provide a temperature-operated switch to prevent the fan from starting until the heating element is heated throughout. Unit heaters may be used in summer as a means of circulating air to give some measure of comfort due to air motion. In such cases the heating element should be shut off from the source of heat. The thermostat which prevents the fan from starting until the heating element is heated, should be provided with a bypass switch, which, upon being closed, will permit the fan to be operated independently of the heating element.

Piping Connections For Steam Unit Heaters

Piping connections for steam unit heaters are similar to those for other types of fan blast heaters. The piping of unit heaters must conform strictly to the system requirements while at the same time permitting the heaters

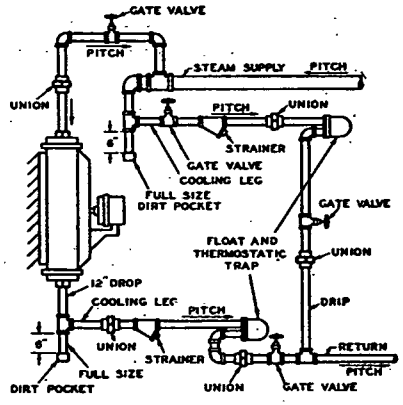

FIG. 6. UNIT HEATER CONNECTION FOR VACUUM OR VAPOR SYSTEM DISCHARGING CONDENSATION INTO DRY RETURN

themselves to function as intended. The basic piping principles for steam systems are discussed in Chapter 20.

Rapid condensation of steam, especially during heating-up periods, is characteristic of this type of equipment. The return piping must be planned to keep the heating coil free of rapid condensation, while the steam piping must be ample to carry a full supply of steam to the unit to take the place of that condensed. Adequate sizes of piping are especially important where a unit heater fan is operated under start-and-stop control, and where all or part of the air is taken from the outside. In such installations the condensation rate may vary rapidly, and the necessity for ample pipe capacity is particularly important.

A method of connecting a unit heater to a one-pipe gravity system is illustrated in Fig. 5. When the return main is located above the boiler water line, an artificial water line must be created by providing an equalizing loop to prevent steam passing into the return, and thus into other units.

A piping arrangement where both the air and condensate pass through a

common return to a boiler, with vent trap or condensate pump and receiver, is shown in Fig. 6. The traps must pass air and condensate rapidly to keep the return piping partially full of water.

Since unit heaters are often constructed with sufficient strength, the use of high pressure steam in them is a common practice. As shown in Fig. 7, the condensate and air reach the overhead return through traps, and check valves are located in the return piping. It is, however, preferable to locate the high pressure return below the heater.

For two-pipe closed gravity return systems, the return from each unit should be fitted with a heavy-duty or blast trap, and an automatic air valve should be connected into the return header of each unit heater. Provision must be made to compensate for the pressure drop by elevating the unit heater above the water line of the boiler or of the receiver.

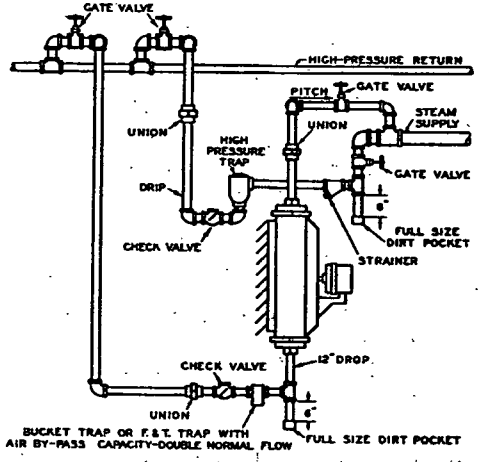

FIG. 7. METHOD OF CONNECTING UNIT HEATER TO HIGH PRESSURE SYSTEM

In pump and receiver systems, the air may be eliminated by individual air valves on the heaters, or it may be carried into the returns as in vacuum systems, and the entire return system be free-vented to the atmosphere, provided all units, drip points, and radiation are properly trapped to prevent steam entering the returns.

On vacuum or open vent systems, the return from each unit should be fitted with a large capacity trap to discharge the water of condensation, and with a thermostatic air valve for eliminating the air, or with a heavy-duty trap for handling both the condensation and the air, provided the air finally can be elininated 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