8.13. DRAUGHT

Draught refers to force needed to draw. In case of boilers, it is required to provide the adequate supply of air to furnace grate to maintain the proper combustion of fuel and to discharge the products of combustion through chimney to surrounding.

Thus, the small pressure difference which causes a flow of gas (chimney to surrounding) is called as *boiler draught* or *simply draught*.

8.14. CLASSIFICATION OF DRAUGHT

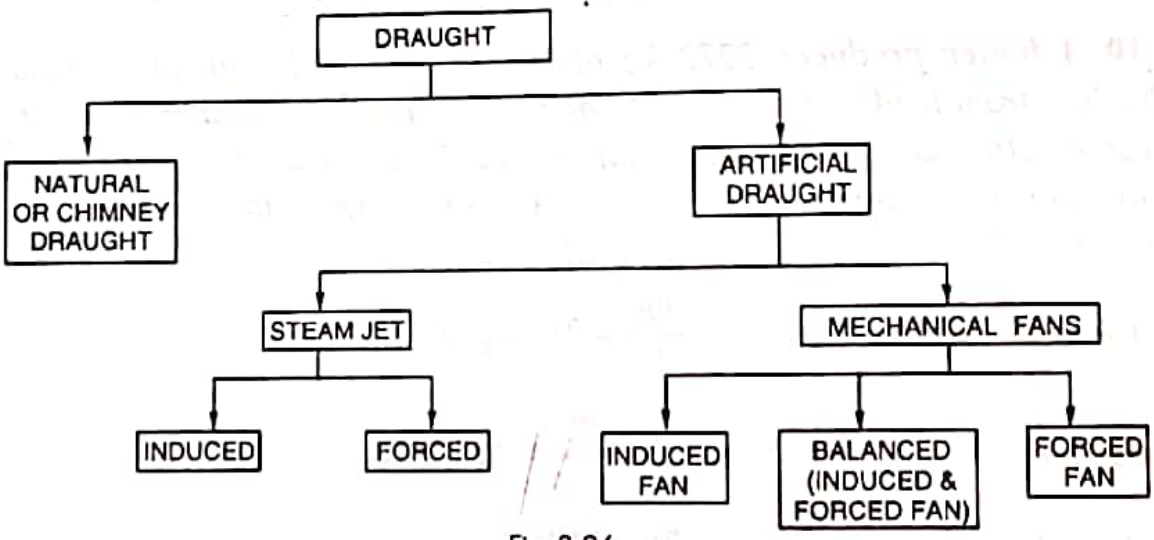

Fig. 8.26.

8.15. NATURAL DRAUGHT

Natural draught is also known as *chimney draught* as it is produced with the help of chimne The difference in static pressure by chimney is obtained by the difference of weight of colum of hot gases inside chimney and weight of column of cold air just outside chimney. It has bee noticed that the pressure outside the level of chimney is more than the pressure inside becaus the density of cold air particles is greater than the hot gases.

This pressure difference causes air to flow from the surrounding to the furnace grate.

The height of chimney required to produce necessary boiler draught is given by

8.16. DRAUGHT LOSSES

There is always some loss of draught due to following reasons :

1. Frictional resistance offered by the flues and gas passages to the flow of flue gases.
2. Loss near the bends in the gas flow circuit.
3. Loss due to friction band in equipments like grate, economize and superheater.
4. Loss due to imparting velocity to the flue gases.

The loss in draught in a chimney is 20% of the total draught produced by it.

8.17. ARTIFICIAL DRAUGHT

Today, modern power plants needed a draught of order of 25-300 mm of water column which is not possible with the help of chimney. Only about 40 mm of water column draught can be obtained through chimney. It is also neither economical nor convenient to built a chimney of such considerable height for larger draught.

Therefore, it is necessary to provide some mechanical means to provide such a larger draught requirements and the draught so produced is called *artificial draught.*

Following types of artificial draught are used in modern power plants.

1. Steam jet draught. It is provided with the aid of steam jet. It uses the exhaust steam of the non-condensing steam engine. This method is simple and cheap. It can be further divided as:

(*a*) Induced steam jet draught.
(*b*) Forced steam jet draught.

2. Fan draught. It is obtained by the aid of centrifugal fan or blower. These are of following types :

(*a*) Induced fan draught
(*b*) Forced fan draught.
(*c*) Balanced fan draught.

Advantages of artificial draught over natural draught :

1. Increased evaporation capacity of boiler.
2. Gives better control on draught requirement.
3. Improves combustion and plant efficiencies.
4. Uses inferior grade of fuel.
5. Meet the large draught requirements of modern boilers.

draught.

4.4.20 Forced Draught

Forces draught fan forces ambient air through the chimney creating the required draught. A fan or blower is installed near the base of the boiler.

