economiser

Economiser is a device used to heat feed water with the excess heat in the flue gases before leaving through the chimney to improve the efficiency of the boiler.

Figure 28 shows the basic principle of an economiser.

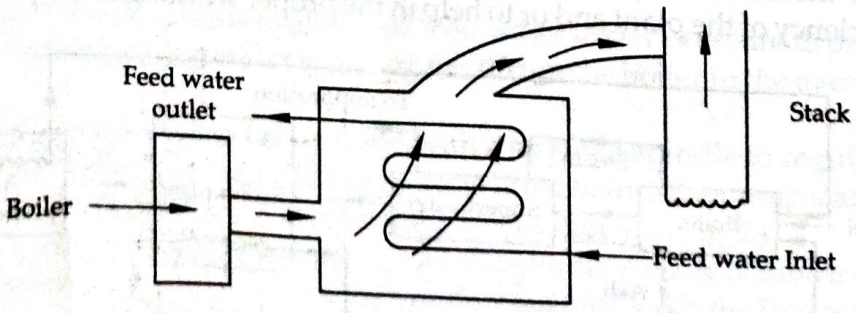

Fig. 28 Economiser

Exhaust gases from boiler furnace enter the economiser where a part of heat carried by them is used in heating feed water, thereafter they are discharged to atmosphere through the chimney or stack.

The constructional details of economiser is shown in Fig. 29. It consists of vertical water tube made up of cast iron. The feed water is pumped into the economiser at the bottom side and travels in cross flow direction to flue gas gaining heat before leaving from the top. To keep the vertical tubes free from deposite of soot, which greatly reduce the efficiency of the economiser, each tube is provided with scraper for this purpose. The scrapers are grouped together and coupled by rods and chains which automatically reverse when they reach the top or bottom end of the tubes. These are kept in motion continuously when the economiser is in use.

