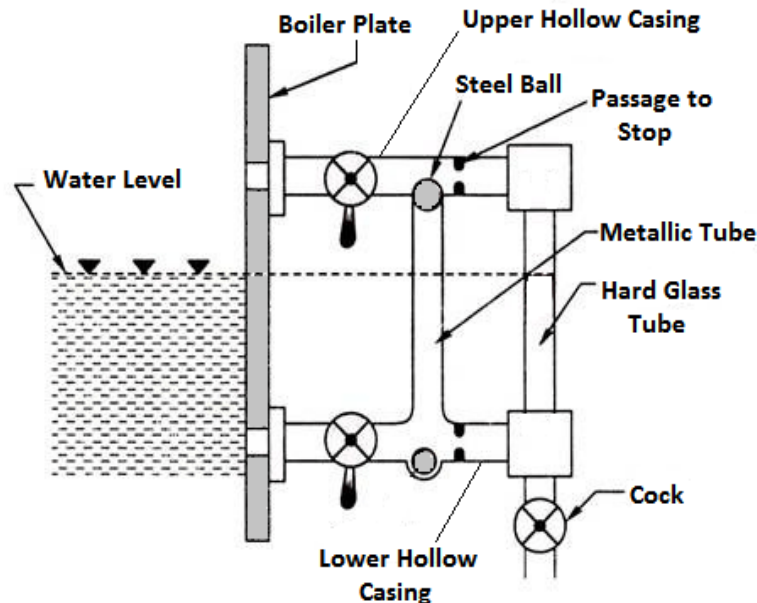


BOILER MOUNTINGS

These are the fittings, which are necessarily mounted on the boiler itself and mandatorily required for the safe and proper operation of boiler.

1. WATER LEVEL INDICATOR

Water level indicator is fitted outside the boiler shell to indicate the water level in the boiler through a glass tube.



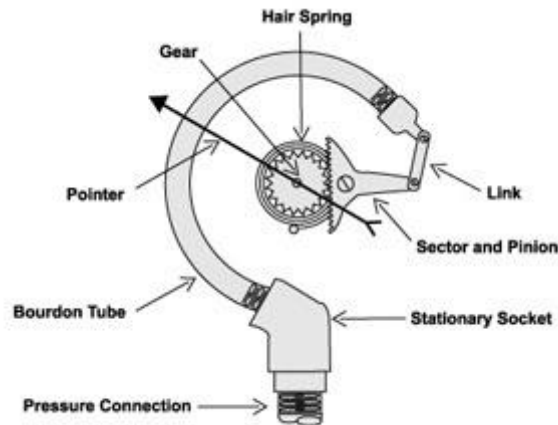
Two horizontal tubes made of gun metal extend from the boiler shell in such a way that top one is connected to steam space and bottom one is connected to water space of the boiler. These are connected at the other end by a vertical glass tube contained in a hollow casing in such a way that water and steam come out in the glass tube and their interface is visible through it. Each gun metal tube is also provided with a cock to control the flow of water/steam to the glass tube. One drain cock is fitted at the bottom for cleaning purpose. The horizontal metal tubes also contain one metal ball each which normally rests on a hemispherical groove in the tubes. In case the water/steam rush with high speed as may be if glass tube breaks by accident, this ball lifts up from its normal position and block a hole which connects the metal tube with glass tube and stops the flow.

When the cocks are opened, boiling water and steam from the boiler shell flow into the hard glass tube and maintain the same level as in the boiler which is visible to operator. When the water level falls down beyond a safe limit, operator may switch on the feed pump to fill more water in the boiler shell. In the water and steam passages in the gun metal tubes, a metal ball rest in the cavity made in the passage. In case of breakage of glass tubes by accident, water and steam contained at high pressure in the boiler rush with high speed towards broken glass tube due to large pressure difference between inside and outside of boiler. Due to this, the ball resting in the cavity made in the passage lifts and rushes towards the end of gun metal tube and

blocks the passage of steam or water flow. Then immediately the cock can be closed and glass tube can be replaced safely.

