

Cochran Boiler: Definition, Construction or Main Parts, Working Principle, Application, Advantages, Disadvantages [With PDF]

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Today in this article, we will look into the Main Parts, Working principle, Applications, Advantages, and Disadvantages of Cochran Boiler. So now let's start with the Definition of Cochran Boiler.

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What is Cochran Boiler?

Cochran Boiler is a multi-tubular vertical fire tube boiler having a number of horizontal fire tubes. It is the modification of a simple vertical boiler where the heating surface has been increased by means of a number of fire tubes. The efficiency of this boiler is much better than the simple vertical boiler.

Parts of Cochran Boiler:

A Cochran Boiler is consisted of following parts:

1. Shell
2. Grate
3. Combustion Chamber
4. Fire tubes
5. Fire hole
6. Firebox (Furnace)
7. Chimney
8. Man Hole
9. Flue pipe
10. Fire Brick Lining
11. Feed Check Valve
12. Blow Off Valve
13. Ash Pit
14. Smoke Box Door

15. Anti Priming Pipe
16. Crown
17. Pressure Gauge
18. Safety Valve
19. Water Level Indicator
20. Water Level Gauge
21. Fusible Plug
22. Stop Valve

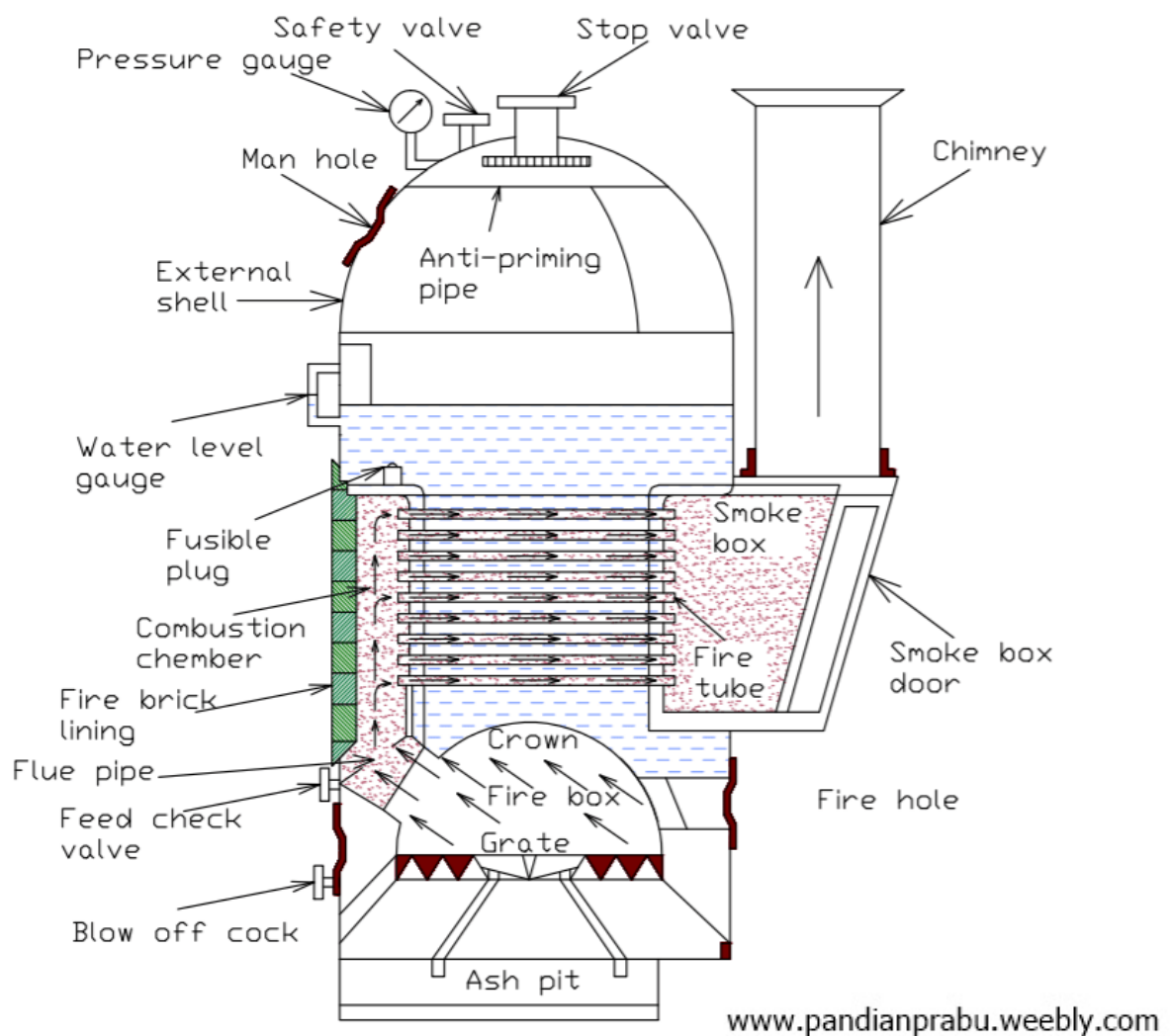


Diagram of Cochran Boiler,

#1 Shell:

The main body of the boiler is known as a shell. It is hemispherical on the top, where space is provided for steam.

