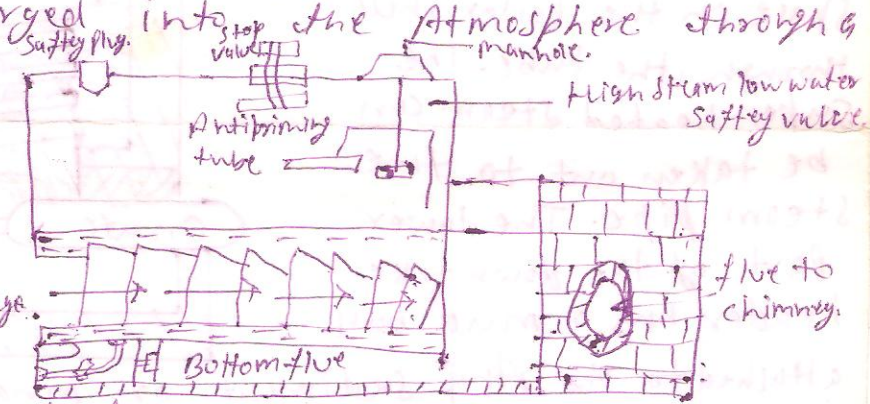


Q.1 Explain with a neat sketch construction of Lancashire boiler and Babcock Wilcox boiler.

Ans:

Lancashire Boiler: It consists of a long cylindrical shell about 9m and 2.74m in diameters. There are two furnace tubes also built up of several cylindrical rings which extend over the entire length of the boiler. The furnace tubes are about one meter in dia. The shell which is placed over the brickwork is filled with a substantial quantity of water. The steam generated collects in the space above the water level. The two furnace tubes are surrounded by water on all sides. There are two furnaces one for each fire tube and there are two grates and two fire holes. The hot products of combustion or flue gases transverse through the entire length of the furnace tube upto the back end and pass downwards and travel all along through the bottom flue situated under the shell to the front end of the boiler. The gases are finally discharged into the atmosphere through a chimney.



The fire bridge made up of fire bricks serves to prevent the entry of unburnt coal or ashes into the furnace tubes. The quantity of air entering the grate is controlled by the dampers placed in the path of flue gases as the latter are passing from the rear end of the side flues to the chimney. These dampers are in the form of doors operated by chains from outside. The boiler is fitted with the various mountings. The blow off cock is opened when the boiler is to be emptied for cleaning repair or inspection. It may also be used from time to time when it is required to blow out the mud or sediments during the operation of the boiler. The Lancashire boiler is usually constructed for working pressure up to 17.5 bar with evaporated capacities of about 8000 kg per hour. The ratio of the heating area to the grate surface is about 24. The boiler interior is accessible through the manhole through which a man can enter.

Babcock and Wilcox boiler: This is the one of most popular type of water tube boiler employed both for large as well as small power stations. The pressure at which steam can be raised varies from 110 to 17.5 but in exceptional can be high As 20000 to 40000 kg per hour.

It consist of large number of 11 tubes inclined at an angle which varies from $5-15^\circ$ to the horizontal which connect the uptake header with the downtake header both of which are connected to the shell having a substantial quantity of water in it. The coal is fed through the fire hole on to the chain grate stoker. The hot water and steam moisture rise up through the uptake header into the boiler shell, where steam separates from water and collects in the steam space. The cold water flows down into the tubes through the down take header. Thus a continuous circulation of water is maintained by the convection currents.

A set of Super heater tubes is provided to Superheat the steam which enters these tubes from the steam space in the boiler shell through the tube. The super heated steam can be taken out to the steam pipe. The lower part of the down take header has a mud box attached to it. Any sediment or mud in the water gets collected in this box, which can be blown off from time to time through the blow off cock. The quantity of air flowing through the boiler is controlled by the damper chain. The boiler is fitted with the usual mountings.

The enable the cleaning of the interior of the boiler two soot doors are provided as the whole boiler is enclosed in fire brick well in order to avoid any strain on the masonry the top expansion of the boiler the latter is suspended by steel slings from girders resting on steel columns.

