distributed over the washer inlet. To insure this, a perforated plate or eliminator plates are installed at the inlet. Eliminator plates are now more generally used. They serve a second purpose in preventing the escape of spray through the washer inlet.

Scrubber type washers, used mainly to wash heavy reclaimable products from the air, are generally composed of one to three eliminator type baffle scrubber plates across the air stream. Water is supplied at the top of the scrubber plate with flooding nozzles spaced on about one foot centers across the top of the washer. The capacity of these nozzles vary with the manufacturer but a fair value of 5 gpm may be used. The pressure at the nozzle is about 5 lb per square inch.

Water is supplied to spray type units through atomizing nozzles generally arranged in banks across the washer. The nozzles spray either in the

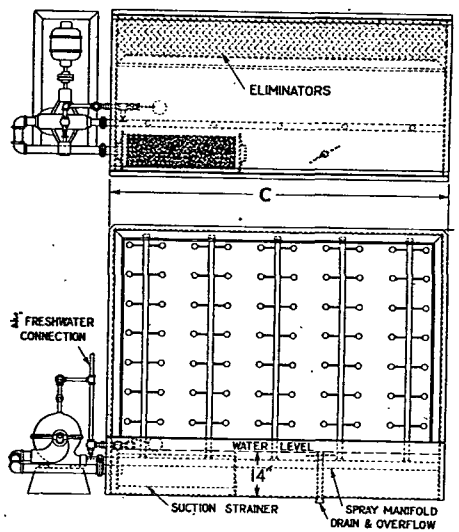


FIG. 1. TYPICAL SINGLE BANK AIR WASHER

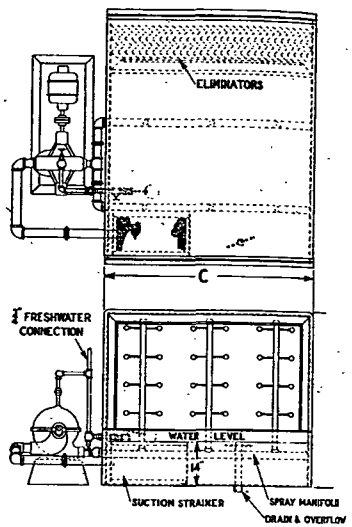


FIG. 2. TYPICAL TWO BANK AIR WASHER

direction of the air flow, that is, downstream, or against the air flow, or upstream. Nozzle capacities vary with the manufacturer, from 1½ to 2 gpm at a water pressure effective for atomization of about 25 lb per square inch. The spacing of spray nozzles is determined by the water requirements of the particular installation. A spray type washer may contain one, two or three banks of nozzles depending upon its application.

When an air washer is used for cleaning air it removes impurities and dusts. In general it does not function as efficiently in this service as a filter. For non-microscopic wettable dust its efficiency averages about 50 per cent, unless the concentration of dust is high. Its effectiveness in removing greasy microscopic dust is practically negligible as is also its deodorizing ability.

When a washer is used to regulate the moisture content of air it adds





moisture to (humidifies) or removes moisture from (dehumidifies) the air to achieve the desired moisture content.

When air passes through a washer wherein water is circulated without the addition or removal of heat, the air tends to become saturated at its entering wet-bulb temperature. What occurs here is partial or complete adiabatic saturation. The total heat content of the air is unchanged, inasmuch as the dry-bulb temperature of the air drops in proportion to the amount of additional water evaporated. This action is also known as evaporative cooling. A measure of the washer's effectiveness under these conditions is its saturating efficiency which is equal to the drop in dry-bulb temperature in per cent of the entering wet-bulb depression. Other things being equal, the saturating efficiency of a spray type washer is a function of the number of spray banks and the direction in which they spray. The following table gives a general comparison:

**HUMIDIFYING**

| | |
|---|---|
| 1 bank—downstream | 60–70 per cent |
| 1 bank—upstream | 65–75 per cent |
| 2 banks—downstream | 85–90 per cent |
| 2 banks—1 upstream and 1 downstream | 90–95 per cent |
| 2 banks—upstream | 90–95 per cent |

When air passes through a washer wherein the circulated water is either cooled or heated before being returned to the spray chamber, a heat interchange between the air and water occurs, and the air tends to become saturated at the temperature of the leaving water. The extent to which the leaving air and leaving water temperatures approach each other is an index to the effectiveness of the washer under the operating conditions. The total heat absorbed by the water in the process equals the total heat given up by the air, or the heat given up by the water equals the heat absorbed by the air. Depending on whether the moisture content of the air is increased or decreased during the operation, humidification or dehumidification occurs. Heat will be added to or removed from the air as the water supplied is of a higher or a lower temperature than the wet-bulb temperature of the entering air.

For dehumidifiers the ratio of the difference between the leaving wet-bulb and the leaving water to the difference between the entering wet-bulb and the entering water may be figured as follows:

**DEHUMIDIFYING**

| | |
|---|---|
| 3 banks—2 upstream and 1 downstream | 0 per cent |
| 2 banks—upstream | 5 per cent |
| 2 banks—1 upstream and 1 downstream | 10 per cent |
| 2 banks—downstream | 15 per cent |
| 1 bank—upstream | 20 per cent |
| 1 bank—downstream | 35 per cent |

Humidifiers may be figured on the same basis as dehumidifiers; the leaving water temperature, of course, will be higher than the wet-bulb temperature of the leaving air.

The problem of cooling or heating the circulated water before returning it to the washer chamber is generally external to the unit as illustrated in