This hemispherical top gives a higher volume to area ratio which increases the steam capacity.

#2 Grate:

In the grate section, solid fuel is stored, it is designed so well that air can easily flow through it, and also the ashes fall from the grate quite easily. In this section, the fire is placed.

#3 Combustion Chamber:

It is lined with fire bricks on the side of the shell to prevent overheating of the boiler. Hot gases enter the fire tubes from the flue pipe through the combustion chamber. The combustion chamber is connected to the furnace.

#4 Fire Tubes:

There are various fire tubes whose one end is connected to the furnace and other to the chimney. Several horizontal fire tubes are provided to increase the heating surface.

#5 Fire Hole:

The small hole is provided at the bottom of the combustion chamber to place fuel is known as a fire hole.

#6 Fire Box (Furnace):

It works as a mediator of fire tubes and combustion chamber.

It is also dome-shaped like the shell so that the gases can be deflected back till they are passed out through the flue pipe to the combustion chamber.

#7 Chimney:

It is provided for the exit of flue gases to the atmosphere from the smokebox.

#8 Man Hole:

It is provided for the inspection and repair of the interior of the boiler shell.

#9 Flue Pipe:

It is a short passage connecting the firebox with the combustion chamber.

#10 Fire Brick Lining:

It is a special type of brick lining used in Cochran Boiler to reduce the convection of heat from the outer surface of the boiler. Fire Brick is generally made of fire clay.

#11 Feed Check Valve:

It is used to control the flow of water inside the boiler, it also helps to restrict the backflow of water.

#12 Blow Off Valve:

It is used to blow off the settle down impurities, mud, and sediments present in the boiler water.

#13 Ash Pit:

It is a chamber inside a boiler where ashes are stored.

#14 Smoke Box Door:

It is used to clean the smoke box deposits materials.

#15 Anti Priming Pipe:

Sometimes water droplets come out with the steam, so to prevent the droplets from carried out by the steam the Anti Priming Pipe is used.

#16 Crown:

It is hemispherical dome-shaped section of a boiler, where burning of fuel happens.

#17 Pressure Gauge:

It measures the pressure of steam inside the boiler.

#18 Safety Valve:

It blows off the extra steam when the steam pressure inside the boiler reaches above safety level.

#19 Water Level Indicator:

The position of the water level in the Cochran boiler is indicated by the water level indicator.

#20 Water Level Gauge:

It glass tube fitted out side of the boiler to check the water level inside the boiler.

#21 Fusible Plug:

It is one type of safety measure. If the inside temperature of the boiler cross the limit, then for safety purpose this Fusible Plug melts and the water comes into the boiler furnace and extinguish the fire.

#22 Stop Valve:

Stop valve is used to transfer steam to the desired location when it is required. Otherwise, it stops the steam in the boiler.

Working Principle of Cochran Boiler:

The Cochran boiler works as same as other fire tube boiler.

First, The coal is placed at the grate through the fire hole.

Then the air is entering into the combustion chamber through the atmosphere and fuel is sparked through fire hole.

Then flue gases start flowing into the hemispherical dome-shaped combustion chamber. This flue gases further moves into the fire pipes.

Heat is exchanged from flue gases to the water into the fire tubes.

The steam produce collected into the upper side of the shell and taken out by when the required pressure generated.

The flue gases now send to the chimney through a firebox where it leaves into the atmosphere.

Now, this process repeats and runs continuously. The steam generates used into the small industrial processed.

Applications of Cochran Boiler:

The application of Cochran boiler are:

- Variety of process applications industries.
- Chemical processing divisions.
- Pulp and Paper manufacturing plants.
- Refining units.

Besides, they are frequently employed in power generation plants where large quantities of steam (ranging up to 500 kg/s) having high pressures i.e. approximately 16 megapascals (160 bar) and high temperatures reaching up to 550 °C are generally required.

Features of Cochran boiler:

These are some features of Cochran Boiler:

- In the Cochran boiler, any type of fuel can be used.
- It is best suitable for small capacity requirements.
- It gives about 70% thermal efficiency with coal firing and about 75% thermal efficiency with oil firing.
- The ratio of the grate area to the heating surface area varies from 10: 1 to 25:1.

Advantages of Cochran Boiler:

The advantages of Cochran Boiler are following:

- Low floor area required.
- Low initialization cost.
- It is easy to operate.
- Transport from one place to another is very easy.
- It has a higher volume to area ratio.

Disadvantages of Cochran Boiler:

There are some disadvantages of Cochran Boiler and those are:

- Low steam generation rate.
- Limited pressure handles capacity.
- It is difficult to inspect and maintain.

So this is all about Cochran boiler, I hope you like this article, if so then don't forget to share this article on your favourite social media platform. See you in some other article till then, stay safe and keep learning.

References:

