Graduated-acting control of the steam valve should not be applied to heaters with outside air connections unless protection against freezing is also used. This protection can be accomplished by separating the heater coil into two parts, one of which acts as a tempering coil and is controlled from an outside thermostat, which will keep steam at full pressure on the coil whenever the entering air is below freezing and which will cut off the steam when the entering air goes above freezing. The main coil is controlled from the room thermostat and is depended upon

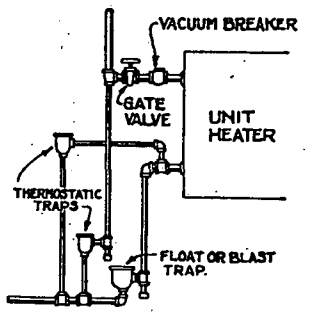

FIG. 1. UNIT HEATER CONNECTIONS WHERE CONDENSATION IS RETURNED TO VACUUM PUMP

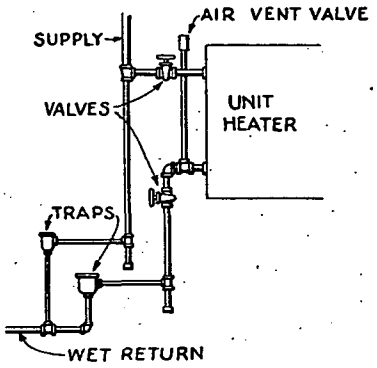

FIG. 2. UNIT HEATER CONNECTIONS WHERE CONDENSATION IS RETURNED TO BOILER THROUGH WET RETURN

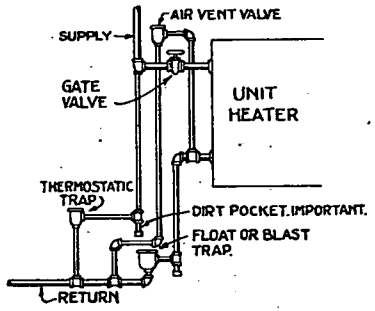

FIG. 3. UNIT HEATER CONNECTIONS WHERE CONDENSATION IS RETURNED TO CONDENSATION PUMP OR HOT WELL

for temperature regulation. Another method of protection is to immerse in the return condensate a thermostat which controls a positive-acting by-pass valve which will admit additional steam if the temperature of the condensate falls to the freezing point. This is purely a safety device and assumes that no condition of normal regulation will require enough throttling to make freezing possible. If this were not the case this method would not be suitable, as it prevents regulation beyond the point where the by-pass opens.

As a precaution against allowing the unit heater motors to continue to run if the steam supply fails or is for some reason shut off, either a pressurestat or thermostat in the steam line may be installed to stop the motor when the pressure or temperature in the supply line drops below a selected point. For a further discussion of this subject, see Chapter 17, Automatic Heat Control.

Quietness of Operation

In selecting unit heaters, attention should be given to the degree of quietness required for the installation.

No given fan speed may be applied as a measure of relative quietness to fans of different design and proportions. Quietness is a function of type, diameter, blade form and other variables besides speed, and all these must be taken into account. In general small fans can be run at higher motor speeds than can large fans with equal quietness.

Unit Heater Connections

Piping connections for unit heaters are similar to those for other types of fan-blast heaters. Typical connections are shown in Figs. 1, 2 and 3.

One-pipe gravity and vapor systems are not recommended for unit heater work.

On two-pipe gravity, or on pump and receiver systems the return from each unit should be fitted with a heavy duty or blast trap and an air valve should be connected into the return header of each unit. Pressure-drop must be compensated for by elevation of the heater above the water line of the boiler or of the receiver.

On vacuum 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 eliminated at some other point in the return system.

On 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.

The connections for steam and return piping to unit heaters must always be calculated on the basis of the high heat emission or condensation rate of such devices, usually by reducing the heat to be supplied to square feet of equivalent radiation by dividing by 240, and then using the pipe-size tables given in Chapter 20. The supply valve must be at the high point, or provision must be made for draining the pocket above this valve when the valve is closed.

Direct Fired Units

The foregoing discussion relates generally to units in which steam, vapor, or hot water are used as the heating medium. On rare occasions electrical resistances are used as the heating element. These are applied only where electric power is abundant and cheap and where other forms of fuel are scarce and expensive.