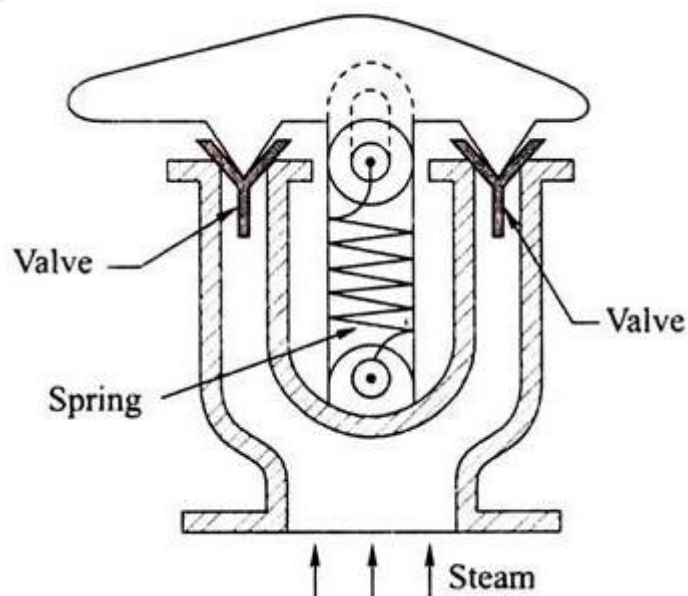
2. PRESSURE GAUGE

A pressure gauge is used to indicate the pressure of steam in the boiler. It is generally mounted on the front top of the boiler. Pressure gauge is of two types as (i) Bourdon Tube Pressure Gauge (ii) Diaphragm type pressure gauge. Both these gauges have a dial in which a needle moves over a circular scale under the influence of pressure. At atmospheric pressure it gives zero reading. A bourdon tube pressure gauge is normally used.



The bourdon tube is an elliptical spring material tube made with special quality bronze. One end of tube is connected to gauge connector and other end is closed and free to move. A needle is attached to the free end of tube through a small gear mechanism. With the movement of tube under pressure, needle rotates on the circular scale. The movement of tube & hence needle is proportionate to the rise in pressure and so calibrated with scale.

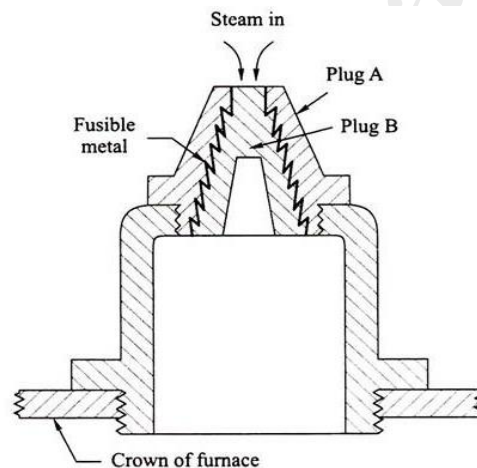
3. SPRING LOADED SAFETY VALVE



Spring loaded safety valve is a safely mounting fitted on the boiler shell and is essentially required on the boiler shell to safeguard the boiler against high pressure. It consists of two openings or valve seats which are closed by two valves attached to a single lever. The lever is pivoted at one end and attached to a spring at the middle. The spring is fixed at the bottom end with the overall body of valve. Due to spring force, the liver and hence valves remain seated on the valve seats and do not allow the steam to escape. When the pressure force of steam exceeds the spring pulling force, valve & lever are lifted and steam escape thus decreasing the pressure below the safe limit. On decreasing the pressure valves sit again on their seats and thus stop the steam flow from the boiler. Sometimes, the lever may also be lifted manually to release steam if required.

4. FUSIBLE PLUG

The function of fusible plug is to protect the boiler from damage due to overheating of boiler tubes by low water level. It is simply a hollow gun metal plug screwed into the fire box crown. This hollow gun metal plug is separated from the main metal plug by an annulus fusible material. This material is protected from fire side by means of a flange.



When the water in the boiler is at its normal level, fusible plug remains submerged in water and its temperature does not exceed its melting temperature, because its heat is transferred to water easily. If under some unwanted condition, water level comes down to unsafe limit; fusible plug is exposed to steam in place of water. On the other side it is exposed to fire. So its temperature exceeds its melting point due to very low heat transfer to steam and it melts down. Immediately steam and water under high pressure rush to the fire box and extinguish the fire.

BOILER ACCESSORIES

Boiler accessories are the components which are attached to the boiler (Not mounted on it) and are essentially for working of boiler and for increasing its efficiency.