Atmospheric air is forced to pass through boiler furnace, economiser, air preheater and chimney. This draught system is known as positive draught system because the pressure throughout the system is above the atmospheric pressure.

The function of the chimney is only to discharge the gases high into atmosphere to reduce air pollution. It is to be noted that the chimney is not designed to produce draught, the height of the chimney may not be large. (Refer to Fig. 4.38).

4.4.21 Induced Draught

In this system, the blower or induced draught fan is installed near the base of the chimney. The air is sucked into the system by reducing the pressure through the system below the atmospheric pressure. The gases from the furnace are sucked by the induced draught fan. These gases pass through economiser, air preheater, induced fan and discharged through the chimney to the atmosphere. The temperature of gases is reduced as they pass through the economiser and air preheater. (Refer to Fig. 4.39).

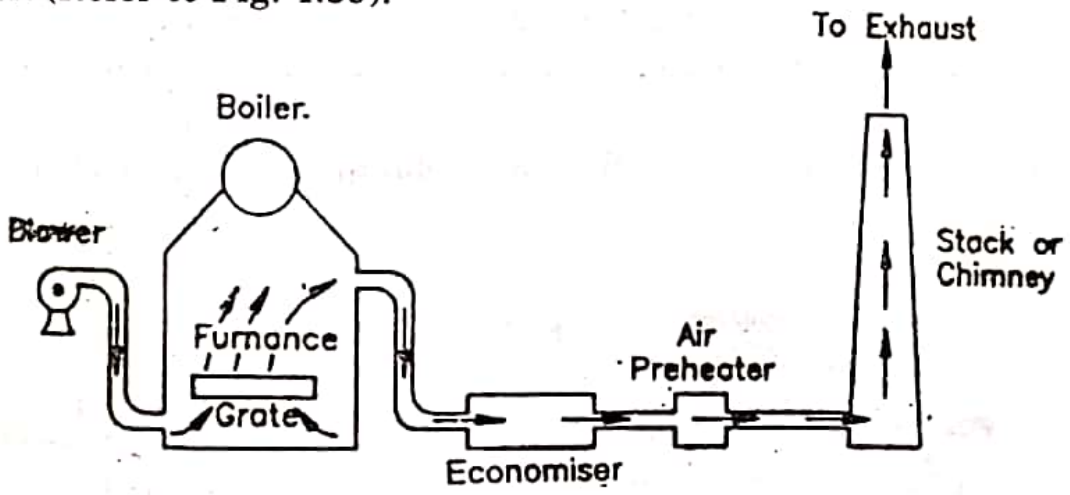

Fig. 4.38. Forced Draught.

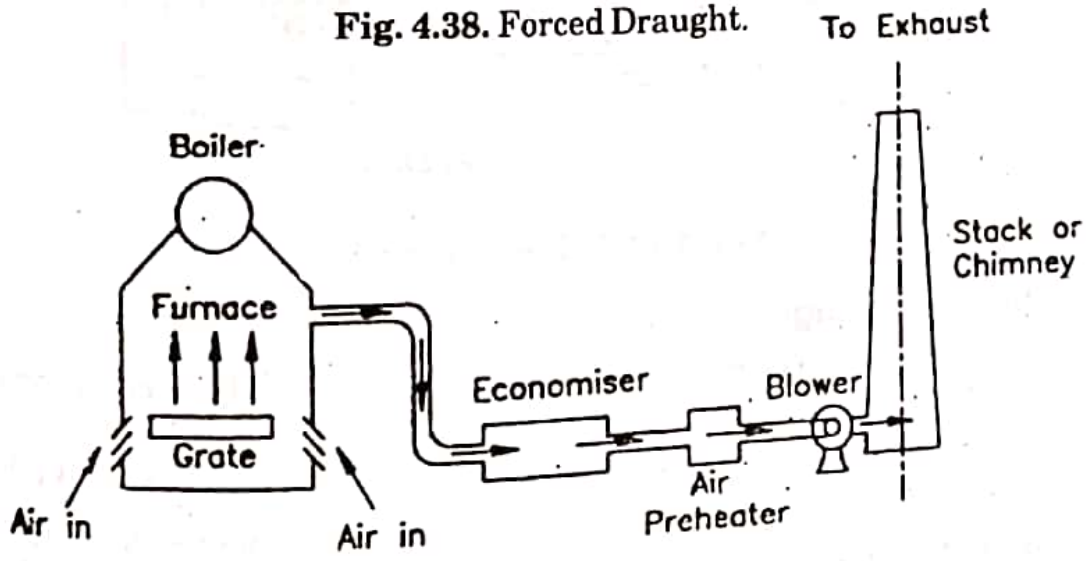

Fig. 4.39. Induced Draught.

