

UNIT-4

Steam Generators

INTRODUCTION

STEAM GENERATOR OR 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 to water and ultimately to generate steam.

The steam generated may be supplied :

1.To an external combustion engine, i.e., steam engine

and steam turbines

2.At low pressures for industrial process work in cotton mills, sugar factories , breweries etc., and

3.For producing hot water, which can be used for heating installations at much lower pressures

IMPORTANT TERMS:

- Boiler shell
- Combustion chamber
- Grate
- Furnace
- Heating surface
- Mountings
- Accessories

CLASSIFICATION OF STEAM BOILERS

Though there are many classifications of steam boilers yet

the following are important.

1. ACCORDING TO THE CONTENTS IN THE TUBE:

- a) fire tube or smoke tube boiler
- b) water tube boiler.

ACCORDING TO POSITION OF FURNACE:

- Internally fired boilers
- Externally fired boilers

ACCORDING TO AXIS OF FURNACE:

- . Vertical boilers
- . Horizontal boilers

ACCORDING TO NUMBER OF TUBES:

- Single tube boilers
- Multi tube boilers

ACCORDING TO METHOD OF CIRCULATION OF WATER:

- Natural circulation boilers
- Forced circulation boilers

ACCORDING TO THE USE

- Stationary boilers
- Mobile boilers

ACCORDING TO SOURCE OF HEAT

WATER TUBE STEAM BOILER:

the water is contained inside the tubes (called water tubes) which are surrounded by flames and hot gases from outside.

Ex: Babcock and Wilcox boiler, stirling boiler, L
- Mont boiler, yarrow boiler and loeffler boiler

FIRE TUBE BOILER

In fire tube steam boilers, the flames and hot gases produced by the combustion of fuel pass through the tubes (called multi tubes) which are surrounded by water.

The heat is conducted through the walls of the tube from the hot gases through the surrounding water.

Ex: Cochran boiler, Lancashire boiler, Cornish boiler,

WORKING OF AN COCHRAN BOILER

- Considered to be one of the most efficient type multi tubular boilers.
- Consists of external cylindrical shell and fire box. The shell and fire box both are hemispherical.
- The fire box and combustion chamber is connected through a short pipe.
- The flue gases from the combustion chamber flow to the smoke box through a

