Certain chemicals, such as a concentrated solution of calcium chloride, solutions of sulphuric acid, alcohol, etc., are correspondingly hygroscopic and react to changes in moisture in the same way. In certain cases, however, such as with sulphuric acid, there is not only the latent heat of absorption but also a chemical heat of combination.

AIR CONDITIONING EQUIPMENT

Air conditioning equipment comprises:

1. Apparatus for providing the necessary heat and moisture exchanges within the room to be conditioned and of the air supplied to the room for ventilation.
2. Automatic devices for governing such apparatus so that temperature and humidity may be controlled within the limits desired. The latter are referred to as controls. Those for controlling temperature are known as thermostats, and those for controlling humidity are known variously as hygrostats, psychrostats, or humidostats.

Apparatus for effecting humidity changes may be divided into two distinct groups:

1. The humidifiers used for the purpose of increasing the moisture content of the air and to produce cooling by evaporation.
2. The dehumidifiers used for the removal of moisture from the air and to produce cooling by contact with water or surfaces at a lower temperature than the air.

Systems of Humidification

Humidifiers may be divided into the following general types, according to the method of operation:

1. *Indirect:* Introduction of moistened air.
2. *Direct:* Spraying into the room.
3. *Combined:* Direct and indirect.

Before the advent of modern air conditioning the direct humidifiers were largely used for increasing the humidity in cotton mills and similar places. There has been much improvement in this type of humidifier and it still finds wide application, especially in the textile mill industry.

One of these types uses atomizer heads in which the water is drawn into the nozzle and then finally atomized by a small jet of air under high pressure. This type is illustrated in Fig. 4.

In another type, water is supplied at high pressure (usually about 200 lb. per square inch) to an atomizing nozzle. This nozzle is located in a sheet metal enclosure, suspended from the ceiling, through which a current of air is caused to pass, either by the action of a motor-driven disc fan or by the induction action of the spray itself. The heavier particles of water are separated by a simple method of baffling and only the very finest particles are caused to pass into the room, with the current of air, where they are rapidly evaporated. This type is illustrated in Fig. 5.

In a third type of direct humidifying head a small jet of water is thrown upon a disc rotating at high velocity within a stationary circular comb which consists of fine metal strips or teeth, against which the water thrown from the disc impinges. The finely atomized particles of water are carried out with the current of air created by a disc fan operated from the motor shaft. This type is illustrated in Fig. 6.

The three types of direct humidifiers described are suitable only for application in certain types of industrial plants and do not provide either for controlled ventilation or for dehumidification. These two provisions are essential in many industries and for installations providing for human comfort.

Indirect humidifiers are similar in operation to spray-type air washers, except that the water is sprayed directly against the current of incoming air. Such humidifiers comprise a chamber usually 10 ft. or more in length, through which the air is drawn at a velocity from 500 to 700 ft. per minute. Inside the chamber are placed one or more banks of spray nozzles distributed uniformly over the cross-sectional area of the chamber.

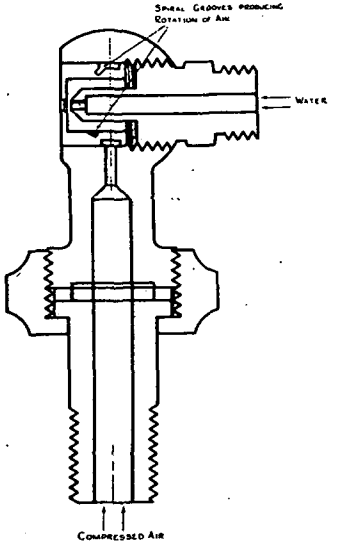

FIG. 4. DIRECT TYPE HUMIDIFIER HEAD

These nozzles create a finely divided spray through centrifugal action and require water pressures for effective humidification of from 35 to 45 lb. per square inch. At the intake of the humidifying chamber there is provided a set of baffles for distribution of the air and for preventing the spray from escaping from the chamber. At the outlet of the humidifier chamber there is provided an eliminator. This eliminator, consisting of a series of metal baffles, is so designed as to separate all of the free, unevaporated moisture from the humidified air. Thus the air leaving the humidifier is completely saturated, but without any entrainment or unevaporated water particles. The general construction of this type of humidifier is shown in Fig. 7. Such humidifiers are used only in connection with ventilating systems. They are practically always placed on the inlet side of the ventilating fan. Provision is made for warming the water in winter so that the air may be saturated at a definite temperature.