

connection and sufficiently above the water line of the boiler to prevent flooding.

The radiators, radiator valves, air valves and radiator runouts, as far back as the risers, are arranged the same as for the *up-feed system*.

GRAVITY TWO-PIPE AIR-VENT SYSTEMS

The gravity two-pipe system indicated in Fig. 8, is now considered obsolete although many of these systems are still in use in older buildings. The same general principles governing its piping design are used when connecting radiators as in other types of gravity systems where they must discharge their condensation to the wet return pipe. Separate supply and return mains and connections are required for each heating unit. Radi-

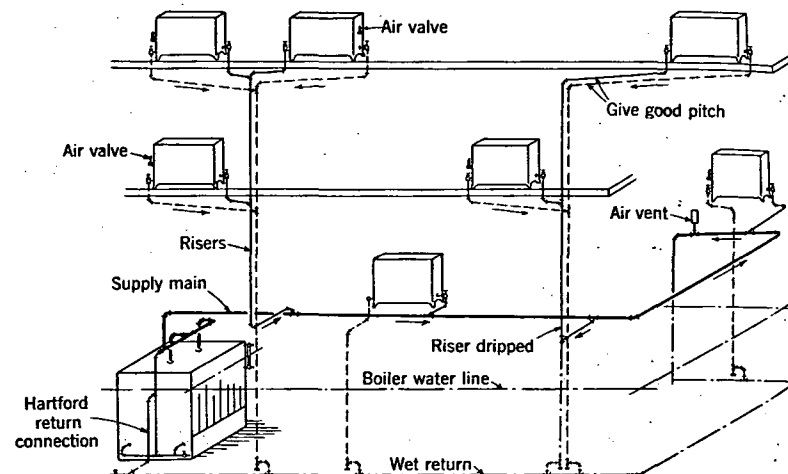


FIG. 8. TYPICAL UP-FEED GRAVITY TWO-PIPE AIR-VENT SYSTEM

ator valves are required in both the supply and return connection to the radiator, and air valves are installed on the heating units and the mains. The radiator valves are the same as described for the gravity one-pipe air-vent system. The steam main is run and pitched in the same manner as in the one-pipe system, but the returns from each radiator are connected into a separate return line system which has the base of the risers sealed either by carrying them down to a wet return below the boiler water line or by a water seal. Where the return has to be kept high to function as a dry return, it is advisable to connect the return risers to the dry return through water seals about 36 in. deep, as shown in Fig. 9, to prevent steam from one riser or radiator entering another through the outlet tapping and closing the air valves on the nearest radiator.

Down-Feed Gravity Two-Pipe System

The steam main in the down-feed system is carried to the top of the building, and the piping of the steam side is arranged practically as in the

down-feed one-pipe gravity system. The drips at the bottoms of the steam drops and the runouts to the radiators are similar to those shown in Fig. 8 for the up-feed gravity two-pipe system. On the return side of the system, the piping is arranged in exactly the same manner as the up-feed gravity two-pipe system.

AIR LINE HEATING SYSTEMS

Both one-pipe and two-pipe systems are at times provided with air valves, which instead of venting to the atmosphere direct, vent to a return pipe of small size. This pipe is then finally vented to atmosphere or connected to a vacuum pump. These are known as *one-pipe* and *two-pipe* air line systems depending upon the omission or provision of a return pipe for the condensate. Where the air line is exhausted by a vacuum pump

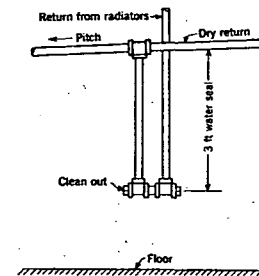


FIG. 9. METHOD OF CONNECTING TWO-PIPE GRAVITY RETURNS TO DRY RETURN MAIN

they are most generally termed *one-pipe* or *two-pipe vacuum air line systems*. Actually the one-pipe air line system has two pipes, the supply pipe and the air pipe (line) while the two-pipe air line system actually has three pipes. Such systems, when making use of a vacuum pump have, in the past, been termed *vacuum systems*. The history of steam heating reveals that the term *vacuum* has been very loosely used.

ONE-PIPE VAPOR SYSTEM

The one-pipe vapor system operates under pressures at or near atmospheric and returns its condensation to the boiler by gravity. In this system the automatic air valves are of special design to permit the ready release of air and prevent its ready return after it is expelled and the steam radiator valves are a type which, when opened, give a free and unobstructed passageway for water. The piping is the same as for the one-pipe gravity system so designed as to permit operation at a few ounces pressure.

TWO-PIPE VAPOR SYSTEM

Two-pipe vapor systems use separate supply and return pipes. In present practice the radiators discharge their condensation through ther-