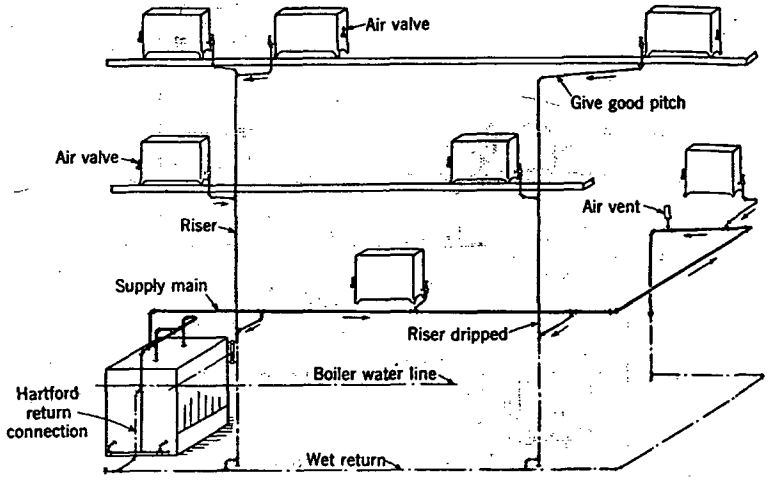

FIG. 6. TYPICAL UP-FEED GRAVITY ONE-PIPE AIR-VENT SYSTEM

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 create 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 may operate under high pressure, low pressure, vapor, or vacuum conditions. Either the up-flow or the down-flow arrangement of mains may be employed.

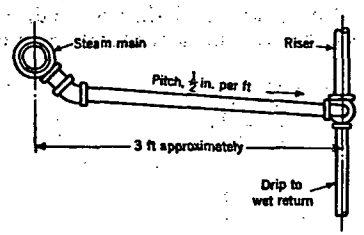

FIG. 7. TYPICAL STEAM RUNOUT WHERE RISERS ARE DRIPPED

Two-Pipe High Pressure Systems

Two-pipe high pressure systems operate at pressures above 15 psig, usually from 30 to 150 psig. They are usually used in large industrial type buildings, which are equipped with unit heaters or large built-up fan units, or in which high pressure steam is required for process work.

Fig. 8 illustrates a typical high pressure system. Because of the high pressures and the great differential between steam and return mains, it is possible to locate returns above the heating units and lift the condensate to these returns.

The condensate can be flashed into steam in low pressure mains if any are available, or passed through an economizer heater before being discharged to a vented receiver. It is, of course, necessary to provide for the elimination of air from high pressure systems, the same as in low pressure systems.

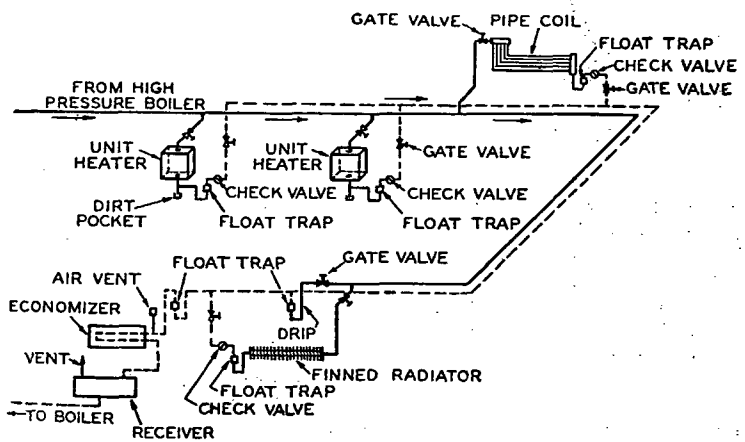

FIG. 8. TYPICAL HIGH PRESSURE HEATING SYSTEM

Return traps used on high pressure systems are usually of the bucket, inverted bucket, float or impulse type.

Two-Pipe Low Pressure Systems

Low pressure systems operate at pressures of 0 to 15 psig. The piping arrangement of both up-feed and down-feed low pressure systems is identical with those of two-pipe vapor systems described in the following section. The only difference between the two systems is in the type of air valve used. The air valves used in low pressure systems usually do not contain the check discs and hence, the system cannot operate under a vacuum. The low pressure systems are not as popular as the vapor systems, because they have the disadvantage of not holding heat when the rate of steam generation is diminishing. They also have the disadvantage of corroding to a greater extent than vapor systems, due to the continued presence of new air in the system.

Low pressure systems have the advantage, however, of returning condensate to the boiler readily and not retaining it in the piping, as may be possible in vapor systems when the system pressure exceeds the operating