Fig. 20.10. Edward's air pump.

20.27. Cooling Towers

The cooling towers are used in many applications in engineering. The main applications are in power plants and refrigeration plants. Its function is to cool the hot water from the condenser by exposing it to the atmospheric air, so that the cold water may be used again for circulation. The cooling towers are used in steam power plants where there is a limited supply of cooling water. It is placed at a certain height (at about 9 metres from the ground level). The hot water falls down in radial sprays from a height and the atmospheric air enters from the base of the tower. The partial evaporation of water takes place which reduces the temperature of circulating water. This cooled water is collected in the pond at the base of the tower and pumped into the condenser.

Following are some factors which affect the cooling of water in a cooling tower :

1. Size and height of cooling tower,
2. Arrangement of plates in cooling tower,
3. Velocity of air entering the cooling tower,
4. Temperature of air,
5. Humidity of air, and
6. Accessibility of air to all parts of the cooling tower.

20.28. Type of Cooling Towers

The cooling towers may be classified as follows :

1. *According to the type of draught.* The cooling towers, according to the type of draught are (*a*) Natural draught cooling towers, (*b*) Forced draught cooling towers, and (*c*) Induced draught cooling towers.

In a *natural draught cooling tower,* as shown in Fig. 20.11, the circulation of air is produced by the pressure difference of air inside and outside the cooling tower.

In a *forced draught cooling tower*, as shown in Fig. 20.12, the circulation of air is produced by means of fans placed at the base of the tower.

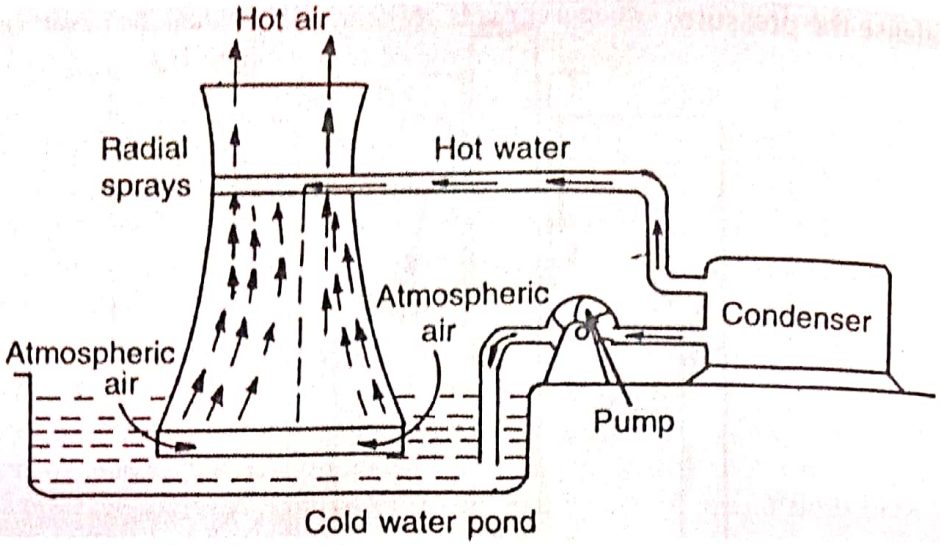


Fig. 20.11. Natural draught cooling tower.

In an *induced draught cooling tower*, as shown in Fig. 20.13, the circulation of air is provided by means of fans placed at the top of the tower.

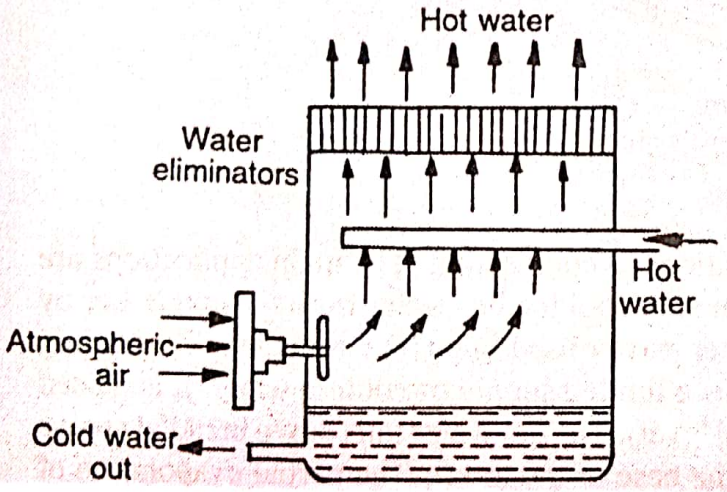
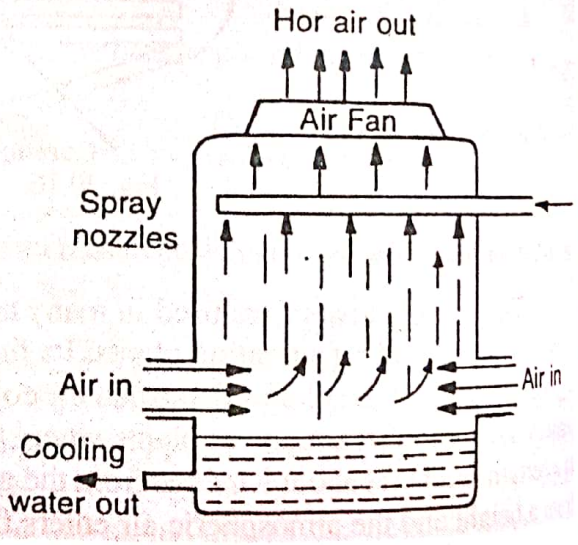


Fig. 20.12. Forced draught cooling tower.



20.13. Induced draught cooling tower.

2. *According to the material used.* The cooling towers, according to the material used are (*a*) Timber cooling towers, (*b*) Concrete (ferro-concrete, multideck concrete hyperbolic) cooling towers, and (*c*) Steel duct type cooling towers.

The timber cooling towers are rarely used due to the following disadvantages :

(*i*) Short life, (*ii*) High maintenance charges, (*iii*) Limited cooling capacity, (*iv*) Rots easily due to exposure to sun, wind, water etc., (*v*) Design generally does not facilitate proper circulation of air.

The concrete cooling towers has the following advantages :

(*i*) Large capacity, (*ii*) Improved draught and air circulation, (*iii*) Increased stability under pressure, (*iv*) Low maintenance.

The duct type cooling towers are rarely used in case of modern power plants due to their small capacity.