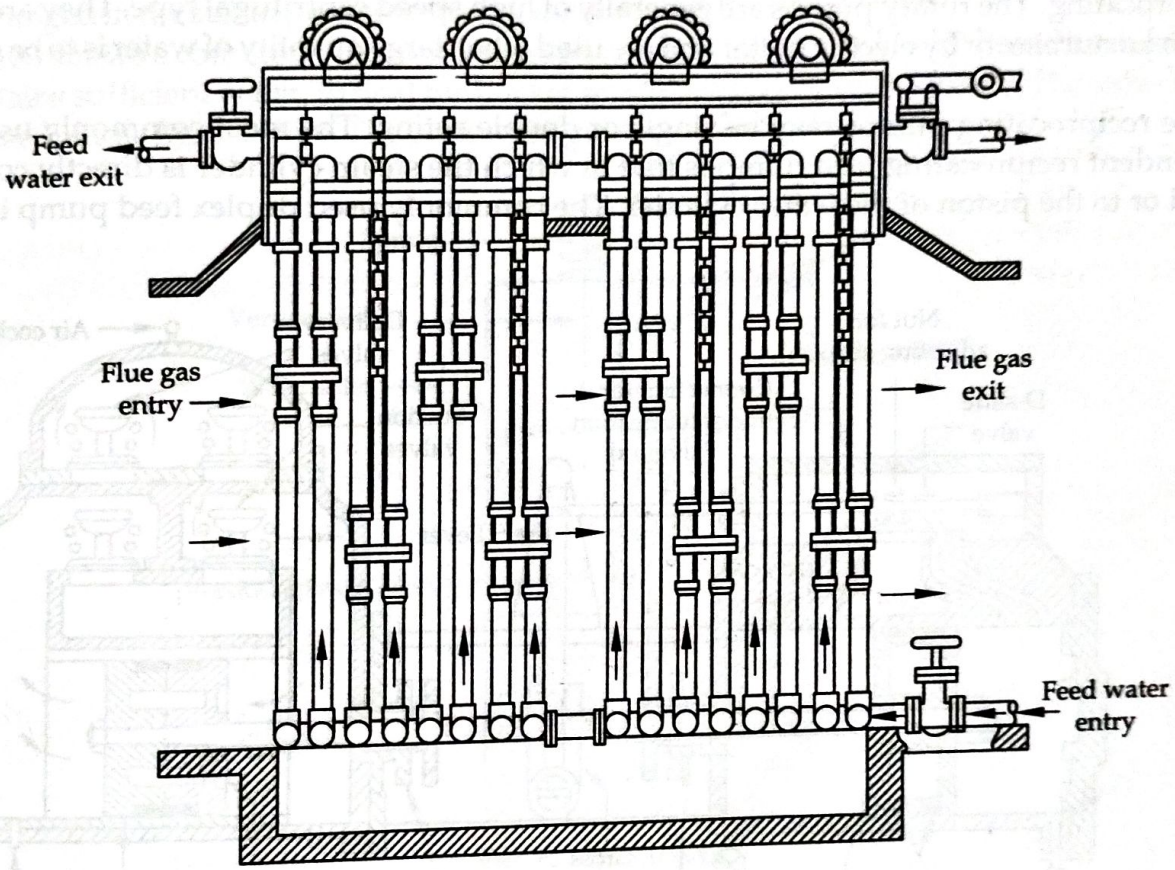

Fig. 29 The Constructional details of Economiser

3.18.3 Superheater

A superheater is used to increase the temperature of saturated steam at constant pressure.

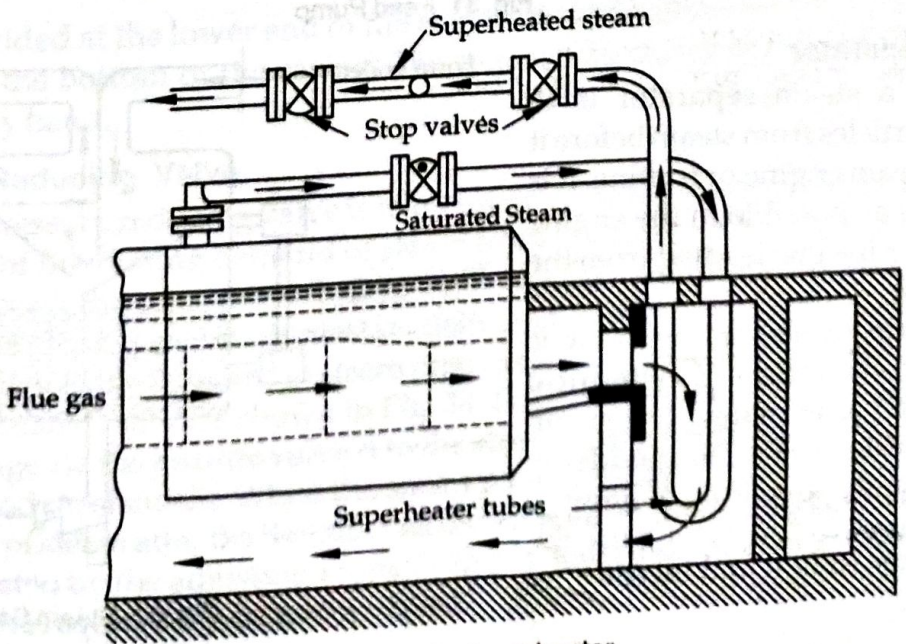

Fig. 30 Superheater

It is usually placed in the path of hot flue gases in the furnace and the heat of the flue gases is first used to superheat the steam as shown in Fig. 30.

The steam enters in the downstream tube and leaves at the front header. The overheating of superheater tube is prevented by the use of a balanced damper which controls the flue gas.

3.18.4 Feed Pump

The function of the feed pump is to pump the feed water to the boiler.

These pumps are needed for delivering the feed water into steam boiler. The pumps may be rotary or reciprocating. The rotary pumps are generally of high speed centrifugal type. They are driven by small steam turbine or by electric motor and are used when large quantity of water is to be supplied to boiler.

The reciprocating pumps may be single or double acting. The most commonly used form of independent reciprocating feed pump is that in which the steam cylinder is directly connected to the rod or to the piston of the water cylinder. The commonly used duplex feed pump is shown in Fig. 31.

