a rapid circulation of air over the cast iron heating surface provided in the fire box. The air thus heated is discharged into the building from an outlet on top of the heater. Generally this type is used where steam or hot water is not available and where it is not desired or practical to install a boiler plant.

The Heating Coil Type unit heater consists of a bank of steam or hot water heating coils which may be made of steel pipe, cast iron, copper or brass over which air is blown or drawn by means of a power driven fan. The fan may be direct connected to the motor or pulley driven from motor or line shaft. This type Unit has two distinct classifications: Namely, the Horizontal and the Vertical types.

The Horizontal type as a general rule uses a propeller or disk fan for passing the air over the heating surface. Cast iron and copper tube heating surface are in most cases used in this type unit. The fan and heater are built into a sheet metal casing and the direction of flow of air is regulated by means of sheet metal baffle plates. An advantage of the Horizontal Unit is that it is comparatively light and can be suspended from columns or trusses of the building, thus conserving the floor space, and allowing return mains to be run overhead. The individual motor power requirements per unit are usually less than for other types.

The Vertical Type, as is implied by its name, provides for the air to enter near the floor level and pass vertically through a bank of steam or hot water heating coils. Movement of the air is produced by a power driven fan, and a sheet metal distributing outlet at the top directs the distribution. While this type unit is quite frequently suspended from overhead structural supports, it is primarily designed to rest on the floor level, from which position the most effective results are obtained.

The fans are of the multi-blade centrifugal type and are capable of operating against a static pressure of 1 in. of water or more.

When placed on the floor level these units take the air in at the lowest point where the air is coldest and discharge the heated air at a distance of from 8 to 12 ft. above the floor. The discharged warm air is dissipated in the space to be heated and as it cools, falls to the lower level and is again taken in at the base of the unit and reheated. When so desired the units may be provided with a fresh air connection so that either all outside, all inside, or a combination of both may be used through the heater. This arrangement proves most satisfactory for producing a circulation of outside air in the summer time for ventilation purposes, particularly in large open industrial buildings such as; machine shops, textile mills, foundries, warehouses, garages, mills, railway shops, armories and gymnasiums.

CHAPTER XVIII

AIR WASHERS AND FILTERS

By W. H. CARRIER, Member

THE cleansing of air for ventilation purposes is a very important phase of the art and is accomplished by two different means; washing and filtering. Both methods cleanse the air of solid or liquid matter in the form of dust or spray, while in addition the washer cleanses the air of soluble gases and vapors, and hence of many objectionable odors.

Air filters are distinguished from air washers in that they clean the air without the use of water or the addition of water vapor. They are of two types (1) the viscous filter depending upon the dirt impinging on surface covered with a viscous fluid or oil; (2) the true dry filter type which removes the dirt from the air by passing it through cloth or felt screens, the openings in which are too small to allow the passage of dirt.

TYPES OF AIR WASHERS

The washing of air is done by passing it over a large surface area of water which is accomplished in the various types of washers; (1) by passing it through a fine spray of water; (2) by passing it over wet surfaces; (3) by passing it both through a spray and over wet surfaces. After the air is washed it is freed from entrained water.

When air is cleansed by washing its humidity or moisture content is usually changed. In passing through the water spray or over the wet surfaces both the dry and wet bulb temperature of the air approaches that of the water at which temperature the air tends to become saturated. The moisture content of the air may, therefore, be controlled by controlling the water temperature. By using water at a very low temperature the washer becomes a dehumidifier or by heating the water the air may be humidified. By raising the dry bulb temperature of the air after leaving the washer its relative humidity may also be controlled. The humidifying efficiency of any air washer may be given as

$$E = 1 - \frac{\text{Final wet bulb depression}}{\text{Initial wet bulb depression}}$$

for example: With an initial wet bulb depression of 20 deg. and the final wet bulb depression of 6 deg., the humidfying efficiency is

$$E = 1 - \frac{6 \text{ deg.}}{20 \text{ deg.}} = 0.70$$