WORKING OF AN COCHRAN BOILER

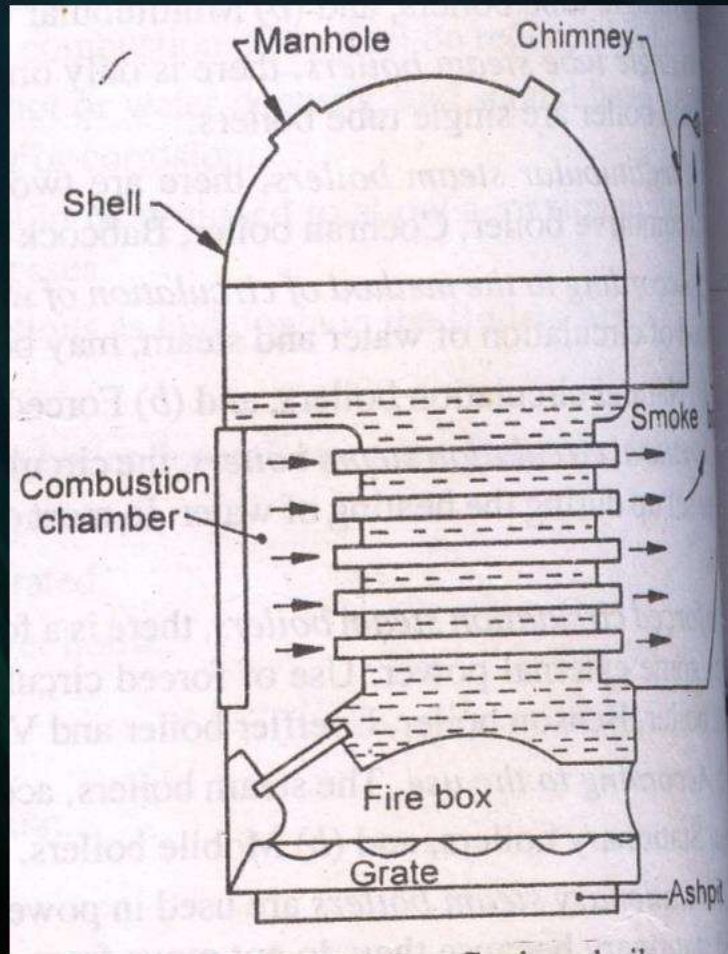
number of smoke

tubes

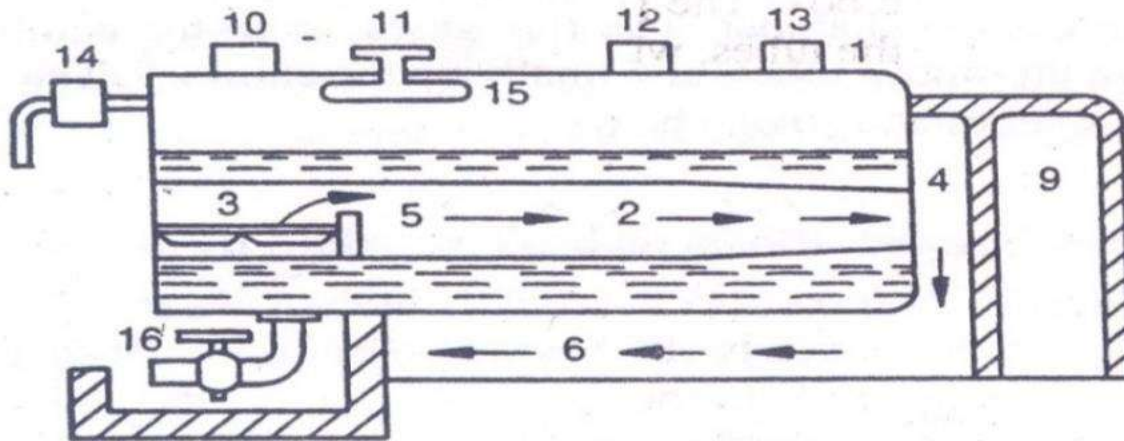
The gases from the smoke box pass to the atmosphere through a chimney

- The external diameter of pipe is 62.5mm and are 165 in number.
- Manhole is provided for cleaning.

