1. By provision for limiting the relative humidity in addition to the temperature at a definite point. When this method is used, either temperature or humidity may demand operation of the cooling source regardless of whether or not the other factor has been exceeded. The use of a high limit humidity control in this manner is desirable during conditions of high relative humidity but its operation may cause excessive cooling unless some method of reheating is employed.

2. By the maintenance of a fixed effective temperature. By this method, a definite relation is maintained between temperature and humidity, and sensible cooling is done whenever possible instead of the removal of latent heat in the form of moisture.

3. By the maintenance of a fixed dew-point in the air discharge. This method usually provides for the control of relative humidity within the space being conditioned between reasonable limits, but does not take into consideration any change in the latent heat load, as compared to the sensible heat load.

The necessity for varying inside temperature conditions in accordance with changes in outdoor conditions on many types of installations is important. A control system is shown in Fig. 5 where the temperature of the treated space is adjusted according to the outdoor temperature.

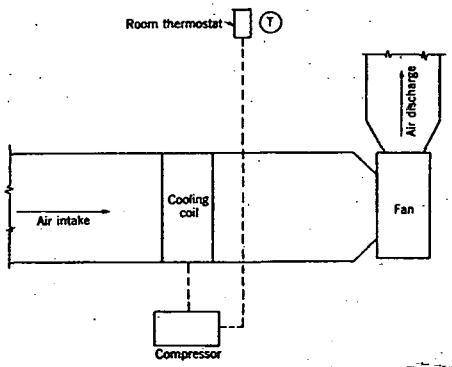

FIG. 4. DIAGRAM OF SIMPLE COOLING SYSTEM CONTROL

Thermostat T_1 measures the outdoor temperature and thereby automatically determines the inside dry-bulb temperature control point. Thermostat T_2 in the conditioned space measures the temperature of that space and controls the refrigerant to the cooling coil so as to maintain the temperature in the space being conditioned at the point which has been set up by thermostat T_1.

It is usually found desirable to adjust the indoor temperature between available limits with the outdoor temperature all of which is fully described in Chapter 3. Various combinations of control may be applied to cooling systems to secure desired relationship between outdoor temperature and resultant indoor temperature and humidity.

All Year Systems

An all year central fan conditioning system consists of the combination of a ventilating system and a cooling system.

During certain seasons of the year, it is sometimes possible to control

the dew-point of the air discharged from an air washer by regulating the relative quantities of outdoor and return air. The use of this method for controlling the outdoor and return air dampers may also provide for automatic change-over from the heating to cooling cycles, providing thereby for the maintenance of a fixed dew-point temperature in the air-discharge during both cycles.

Complete automatic control of all year systems incorporates an automatic change-over between the cooling and heating cycles. If the installation necessitates operation of manual switch or other device to change over between the heating and cooling cycles, then the control system is semi-automatic. The full automatic change-over between cycles becomes particularly desirable in the early and late portions of the cooling and heating seasons when heating is required during the early and late portion of the day and cooling may be required during the middle of the day.

A system for the control of an all year conditioning system providing for automatic change-over from the cooling to heating cycles is illustrated in Fig. 6.

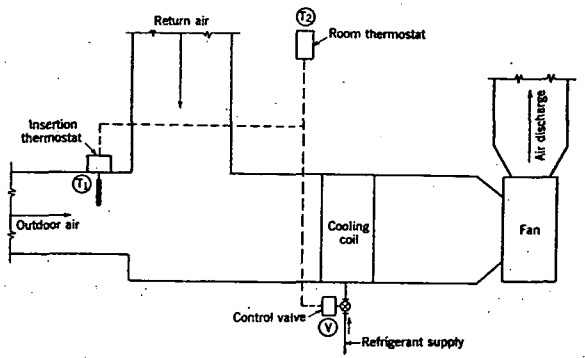

FIG. 5. DIAGRAM OF COMPENSATED COOLING SYSTEM CONTROL

During the heating cycle, thermostat T_1 in the return air or room measures the temperature of the conditioned space and modulates control valve V_1 which, in turn, modulates the flow of steam to the heating coil so as to maintain a fixed temperature in the space. Humidity control H_1 measures the relative humidity in the space being conditioned and opens control valve V_2 so as to admit water to the sprays whenever moisture is required in the air.

During the cooling cycle, thermostat T_2 in the return air measures the temperature in the space being conditioned and modulates control valve V_3 which, in turn, modulates the flow of water to the cooling coil so as to maintain a fixed temperature in the space. Humidity control H_2 measures the relative humidity in the space being conditioned and then assumes command of control valve V_3 whenever the relative humidity exceeds a predetermined amount.

During the heating cycle thermostat T_3 acts as a low limit. It assumes command of control valve V_1 whenever it is necessary to prevent the air