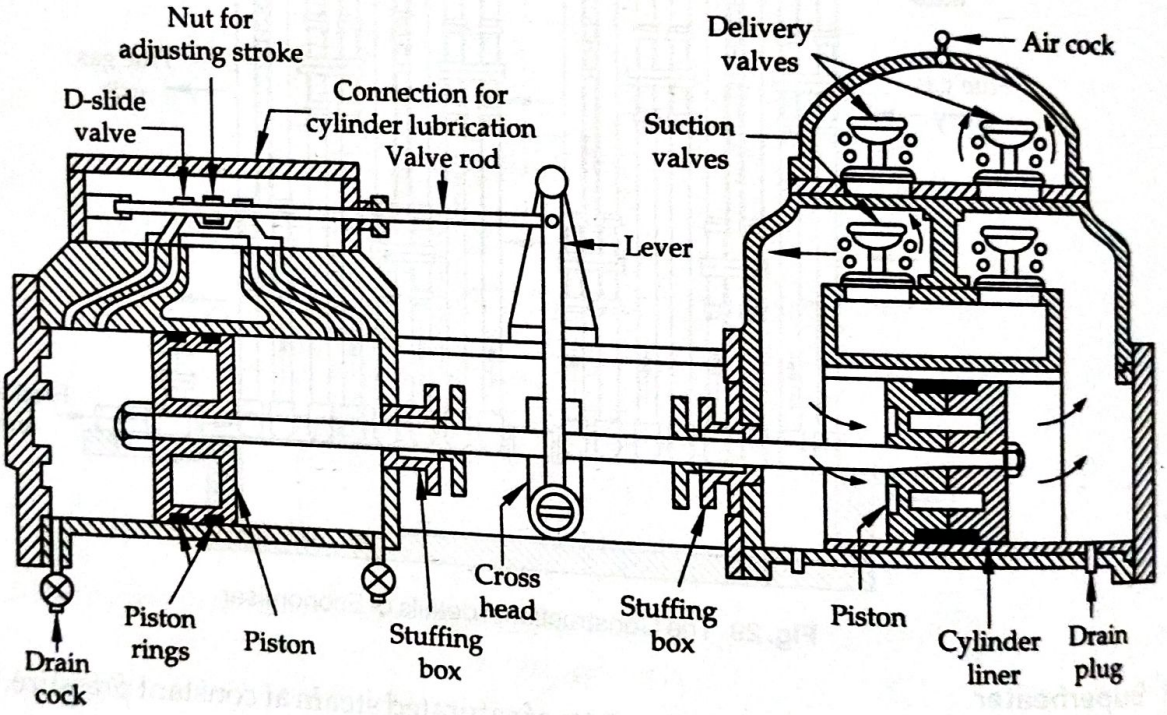

Fig. 31 Feed Pump

3.18.5 Steam Separator

The function of a steam separator is to separate water particles from steam before it is supplied to a steam engine or turbine. It is provided as close as possible to the engine in the main steam pipe line leading from the boiler to the engine.

A simple form of steam separator is shown in Fig. 32. It consists of cylindrical vessel fitted with baffle plates. The steam striking the baffle plate is suddenly deflected so that its direction of flow is changed. Consequently the water particles, due to their greater weight and inertia after

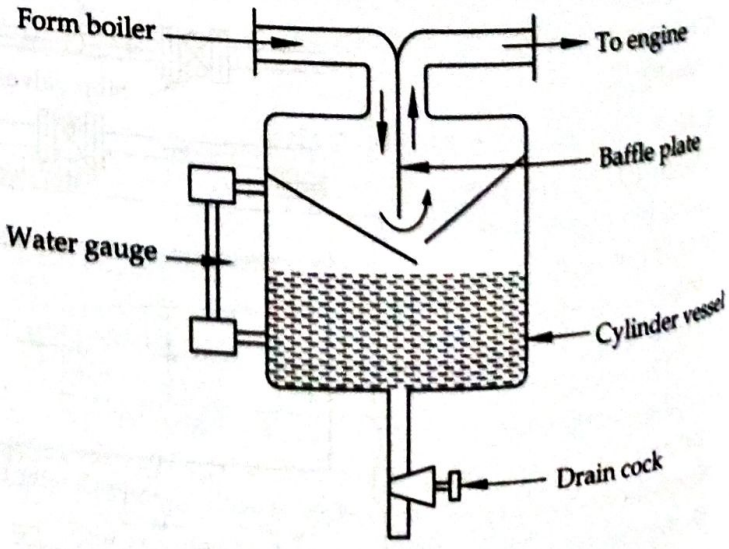

Fig. 32 Steam Separator

striking with baffle plates falll to the bottom of the separator. The water gauge indicates the level of water collected at the bottom of the separator. The drain cock fitted at the bottom of the separator helps to drain away the water separated from incoming steam. The steam free from water particles goes to the engine through the outlet pipe as shown in Fig. 32.

3.18.6 Steam Trap

Steam traps are devices used to automatically drain off water collected in the steam pipe or steam jacket as a result of partial condensation of steam, without allowing the steam to escape.

It is arranged in the steam pipe near the engine or the turbine.