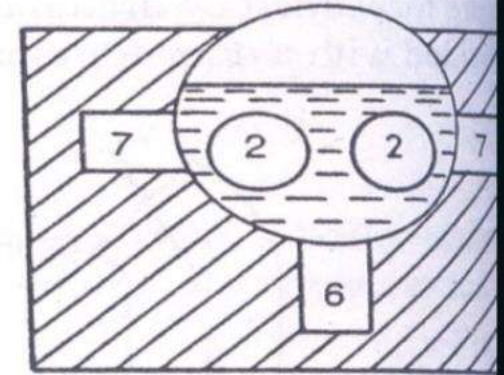
COCHRAN BOILER



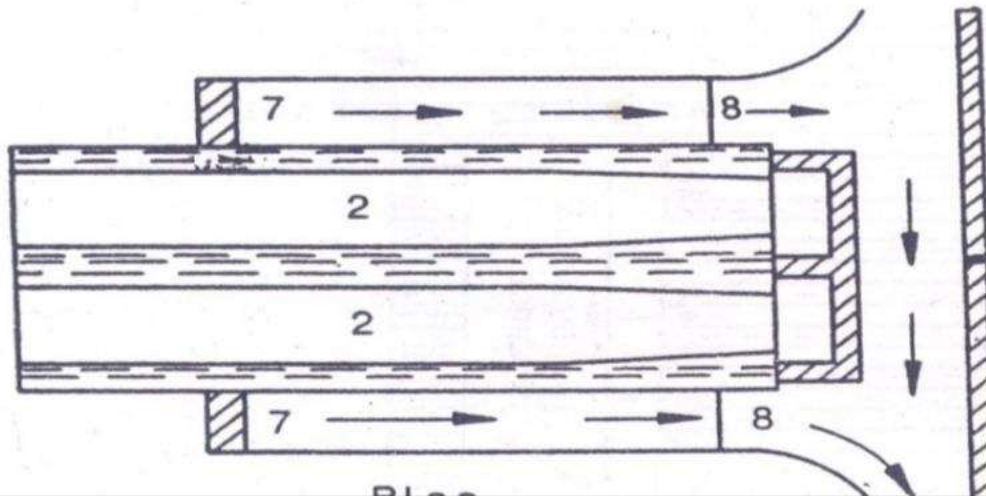
LANCASHIRE BOILER



Elevation



Side



Plan

- The boiler consists of a long cylindrical external shell (1) built of steel plates in sections riveted together.
- It has two large internal flue tubes (2).
- A fire grate (3) is also called furnace is provided at one end of the flue tubes on which solid fuel is burnt.
- At the end of the fire grate there is a brick arch (5) to deflect the flue gases upwards.
- The hot flue gases leaving internal flue tube passes through the bottom tube(6).

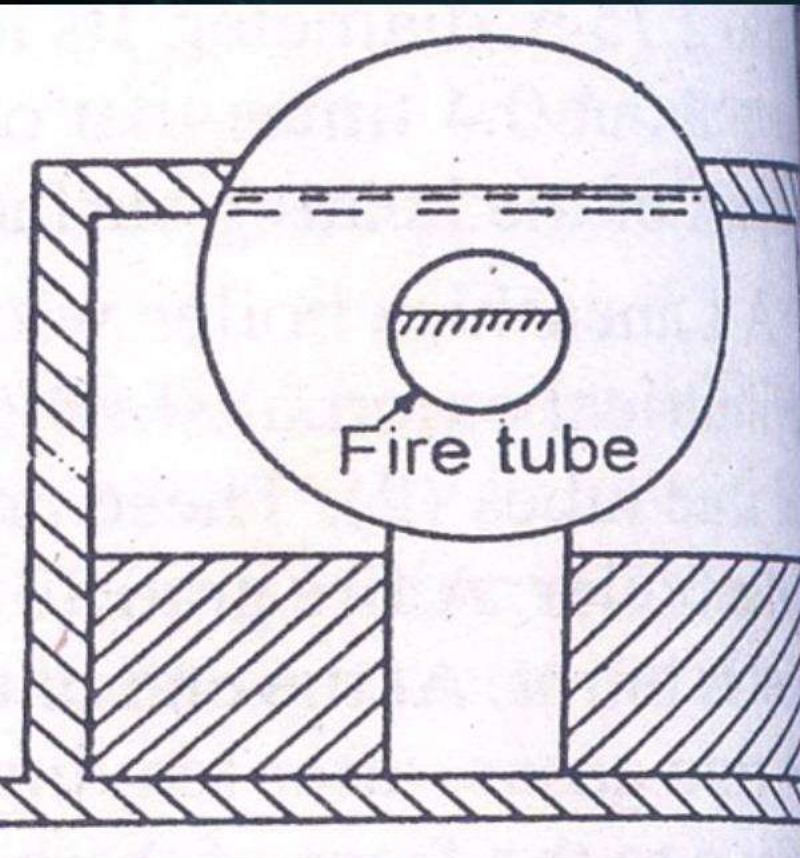
- These flue gases move to the front of the boiler where they divide and flow into side tube (7).
- The flue gases then enter the main flue (9) which leads them to chimney.
- The damper (8) is fitted at one side flues to control the draught and thus regulate the rate of generation of steam.
- A spring loaded safety valve (10) and stop valve (11) are mounted.

- A high steam and low water safety valve (12) is also provided.
- A perforated feed pipe (14) controlled by a feed valve is used for feeding water uniformly.
- An antipriming pipe (15) is provided to separate out water as far as possible.
- A blow-off cock (16) removes mud that settles at the bottom of the boiler by forcing out some of the water.

CORNISH BOILER

- It is a similar type of Lancashire boiler in all respects, except there is only one flue tube in Cornish boiler instead of two in Lancashire boiler.
- The diameter of Cornish boiler is generally 1m to 2m and its length varies from 5m to 7.5m.
- The diameter of flue tube may be 0.6 times that of shell.

CORNISH BOILER



□ The capacity and working pressure of a Cornish boiler is low as compared to Lancashire boiler.