

LABORATORY MANUAL
ON
STUDY OF FIRE TUBE AND WATER TUBE BOILERS

Prepared
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AIM OF THE EXPERIMENT:-

Study of boilers (fire tube, water tube)

APPARATUS REQUIRED: -

SL.NO	NAME OF THE APPARATUS	SPECIFICATION	QUANTITY
01	Fire tube boiler	Cochran boiler	01
02	Water tube boiler	Babcock and Wilcox boiler	01

THEORY:-

BOILER:-

A steam generator or boiler is, usually, a closed vessel made of steel. Its function is to transfer the heat produced by the combustion of fuel (solid, liquid or gaseous) to water, and ultimately to generate steam.

FIRE TUBE BOILER:-

The boiler in which the hot gases from the furnace pass through the tubes which are surrounded by water is called fire tube boiler.

Example: - Cochran Boiler.

COCHRAN BOILER :-

- There are various designs of vertical multi tubular boilers. A Cochran boiler is considered to be one of the most efficient types of such boilers. It is an improved type of simple vertical boiler.
- The boiler consists of an external cylindrical shell and a fire box. The shell and fire box are both hemispherical, the hemispherical crown of the boiler shell gives maximum space and strength to withstand the pressure of steam inside the boiler.
- The hemispherical crown of the fire box also advantages for resisting intense heat.
- The firebox and the combustion chamber is connected through a short pipe.
- The flue gases from the combustion chamber flow to the smoke box through a number of smoke tubes. These tubes generally have 62.5mm external dia. And are 165 in number.
- The gases from the smoke box pass to the atmosphere through a chimney.

- The combustion chamber is lined with fire bricks on the shell side. A man hole near the top of the crown on the shell is provided for cleaning.
- At the bottom of the firebox, there is grate and the coal is fed through the fire hole.

WATER TUBE BOILER :-

The boiler in which The water circulates inside the tubes which are surrounded by hot gases from the furnace is called water tube boiler.

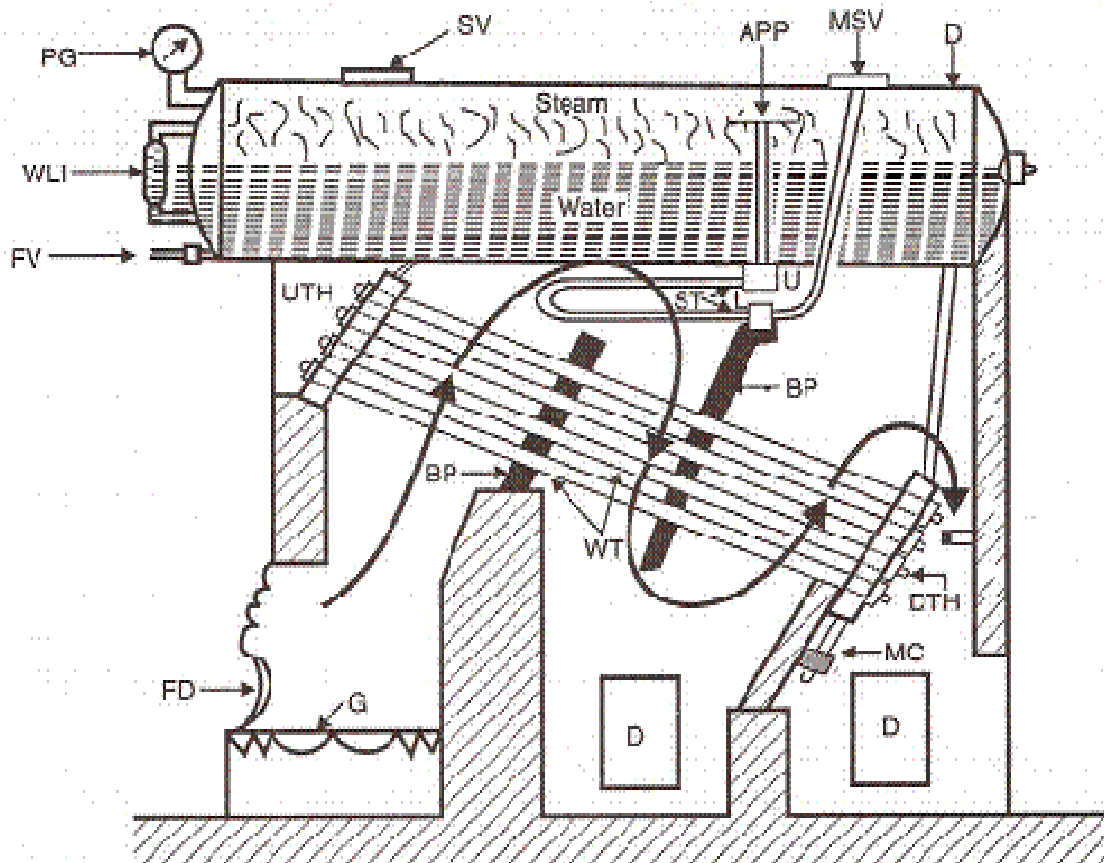
Example : Babcock and Wilcox boiler.