Figure 33 shows a common type of steam trap known as *bucket steam trap*. It consists of a casting which contains sufficient water, to float the bucket which carries a vertical spindle. The valve fitted to the top of the spindle fits in a pipe. The guide tube guides the vertical spindle.

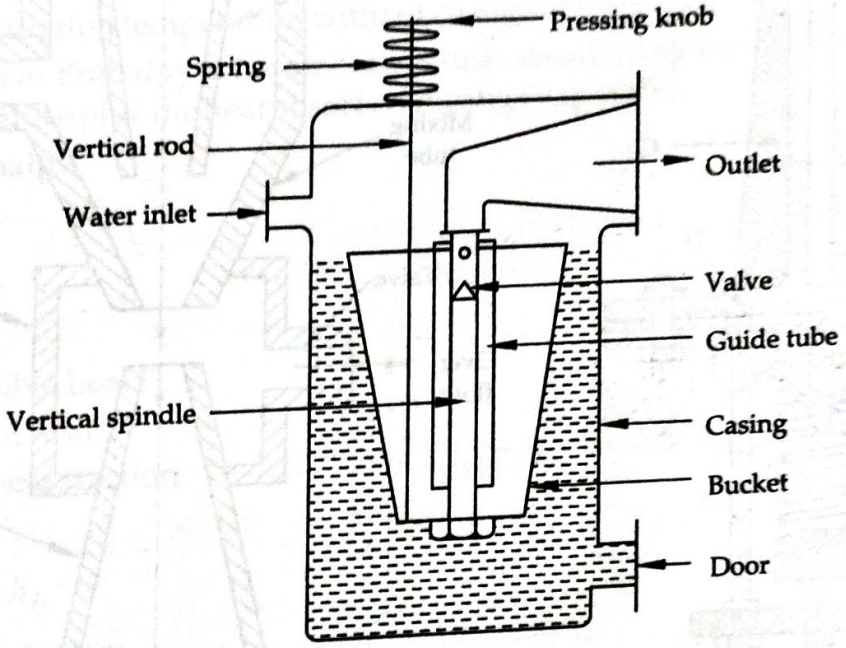

Fig. 33 Steam Trap

The steam trap is so located that the water formed due to condensation of steam in the steam pipe, flows into it by gravity. When the water rises high enough in the casting, it overflows into the bucket which ultimately sinks down and the valve opens. The water is then forced up through the guide tube.

The door provided at the lower end of the trap is used to remove periodically the sediments or dust deposited at the bottom of the casing. The trap can be tested at any time by blowing off by passing the knob by hand.

3.18.7 Pressure Reducing Valve

The function of a pressure reducing valve is to maintain constant pressure on its delivery side of the valve irrespective of fluctuating demand of steam from the boiler. This is achieved by throttling of steam passing through the pressure reducing valve. It is generally used in low steaming capacity boilers, where it is difficult to maintain constant delivery pressure with fluctuating demand of steam. Pressure reducing valves are installed in steam pipe to maintain pressure of steam.

The constructional details are shown in Fig. 34. From the boiler the high pressure steam enters the steam inlet flange via the throttle valve *A* to the steam outlet flange. The throttle is actuated by a spring and valve rod mechanism. When the steam passes through the throttle valve, it is throttled, hence the pressure of steam after the throttle valve is less than the inlet pressure. The force exerted by spring can be adjusted by the adjusting screw *F*. This will vary the opening of the throttle valve, so that any exit pressure required can be manipulated.