Advantages of Forced Draught over Induced Draught. The advantages of forced draught system over the induced draught system are as follows :

1. The size and power required by the induced draught fan is more than forced draught fan. The forced draught fan handles cold air (more dense air than hot air) therefore the fan size and power required for the same capacity of draught and nearly $\frac{1}{2}$ that of the induced draught system.
2. Water cooled or air cooled bearings are required by induced draught fan because it bandles hot gases.
3. In induced draught system there is leakage of air into the furnace as the pressure inside the furnace is below the atmosphere. But in forced draught system there is no chance of leakage as the pressure inside the furnace is above atmosphere.

4.4.22 Balanced Draught

(Refer to Fig. 4. 40). The balance draught is a combination of the induced and forced draught system. It is always preferable to use combination of induced draught and forced draught system instead of forced or induced draught alone.

If only the forced draught is used, the furnace cannot be opened for firing or inspection. Because the high pressure air/gases inside the furnace will try to blow out.

If only the induced draught is used, the furnace cannot be opened for firing or inspection. Because the cold air will try to rush into the furnace, which reduces the effective draught.

Considering the above difficulties a balanced draught system is always preferred.

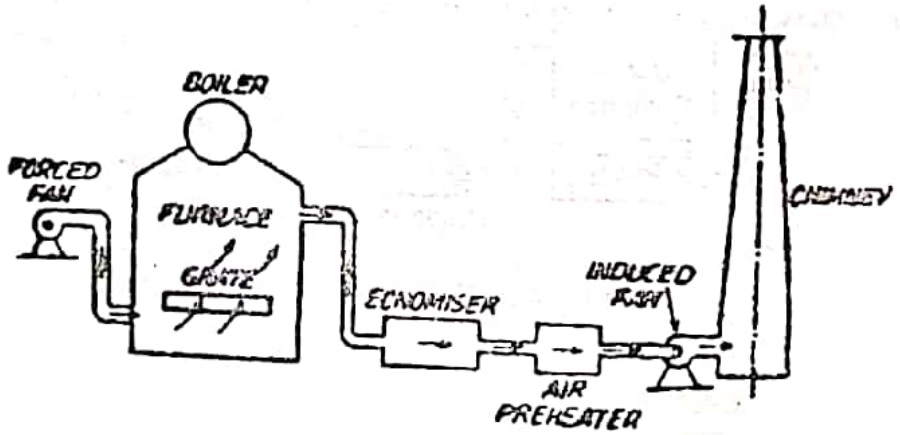

Fig. 4.40. Balanced draught.

4.4.23 System Jet Draught

It is an artificial type draught. It may be Forced or Induced type (Refer to fig. 4.41).

The steam nozzle is located near the smoke box, the air is sucked through the system, into the smoke box. If the steam nozzle is located near grate, air is forced through the system.

Induced draught is produced by steam jet in case of locomotive boiler. The ust steam from the steam engine is passed through the nozzle to the smoke o produce draught.

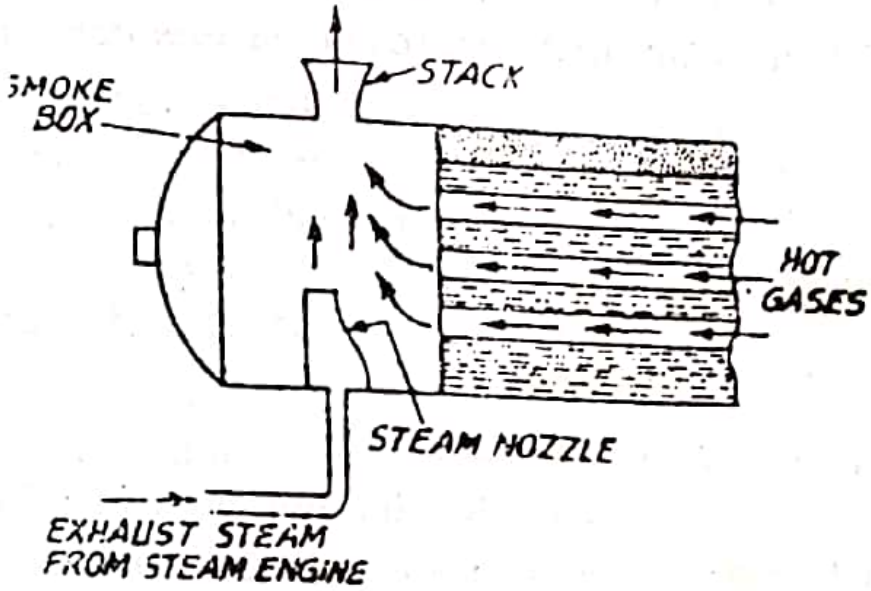

Fig. 4.41. Induced type steam jet draught used for locomotive boilers.

Advantages of Steam Jet Draught

1. It is very simple and economical.
2. It occupies minimum scale.
3. No maintenance cost.

isadvantages of Steam Draught

The only disadvantage of this system is that it cannot be started until high ressure steam is available.