BABCOCK AND WILCOX BOILER:-

- It is straight tube, stationary tube water tube boiler.]
- It consists of steam and water drum. It is connected by a short tube with header at the back end.
- The water tubes are inclined to the horizontal and connect the uptake header to the down take header.
- Each row of the tube is connected with two headers, and there are plenty of such rows.
- A mud box is provided with each down take header and the mud, that settles down is removed.

- A hopper is provided to supply the coal.
- A baffle is present which moves upward and down to circulate the smoke inside the boiler.
- The dampers are operated by a chain which passes over a pulley to the front of a boiler to regulate the draught.
- The boiler is suspended on steel girders and surrounded on all the 4 sides by the fire brick walls.
- A door is provided for a man to enter the boiler for repairing and cooling.
- Water circulates from the drum into the header and through the tubes to header and again to the drum.
- Water continues to circulate like this till it is evaporated.
- A steam super heater consists of a large number of steel tubes and contains two boxes; one is superheated steam box and other is saturated steam box.
- The steam generated above the water level in the drum flows in the dry pipe and through the inlet tubes into the superheated steam box.
- The steam, during its passage through the tubes, gets further heated and through the outlet pipe to the stop valve.

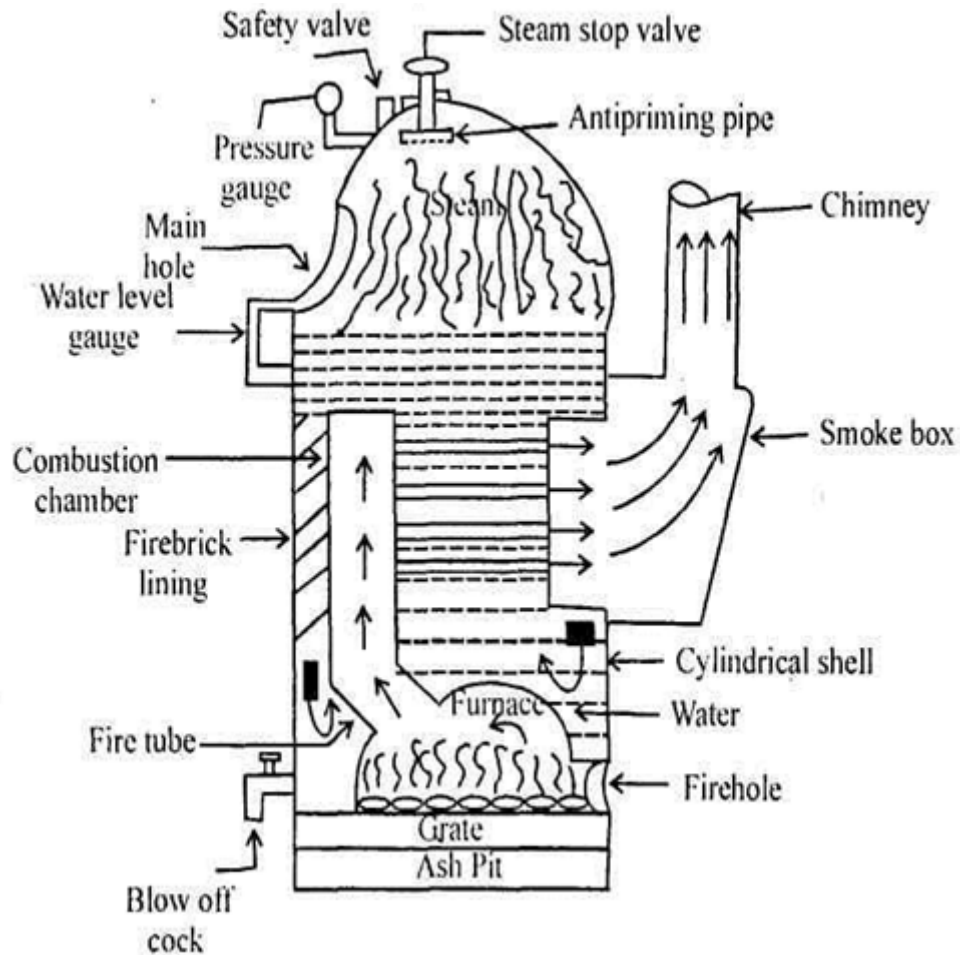
- The boiler is fitted with usual mountings, such as safety valve, feed valve, water level indicator and pressure gauge.



D = Drum
DTH = Down take header
WT = Water tubes
BP = Baffle plates
D = Doors
G = Grate
FD = Fire door
MC = Mud collector
WLI = Water level indicator

PG = Pressure gauge
ST = Superheater tubes
SV = Safety valve
MSV = Main stop valve
APP = Antipriming pipe
L = Lower junction box
U = Upper junction box
FV = Feed valve

BABCOCK AND WILCOX BOILER



COCHRAN BOILER

CONCLUSIONS: - From the above experiment we have successfully studied about water tube and fire tube boilers. The working principle, mountings and accessories of different types of boilers are also studied.