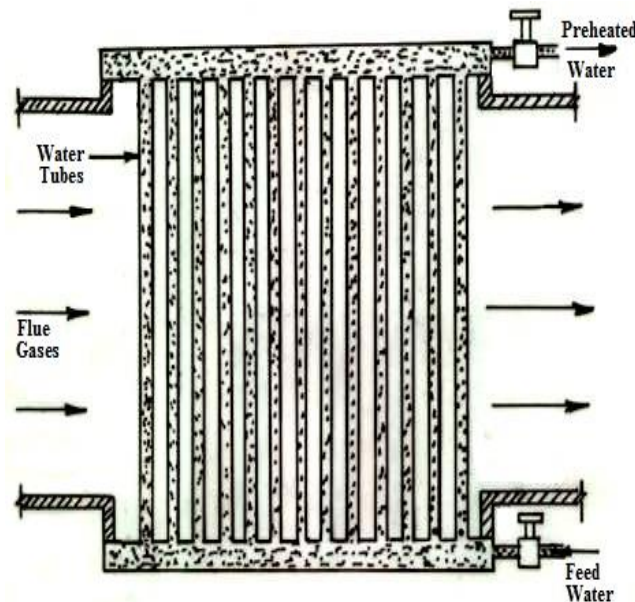
1. FEED PUMP

Feed pump is placed nearby the boiler and is used to feed water to boiler working at a high pressure. The job of feed pump is not just put the water in the boiler but as boiler is

working at high pressure, discharge pressure of feed pump must be sufficiently higher than this to push the water inside the boiler. The feed pump used in boiler is of two types (i) Reciprocating type (ii) Rotary type. Both these types are positive displacement type to discharge against high pressure.

2. ECONOMIZER

An economizer is a specially constructed heat exchanger for harnessing the heat energy of outgoing flue gases and utilizing it in preheating of boiler feed water. It saves the heat energy and so the fuel and decreases the operating cost of boiler by increasing its thermal efficiency. Economizers are of two types as (i) External type (ii) Internal type. The external type economizer is constructed and installed apart from the boiler and the flue gases from the boiler are directed to flow through it before escaping through chimney. A vertical tube external economizer is shown in fig

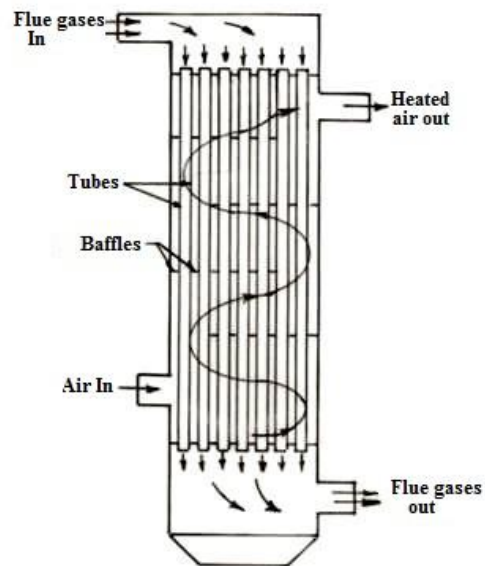


Here a number of vertical tubes made of cast iron are connected to common headers at the bottom and top. Feed water flow into the bottom header and then through the vertical tubes flow out from the top header. Hot flue gases escaping from the boiler are directed to flow across the outside surface of tubes thus indirectly heating the feed water flowing inside. An internal tube economizer is fitted inside the boiler and is an integral part of it.

Advantages of Economizer

1. Stresses produced in the boiler material due to temperature difference of boiler material and feed water are reduced because of increase in feed water temperature.
2. Evaporative capacity of boiler increases as less heat will be required to generate steam if feed water temperature is already high due to preheating.
3. Overall efficiency of boiler increases because of more steam produced per kg of fuel burnt.

3. AIR PRE-HEATER



The function of air pre-heater is to further utilize the heat of flue gases after coming out of economizer to preheat the air used in furnace or oil burner. It is a plate type or tubular type or storage heat exchanger, in which flue gases pass through the tubes on one side of plate and air pass on other side. A tubular type air-heater is as shown in fig.

4. SUPER HEATER

The function of super heater is to increase the temperature of steam beyond its saturation temperature. It is a type of heat exchanger. Hot flue gases coming out of burner are first directed through super heater before the boiler. The main advantage of superheating of steam comes in power plants, where steam is expanded through a turbine.