

except that the head on the pump or trap discharge becomes greater as the height of the boiler water line above the trap or pump increases.

There are three general types of mechanical returns in common use, namely, (1) the mechanical return trap, (2) the condensation return pump, and (3) the vacuum return pump. Further information on pumps and traps will be presented later in this chapter.

GRAVITY ONE-PIPE AIR-VENT SYSTEM

In the gravity one-pipe air-vent system each radiator has but a single connection through which steam must enter and condensation must return in the opposite direction. Each radiator has an individual air valve.

Up-Feed Gravity One-Pipe Air-Vent System

■ This system is the most common of all methods of steam heating, especially for small size installations, due largely to its low cost of instal-

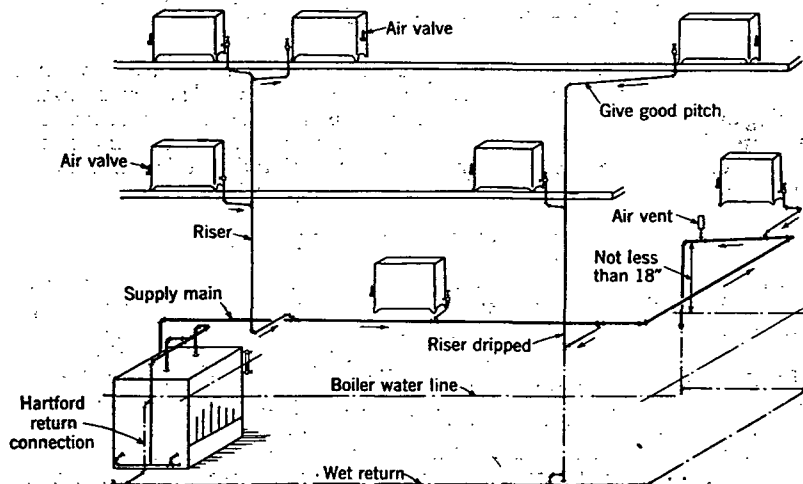


FIG. 1. TYPICAL UP-FEED GRAVITY ONE-PIPE AIR-VENT SYSTEM

lation and its simplicity. Where the size of the system is moderate or large, it cannot be assumed that these systems will be lower in cost than two-pipe systems using steam traps. In some instances it has been found that the cost of one-pipe systems under these conditions is greater owing to the higher cost of labor and materials due to the larger pipe sizes. As will be seen from Fig. 1, the steam piping rises to a point as high as possible at the boiler and pitches downward from this location until the far end of the main or mains is reached. At the far ends drips are taken off at the low points of the steam mains, are water-sealed below the boiler water line, and then brought back to the boiler in a wet return. Single pipe risers

are branched off the main or mains to feed the radiators, the steam passing up the riser and the condensation flowing down it. The steam and condensation flow in opposite directions in the riser but after the condensation enters the steam main it flows in the same direction as the steam and is disposed of through the drip connection at the end of the main. In buildings of several stories, it is customary to drip the heel of each riser separately, whereas in one- or two-story buildings this is not necessary. Both types of branches and risers are shown in Fig. 1.

Rapid elimination of air and condensation from the steam piping is essential to the successful operation of this system. It is therefore desirable that the venting and dripping of the steam main in long runs be made at several intermediate points where the steam main may again be brought to a higher elevation.

It is desirable to install the air-vent valves on the steam main about a foot ahead of the drips, as is indicated in Fig. 1 to prevent possible damage to the mechanism of the air-vent valve by water, in case the valves are installed directly above the drips.

Horizontal branches to radiators and risers should be pitched at least $\frac{1}{2}$ in. in 10 ft downward toward the riser or vertical pipe, and the hori-

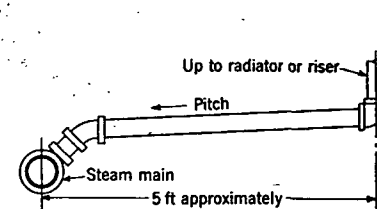


FIG. 2. TYPICAL STEAM RUNOUT WHERE RISERS ARE NOT DRIPPED

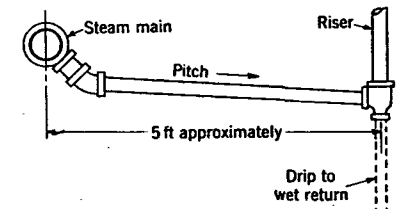


FIG. 3. TYPICAL STEAM RUNOUT WHERE RISERS ARE DRIPPED

zontal branches from the steam main should be graded at least this amount toward the main, except where the heel of the riser is dripped, in which case the branch should pitch down toward the riser drip (Figs. 2 and 3). The return line, if wet, may be run without pitch or may be pitched in either direction, but if it is necessary to carry the return main overhead for any distance before dropping, the return should slope downward with the flow. It is desirable to install the wet return pipe with a pitch so that the system may be drained to prevent freezing in case the building remains unoccupied for a considerable length of time.

The radiator valves may be of the angle-globe or gate type. They should not be of the straight-globe type because the damming effect of the raised valve seat interferes with the flow of condensation through the valve. Graduated valves cannot be used, as the steam valves on this system must be fully open or closed to prevent the radiator's filling with water. Air valves may be manual or automatic, with or without a check to prevent the re-entrance of expelled air. Usually the automatic type is installed. An objection to one-pipe steam systems is that the heat is all on or all off, with no intermediate position possible. However, intelligent