be used for throttling. Angle globe valves and straight globe valves should be used for throttling, as done on by-passes around pressure reducing valves or on by-passes around traps.

Connection to Heating Units

Riser, radiator and convector connections must not only be properly pitched at the time they are installed but must be arranged so that the pitch will be maintained under the strains of expansion and contraction. These connections may be made by swing joints which permit the expansion or contraction to occur under heating and cooling without bending of pipes. To take care of expansion in long risers, either expansion joints

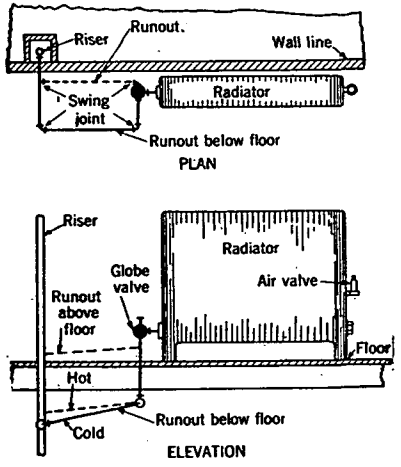

FIG. 4. ONE-PIPE RADIATOR CONNECTIONS

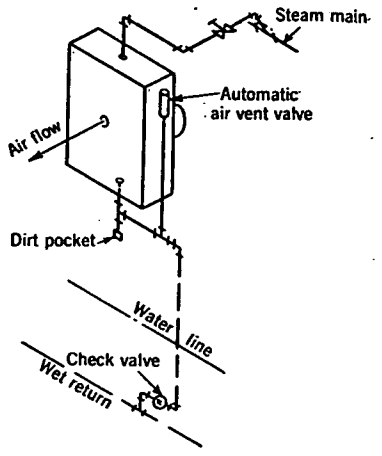

FIG. 5. UNIT HEATER CONNECTED TO ONE-PIPE AIR-VENT SYSTEM

of commercial construction or pipe swing joints are used. Anchoring of pipes between expansion joints is desirable.

Two satisfactory methods of making runouts for one-pipe systems for either the up-feed or the down-feed type are shown in Fig. 4. Where the vertical distance is limited and the runouts must run above the floor the radiator may be set on pedestals or of the high leg type. A method of connecting a unit heater to a one-pipe steam heating system is illustrated in Fig. 5.

Typical two-pipe radiator or convector connections are shown in Figs. 6, 7 and 8. While the top is the preferred location for the control valve, it may be located at the bottom. Short radiators may be top supply and bottom return on same end. With convectors the control valve is sometimes omitted and a damper in outlet grille used for heat control. The typical method of connecting pipe coils is shown in Fig. 9 and is suitable for atmospheric, vapor, vacuum, sub-atmospheric, and orifice systems.

Typical pipe connections for indirect radiators and tempering or heating stacks are shown in Figs. 10, 11, 12 and 13.

Where a building is served by a vacuum system or a sub-atmospheric system the stacks should be piped in the usual manner and traps of large capacity, preferably of the combination float and thermostatic type, should be used. In the orifice and *closed* two-pipe systems, traps should be used on the returns so that a pressure above that of the atmosphere may be secured on the heaters.

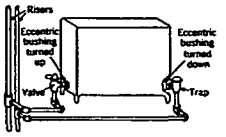

FIG. 6. TYPICAL CONNECTIONS FOR TWO-PIPE SYSTEM

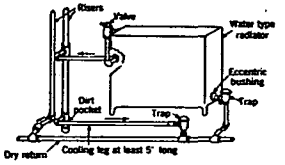

FIG. 7. TOP AND BOTTOM OPPOSITE END RADIATOR CONNECTIONS

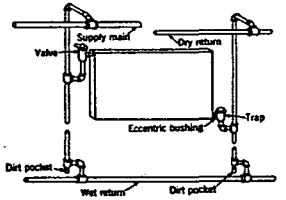

FIG. 8. CONNECTIONS TO RADIATOR HUNG ON WALL

Each stack should have a separate steam and return connection. Wide stacks are more evenly heated with two steam connections, one at each end, the stacks being divided and a return connection provided for each steam connection. For stacks of large capacity it is sometimes desirable to run a separate steam main direct from the boiler to the stacks.

PIPE SIZING FOR INDIRECT HEATING UNITS

Pipe connections and mains for indirect heating units are sized in a manner similar to radiators, but the equivalent direct radiation must be ascertained for each row of heating unit stacks and then must be divided into the number of stacks constituting that row and into the number of connections to each stack.

$$EDR = \frac{Q \times 60 \times (t_1 - t_e)}{55.2 \times 240} = \frac{Q \times (t_1 - t_e)}{220.8} \quad (1)$$