

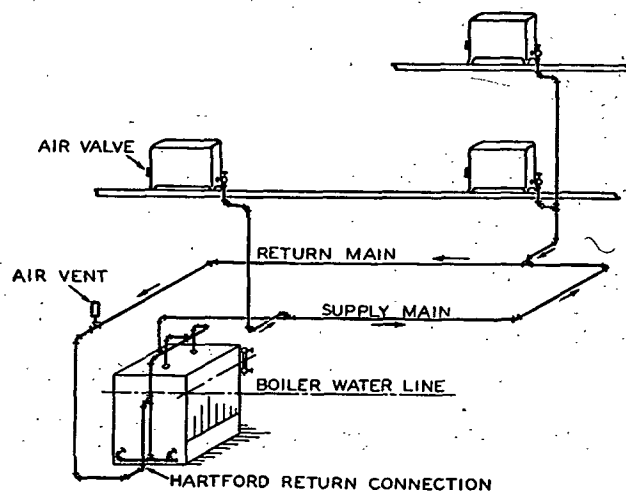


FIG. 3. TYPICAL UP-FEED GRAVITY ONE-PIPE AIR-VENT SYSTEM

in Fig. 6. Typical connections to radiators and risers are illustrated in Fig. 7. Up-feed systems are not recommended for systems higher than four stories.

3. Down-feed one-pipe systems, where the radiators and other heating units are located below the supply main. In this arrangement only risers and connections to heating units convey both steam and condensate, and both are flowing in the same direction. The steam main is kept relatively free of condensate by dripping through the drop risers.

Each radiator or heating unit in a one-pipe system must be supplied with a thermostatic air valve which functions to relieve air from the heating unit under pressure, and to close when steam itself heats the thermostatic element of the valve.

To improve steam circulation in one-pipe systems quick vent air valves should be provided at the ends and at intermediate points where the steam main is brought to a higher elevation or where dropped below the water line. It is desirable to install the air-vent valves about a foot ahead of the drips, as indicated in Fig. 6, to prevent possible damage to their mechanisms by water.

Air valves are of two general types, the pressure and the vacuum types. The pressure type permits the inflow of atmospheric air to the system when the steam pressure in the system falls below atmospheric pressure. The vacuum type, which contains a small check valve, prevents the air from flowing back to the system and thereby maintains vacuum condi-

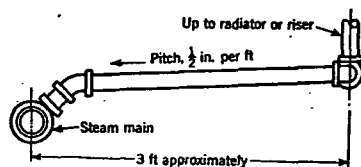


FIG. 4. TYPICAL STEAM RUNOUT WHERE RISERS ARE NOT DRIPPED

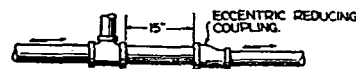


FIG. 5. METHOD OF CHANGING SIZE OF STEAM MAIN WHEN RUNOUTS ARE TAKEN FROM TOP

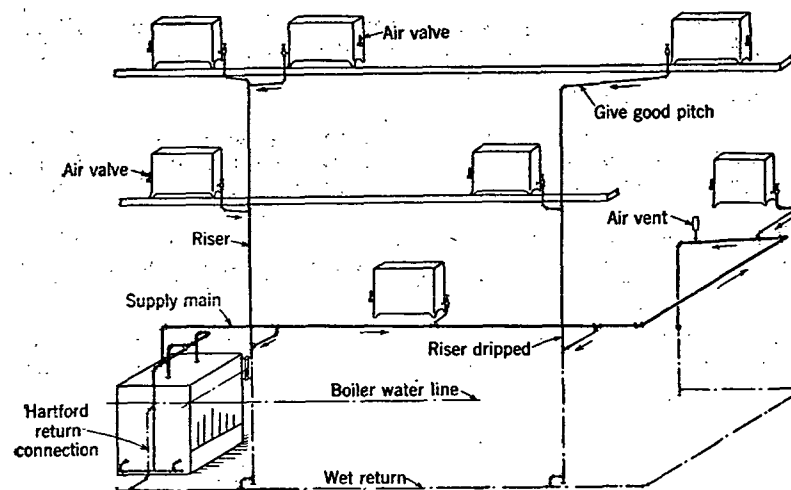


FIG. 6. TYPICAL UP-FEED GRAVITY ONE-PIPE AIR-VENT SYSTEM

tions in the system, and a consequent evaporation or generation of steam or vapor at sub-atmospheric pressures, and at consequent lower temperatures. Systems which use vacuum valves are known as *vapor* or *vacuum one-pipe systems*. The vapor or vacuum systems will maintain a more uniform temperature condition than the pressure systems.

Each heating unit in a one-pipe system may also be provided with a valve on the connection to the unit, although this is not essential except to shut the unit off in case it is not desired for heating. Valves on one-pipe systems must be either fully opened or fully closed. No throttling or modulating position can be maintained, since if a valve is partially closed condensate will not drain from the unit. This condition is dangerous because it may create a low water condition in the boiler with consequent burning or cracking of the boiler, or of creating a hazard due to the freezing of the water logged heating unit itself.

TWO-PIPE SYSTEMS

Two-pipe systems, as previously defined, are systems in which steam and condensate flow in separate pipes. Two-pipe systems operate under

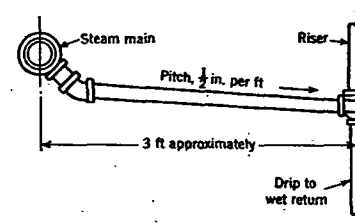


FIG. 7. TYPICAL STEAM RUNOUT WHERE RISERS ARE DRIPPED