the temperature required by the room. Some units are placed under windows, while others are mounted in the ceilings from which air may be delivered to the room through ceiling, wall, or window outlets. Some units are also provided with volume regulators to maintain a steady flow condition.

This system is best suited for multi-room or multi-zone installations, and may be of either high- or low-velocity and high- or low-pressure type with substantially the same control methods. It is often applied to high-velocity systems with long distribution mains, and consequently high-static fan pressures; although extremely high static pressures are seldom justified. With two supply mains, the system static pressures vary as a result of changing demands for heating or cooling. Thus volume regulation often becomes necessary. Extreme variations of flow to different

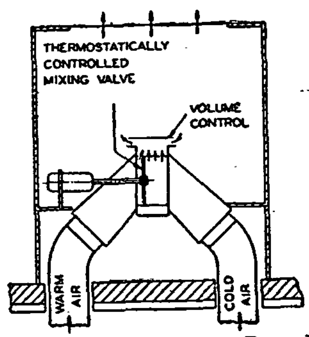

FIG. 8. ROOM AIR-MIXING UNIT FOR DUAL DUCT SYSTEM

rooms may be somewhat limited by static-pressure regulators and volume dampers at selected points along the mains. There are some installations where volume control at each room supply is desirable to maintain close control regardless of static-pressure changes in the ducts, and incidentally to facilitate balancing of the distribution system.

Air-capacity requirements are generally governed by summer cooling loads, and general practice is to supply the cold air to the cold-air duct at 25 to 30 deg below the established room temperature, this being satisfactory with suitably designed room outlets.

Fan and Coil Units

Another type of room convector used in connection with central cooling and heating plants is known as the *Fan and Coil* Unit (see Fig. 5, Chapter 25).

These units, like induction units, are located around the periphery of a building, usually under windows, and are equipped with fans and a water-type heating-cooling coil. They normally take air for ventilation directly from outdoors, and have a manual damper for adjusting the quantity of outdoor air within certain limits. Positive closing of this damper when the fan stops, can be obtained by adding a damper operator actuated by the fan-motor switch. Hot water supplied during the heating season frequently is varied in accordance with outdoor temperature. Cold water for use during the cooling season should be supplied at a fixed temperature low enough to provide the proper amount of dehumidification.

These units sometimes are used with a primary-air system which supplies the outdoor ventilation air and handles the latent load. In such cases the primary air unit is controlled as explained under the section Unitary-Central Systems, and may be of either the low- or high-pressure type.

The combined heating-cooling coil of each unit may be controlled by a valve in the water supply line to each unit, actuated by a thermostat in the room or recirculated air of the unit. The thermostat is of the heating-cooling type.

EVAPORATIVE COOLING

In climates where, on the hottest days, the outdoor wet-bulb depression is relatively great, it may be possible to replace mechanical refrigeration, or other cooling sources, and use the evaporative cooling effect. A well-designed air washer using recirculating sprays will reduce the entering dry-bulb temperature to within a degree or two of the entering wet-bulb condition. Thus, it may be possible that, with air entering at 100 F dry-bulb, 60 F wet-bulb, a leaving condition of 62 F dry-bulb, nearly saturated, can be obtained. Under some conditions of latent and sensible heat load, this evaporative cooling may be adequate.

At times when the outdoor wet-bulb temperature is not low enough to permit the use of straight evaporative cooling, it is still possible to use pre-cooling convectors with refrigeration, well water, or a cooling tower, as the basic source of sensible heat removal to reduce the wet-bulb temperature of the air before it enters the spray chamber. Where internal heat loads are high, this scheme may be more economical than one using return air. Where the required supply air dew point is too low to permit straight evaporative cooling, and where the sensible heat load is not too great, intentional partial saturation may be employed. That is, the low dew point of the outdoor air is utilized by permitting some of this air to pass through the humidifying sprays untreated, or to bypass the humidifier. All of these remarks with regard to evaporative cooling are based on the assumption that all of the supply air will be taken from outside. Provision should be made in most cases for the return of some air from the conditioned spaces for control purposes, as well as for economy of fuel in winter.

PRECOOLING

Where sufficiently cold water from wells or streams is available, a saving in refrigeration may be obtained by the use, in location ahead of the dehumidifier, of precooling coils through which the cold water is circulated. The resultant cooling of the air decreases the load to be carried by the dehumidifier and refrigeration plant. In normal practice the water, after passing through the precooling coils, may be further utilized in the refrigeration plant condenser. The economic advantages of this scheme are apparent, and it is frequently used.

SENSIBLE COOLING WITH UNWETTED COILS

Under favorable atmospheric conditions where a large wet-bulb depression exists and the dew point of the outdoor air is sufficiently low at all times, acceptable cooling may be obtained by removing only the sensible heat from the outdoor air delivered to the rooms. Under this condition of a great wet-bulb depression, a temperature-reducing coil may be located in the air stream and supplied with water from a cooling tower. When humidity control is desired, sprays to saturate or partially saturate the air may be used down stream from the unwetted coil. Saturation or partial