trap for handling both the condensation and the air, provided the air finally can be eliminated at some other point in the return system.

For high pressure systems the same kind of traps may be used as with vacuum systems, except that they must be constructed for the pressure used. If the air is to be eliminated at the return header of the unit, a high pressure air valve can be used; otherwise the air may be passed with the condensate through the high-pressure return trap, and then eliminated at some other point in the system.

Fig. 8 represents the connections to a hot water heating system. The air vent is not required if the main is above the heater and air can be eliminated through the piping system.

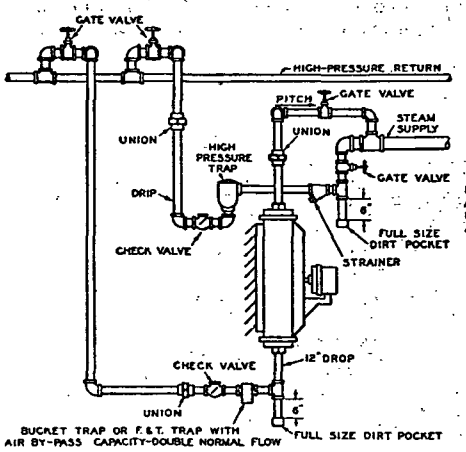


FIG. 7. METHOD OF CONNECTING UNIT HEATER TO HIGH PRESSURE SYSTEM

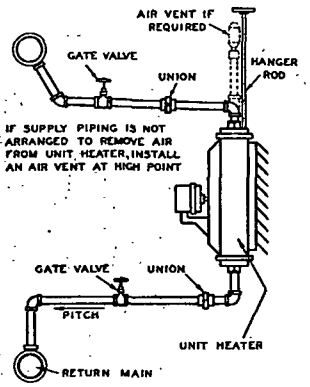


FIG. 8. METHOD OF CONNECTING UNIT HEATER TO HOT WATER SYSTEM

BOILER CAPACITY FOR STEAM UNIT HEATERS

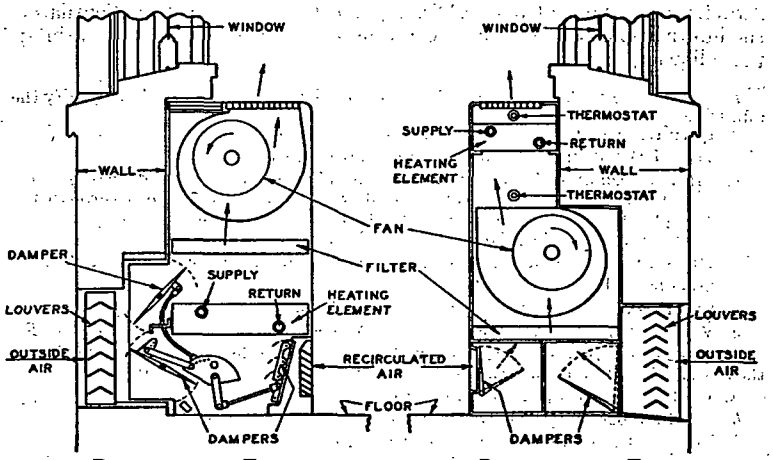
The capacity of the boiler should be based on the rated capacity of the unit heaters at the lowest entering air temperature and highest fan speed that will occur, plus an allowance for pipe line losses. It is unwise to install a single unit heater as the sole load on any boiler, particularly if the unit heater motor is started and stopped by thermostatic control. The wide and sudden fluctuations of load that occur under such conditions would require closer attention to the boiler than is usually possible in a small installation. Where oil or gas is used to fire the boiler, it is possible by means of a pressurestat to control the boiler, in response to this rapid fluctuation. In most cases, and particularly where the boiler is coal-fired, it is advisable to use two or more smaller unit heaters instead of one large unit.

Steam pressures below 5 lb can be used with safety for recirculating unit heaters when their heating surfaces are designed for those pressures, and when proper provision is made for returning the condensate. If units admit air that may be at a temperature below freezing, a steam pressure of

not less than 5 lb should be maintained on the heating element, or a corresponding differential in pressure between the supply and returns should be maintained by means of a vacuum.

UNIT VENTILATORS

A unit ventilator is essentially a unit heater equipped with dampers for introducing outdoor and recirculating air in varying quantities, and arranged with a system of control that permits the heating effect to be varied with the fans operating continuously. Either steam or forced hot water may be employed as the heating medium, although steam is the more common. Unit ventilators are intended primarily for use in schools, meeting rooms, offices or other applications where the density of occupancy indicates the need for ventilation. In normal operation, the discharge air temperature from a unit ventilator is varied in accordance with the room



DRAW-THROUGH TYPE BLOW-THROUGH TYPE

FIG. 9. TYPICAL UNIT VENTILATORS SHOWING TWO OF MANY ARRANGEMENTS OF DAMPERS AND HEATING COILS

demands. Where a heating effect is required, the air delivered is above room temperature. Where the heat generated within the room by occupants, sun, etc., is sufficient to cause overheating, then the air delivery temperature must be below that of the rooms. It is customary to equip unit ventilators with control devices that prevent the delivery of air at a temperature that will cause cold drafts. Unit ventilators may be of the radiator or damper controlled type constructed on the blow-through or draw-through principle as illustrated in Fig. 9.

Ratings of Unit Ventilators

Unit ventilators of the steam type are customarily cataloged with two ratings, one the input and the other the output capacity. The first is the heat input to the unit which is determined by measuring the temperature and quantity of condensate and the pressure and quality of the steam. The second is the heat output of the unit which is determined by measuring