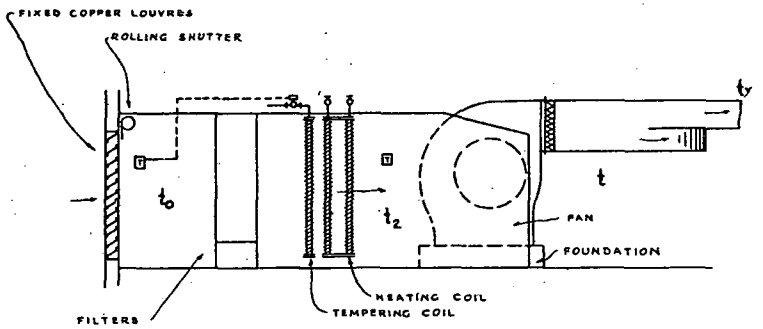

FIG. 13. COMBINATION OF RECIRCULATED AND OUTSIDE AIR (CASE C)

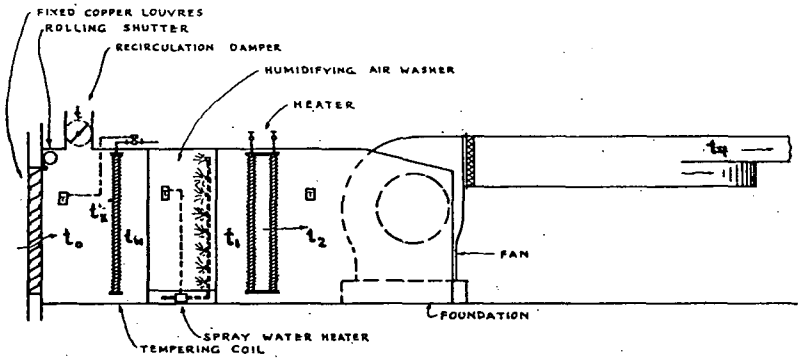

FIG. 14. OUTSIDE AIR CIRCULATED; CONSTANT RELATIVE HUMIDITY IN ROOM (CASE D)

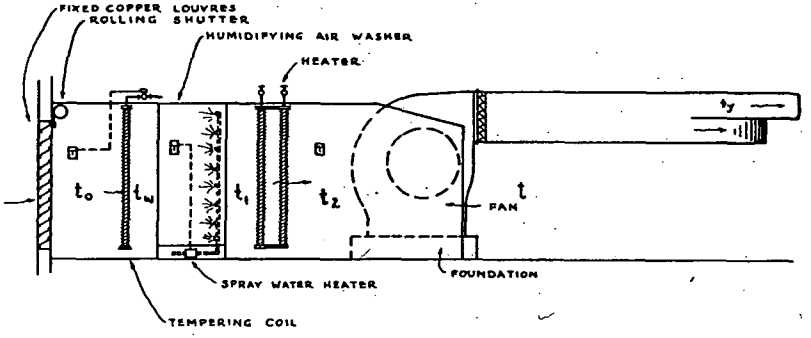

FIG. 15. COMBINATION OF RECIRCULATED AND OUTSIDE AIR; CONSTANT RELATIVE HUMIDITY IN ROOM (CASE E)

in depth, warms the incoming air to approximately 35 F to prevent freezing any of the spray water. The air passing through the spray chamber is saturated and leaves at a temperature of $t_1 = 41$ F.

The heat to be supplied the heater is:

$$H_1 = 0.24\,(t_2 - 41)M \text{ Btu per hour}$$

The heat to be supplied the tempering coil is:

$$H_2 = 0.24\,(35 - t_0)M \text{ Btu per hour}$$

The amount of heat, per pound of air circulated, to be supplied the humidifying washer or humidifier is the difference between the heat content of the assumed dry air entering

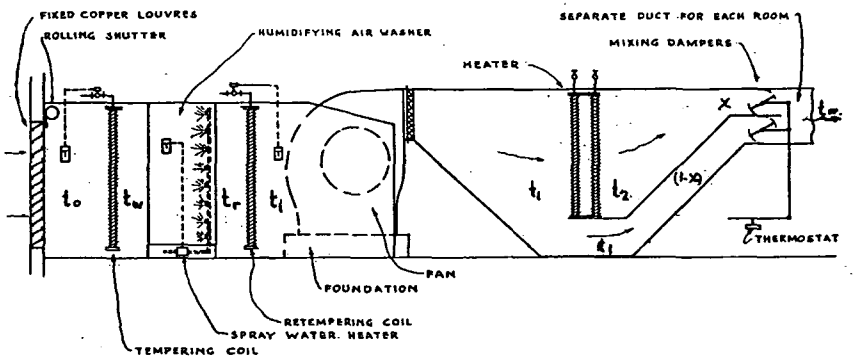

FIG. 16. OUTSIDE AIR CIRCULATED; CONSTANT TEMPERATURE AND RELATIVE HUMIDITY MAINTAINED IN EACH ROOM (CASE F)

the washer at a temperature of $t_w = 35$ F and the leaving saturated air at $t_1 = 41$ F, or

$$15.7 - 8.4 = 7.3 \text{ Btu per pound of dry air}$$

The amount of heat required for the washer is:

$$H_3 = 7.3\,M \text{ Btu per hour}$$

The total amount of heat required by the apparatus is therefore;

$$H_1 + H_2 + H_3 \text{ Btu per hour}$$

If a washer having a *humidifying efficiency* of 67 per cent *without water heater* is employed it will be necessary to heat the outside air drawn into the apparatus by means of a tempering coil to such a temperature that the air in passing through the water sprays will become partially saturated (adiabatically) having a moisture content per pound of air equal to saturated air at 41 F. If the incoming air is warmed by the tempering coil to $t_w = 88$ F (requiring a two-section-depth heater) it will be cooled in the washer to 64 F or $88 - 64 = 24$ deg.

If the *humidifying efficiency* of the washer were 100 per cent, the air would become adiabatically saturated at 52 F or a temperature drop of $88 - 52 = 30$ F. The efficiency of the washer is, however, only 67 per cent, so that the actual temperature drop will be 0.67×36 deg or 24 deg, as used.

The heat to be supplied the heater is in this case $H_1 = 0.24\,(t_2 - 64)M$ Btu per hour, and for the tempering coil is $H_2 = 0.24\,(88 - t_0)M$. The total heat required by the apparatus is $H_1 + H_2$, no heat being supplied to the washer.

Case E. (Fig. 15) The arrangement of the heating and ventilating apparatus is similar