the inner tube orifices. This condensation flowing back along the warm inner tube is prevented from freezing. A wide range of modulation at very low temperatures without danger of freezing, is therefore obtained. As an added precaution, with both steam and water coils, the outside air inlet dampers are often closed automatically when the fan is stopped to avoid trouble caused by very cold outside air drifting in during *off* periods.

A typical arrangement of coils is shown in Fig. 9. All of the air should be filtered to prevent dirt, insects and foreign matter from accumulating on the coils. The cooling coil and humidifier must be provided with a drip pan to catch the condensate formed during the cooling cycle and the excess water from the humidifier. The drain connection should be on the downstream side of the coils, made of ample size (not less than 1¼-in. pipe), provided with accessible clean-outs, a deep seal trap, and discharge to an indirect waste, so that there will be no possibility that sewer gas may enter

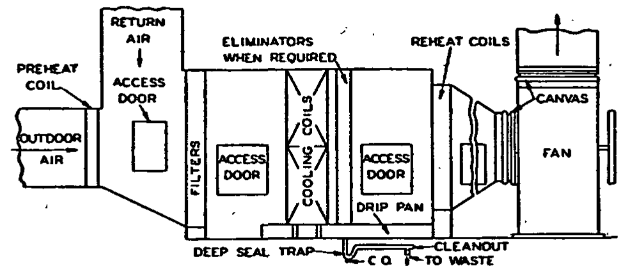

FIG. 9. TYPICAL ARRANGEMENT OF COOLING COILS IN A CENTRAL SYSTEM

the system. Precautions against freezing must be taken with the humidifier piping and drain connections.

Water coils and large steam coils are also subject to freezing. Cold outside air must be provided with tempering coils or mixing vanes. They must be installed to insure thorough mixing of the outside and return air to prevent this hazard.

Face and by-pass damper have proven to be satisfactory means of capacity reduction for cooling coils using non-volatile refrigerants. The use of such face and by-pass damper arrangements on volatile refrigerant coils poses difficult refrigerant control problems which are most severe when a change of setting at the thermostat imposes a rapid change in the dampers at the coils. On many installations, the coil bank is divided into 2, 3, or 4 sections and each section is connected to an individual compressor, or connected to a modulating compressor or compressors which will adjust to the load as each succeeding coil section is cut out by the thermostat.

The design features of the coil (fin spacing and type of fins, whether circular fins or plate) determine at what air velocity condensed moisture will be blown off the coil. Water blows off some coils below 400 fpm *face* velocity, while this does not occur on others at *face* velocities in excess of 500 fpm. Where there is a likelihood of water being blown off the coil face, eliminator plates should be placed on the down-stream side of the coil. Plate coils are most frequently installed without eliminator plates. When a number of coil sections are stacked one above another, there is a tendency for the condensate to be carried out into the air stream as it drips

from one coil to the next one. In such cases, drip troughs as are shown in Fig. 10 are used to collect the water and conduct it to the drain pan.

The enclosure around a coil or filter bank should be corrosion resistant and should have adequate access doors to provide for changing of air filters, cleaning of coils, adjusting expansion valves, oiling motors, etc.

Sometimes cooling and dehumidifying coils are sprayed with water to increase the rate of heat transfer and to provide leaving air approaching saturation. This arrangement requires a collecting tank and recirculating pump to maintain water circulation whenever the apparatus is in operation. Fig. 11 illustrates this arrangement with a bypass around the coil. This bypass is often used to facilitate thermostatic control. It is advantageous

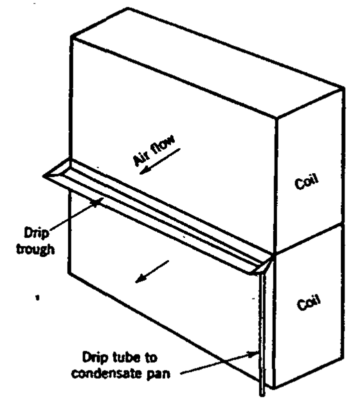

FIG. 10. COIL ARRANGED WITH DRIP TROUGH

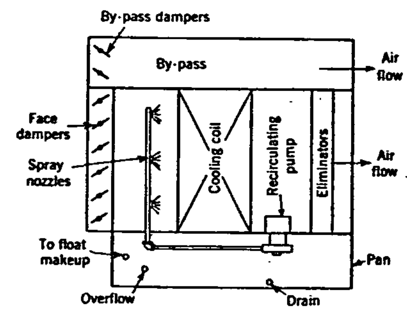

FIG. 11. RECIRCULATING SPRAY SYSTEM FOR CLEANING COILS

to direct only return air through the bypass rather than a mixture of return and outdoor air in order to hold the humidity ratio under thermostatic control.

Although both heating and cooling coils are made of sufficient strength to take up expansion and contraction arising within themselves, care should be taken to avoid imposing strains from the piping on the coil connections. (See Chapter 20.)

COIL SELECTION

In the selection of a coil it is necessary to consider various factors:

1. The duty required: heating, cooling, dehumidifying, and the capacity required to maintain balance with other system components such as compressor equipment in the case of direct expansion coils.
2. Temperature of entering air—dry-bulb only if there is no dehumidification; dry- and wet-bulb if moisture is to be removed.
3. Available heating and cooling media.
4. Space and dimensional limitations.
5. Air quantity limitations.
6. Allowable resistances in air circuit and through tubes.
7. Allowable resistance betwen the inlet and the outlet of the coil tubing circuits.
8. Characteristics of individual coil designs.
9. Individual installation requirements, such as, for example, the type of automatic control to be used.

The duties required may be determined from information in Chapters 9,