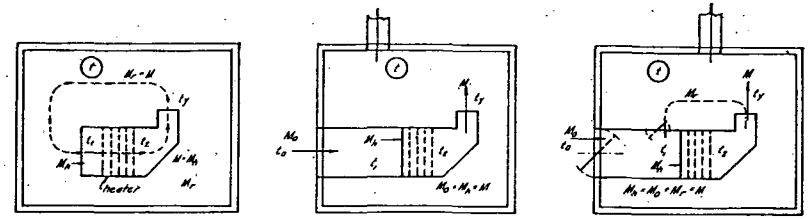

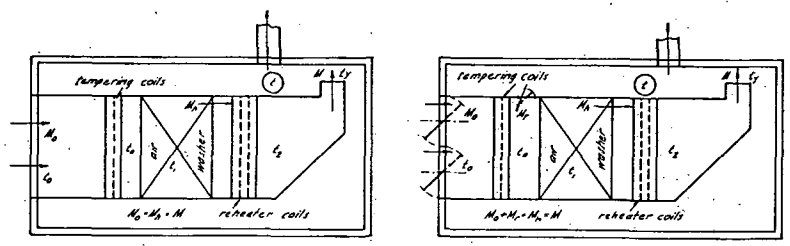

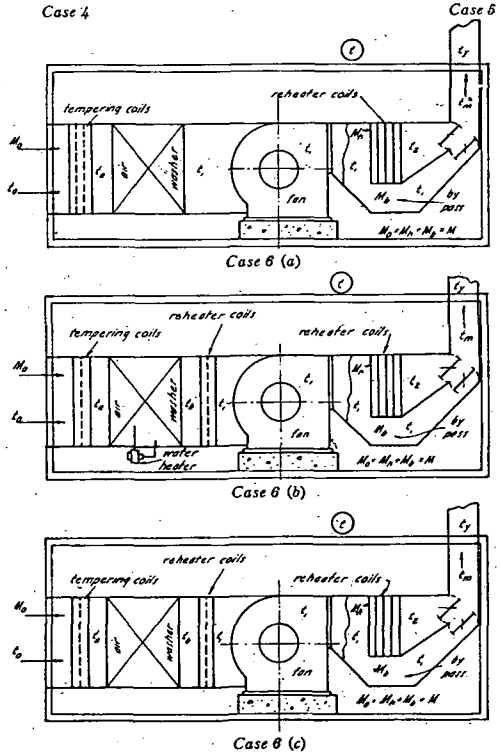

A relative humidity of 35 per cent for a room temperature of 70 deg. has been selected because this is the highest percentage of moisture which the air can hold without producing dripping on single-thickness windows in cold weather.

In this case: $M = M_o = M_h = \frac{H}{0.24\ (t_y - t)}$ .....(6)

If it is desired to maintain a room temperature of 70 deg. with 35 per cent relative humidity from an outside temperature of zero and with simply an air washer without any water heater in connection, the tempering coil must be of sufficient capacity to heat the entering air from the outside temperature to 88 deg. dry bulb temperature and 52 deg. wet bulb temperature, and this will be represented by t_a in the diagram. In this case the difference is 36 deg. between the wet bulb temperature and the dry bulb temperature and assuming the washer to be 67 per cent efficient, moisture will be evaporated into the air in sufficient quantity to bring the temperature down to 24 deg. which is 67 per cent of 36 deg. Subtracting 24 deg. drop in temperature through the air washer from 88 deg. dry bulb temperature of the air entering the air washer, gives 64 deg. as the final temperature of the air leaving the air washer, the wet bulb temperature remaining at 52 deg. The reheater will heat the air to any temperature necessary to take care of the heat losses since room heating is desired.

The dewpoint temperature of the air leaving the air washer and in the room itself will be 41 deg.

Using the same illustration and assuming that a humidifying air washer is used with a water heater, the tempering coil will simply have one stack, section or tube row deep to raise the air temperature to about 35 deg. from zero outside temperature. The hot water sprays in the air washer will saturate this air at a tempearture of 41 deg. and the reheater will simply raise this temperature to any point required to maintain a room temperature of 70 deg. and a relative humidity of 35 per cent.

The amount of heat to be furnished by the water heater in connection with the humidifying air washer is made up of the sum of two factors—*First:* to heat the specified air volume from the temperature leaving the tempering coil to the saturated air temperature leaving the washer, and *Second:* to evaporate sufficient moisture into this air to saturate it at the temperature required.

If only 23 per cent relative humidity is desired in the room in connection with 70 deg. dry bulb temperature, the temperature entering the air washer, without water heater will be 64 deg. dry bulb, and the temperature leaving the air washer will be 48 deg. dry bulb, which is a drop of 16 deg. through the washer or 67 per cent of 23½ deg. difference between 64 deg. dry bulb and the corresponding 40½ deg. wet bulb temperature.

The illustration in connection with Case 4 indicates that this arrangement is used entirely for heating the room by the fan system. In many cases the heat losses in a room or building are taken care of entirely by direct radiation, and in such cases the final temperature of the air leaving the heater will probably be in the neighborhood of 80 deg. In such a case the same arrangements of tempering coils and reheaters will be used. The arrangement shown in the diagram contemplates the same air temperature being delivered to all rooms on this system, and will not be applicable to the heating of several rooms where individual control of each room is desired.

Case 5—When a portion M_o of the air circulated is drawn from the outside and the remaining M_r recirculated air, the air drawn from the outside is passed through a tempering coil and the mixture of air, from the outside and recirculated air, being passed through an air washer or humidifider and a reheater.

Similar conditions will apply to this Case 5 as have been outlined for Case 4 except that a percentage of recirculated air at a different dry and wet bulb temperature and a different percentage of relative humidity will be mixed with the fresh air after it has been warmed by the tempering coil.

In this Case 5, M_o is known from the ventilation requirements as specified, and the amount of air permitted to be recirculated is, therefore:

$$M_r = \frac{H}{0.24\ (t_y - t)} - M_o \qquad (7)$$

Case 6 (a, b, c)—When all of the air circulated is drawn from the outside, passed through a tempering coil and air washer or humidifier, a portion of the tempered and