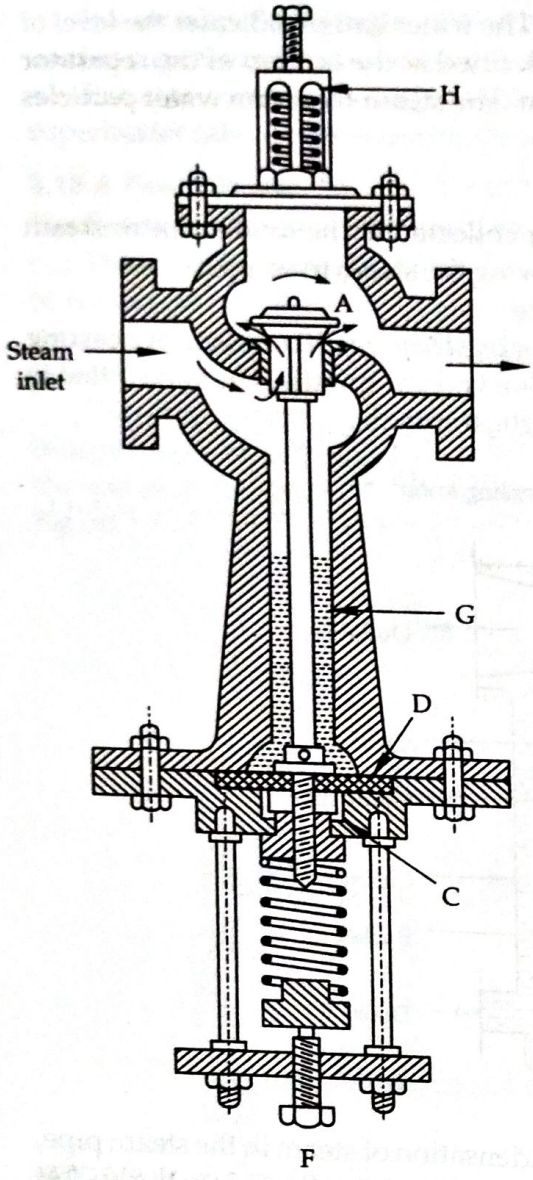

Fig. 34 Pressure Reducing Valve

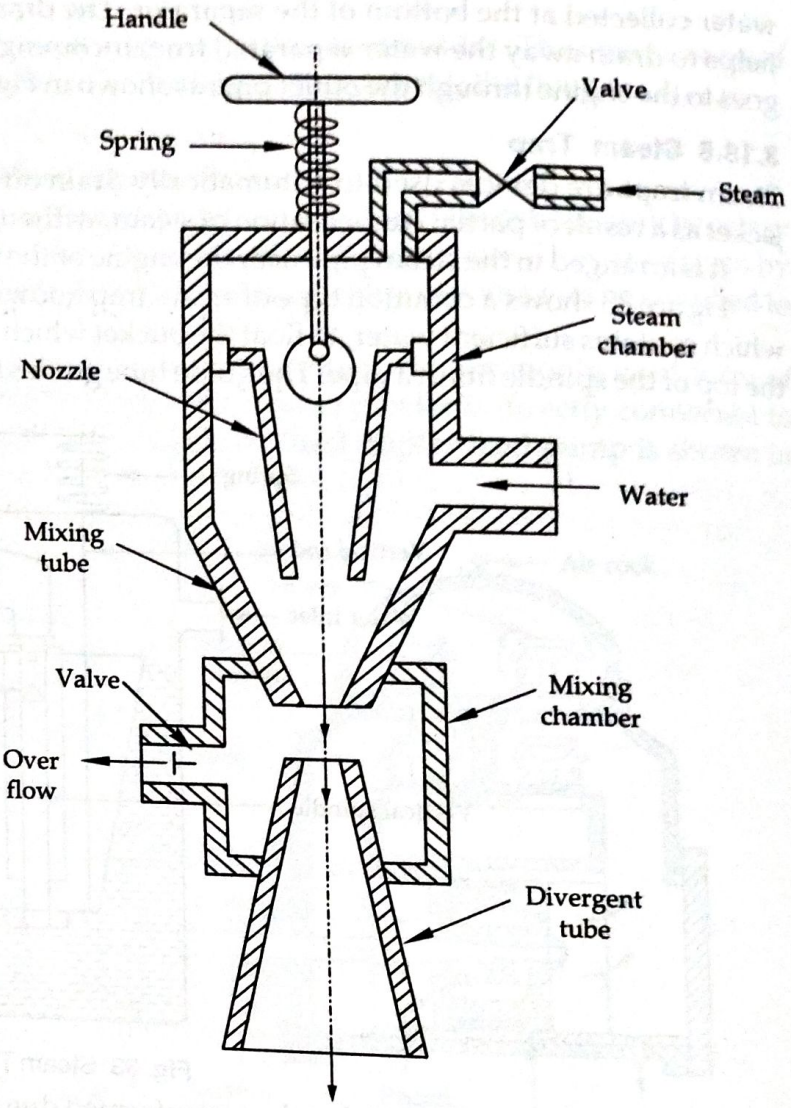

Fig. 35 Steam Injector

3.18.8 Steam Injector

The injector is a feed pump which is used to deliver feed water into the boiler under pressure. It is mostly used in a vertical and locomotive boiler and is not suitable for large power plant. It consists of group of nozzles so arrange that the steam expanding in this nozzles imparts kinetic energy to a mass of water.

Injector is shown in Fig. 35.