

The returns from heating units on several floors are usually connected into common risers and the various risers tie into the return system.

This return system, if kept above the water line so as to remain dry, is usually filled with steam (plus the water of condensation), at a pressure somewhere between that of the supply and that of the atmosphere, depending upon the amount of steam passing through the heating unit returns. This makes the gravity two-pipe system susceptible to the backing up of steam from one heating unit to another, if the return valve is left open, causing troubles due to water hammer, noise caused by

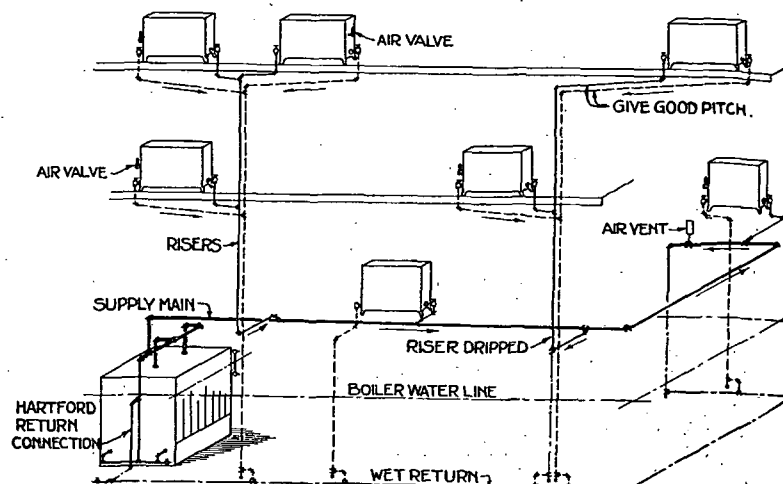


FIG. 3. TYPICAL AIR-VENT TWO-PIPE STEAM SYSTEM

counterflow and mixing of steam from the return, with the condensation leaving the heating units and air binding due to the premature closing of air valves by steam entering at the return end of the heating units. Sometimes check valves are used on the return end of heating units to prevent steam backing into those which have been shut off. This practice is not desirable as condensation may collect in the heating units, endangering the boiler. The troubles from the backing up of steam in the returns are generally eliminated when all heating unit returns are connected separately into the wet return. The return mains are kept below the water line, so as to be wet.

The two-pipe gravity steam system is almost obsolete, except for special installations. Old systems of this type may easily be changed to vapor systems by installing traps at the ends of the heating units and by arranging for dry returns with an air eliminator, or by using the old wet returns and installing a vacuum pump.

Vapor System

Fig. 4 illustrates a vapor system. The device at the end of the dry return main is usually of a proprietary nature. Its function is to vent

the air and in some cases it prevents the reentry of air. Some of these devices are designed to maintain a constant differential between the pressure in the supply main and the pressure in the return main. A wet return main is not always essential, though in many cases it is a useful auxiliary.

Steam is prevented from entering the return main by thermostatic traps or other means of resistance on the return ends of the heating units and at drainage or venting points on the supply mains. There are no air valves, as such, on the heating units. With vapor systems the amount of vapor admitted to each heating unit is under throttle control at each

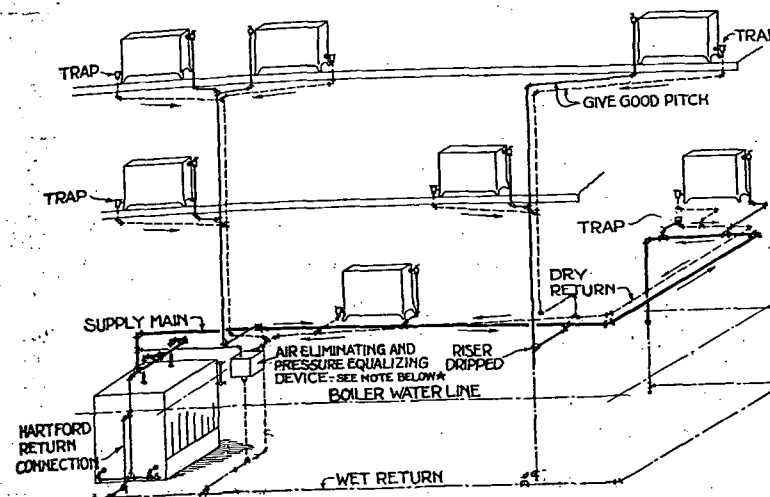


FIG. 4. TYPICAL GRAVITY VAPOR SYSTEM

*Manufacturers of vapor specialties have special appliances for pressure equalizing and air elimination. Consult the manufacturer of such devices for proper piping connections, etc.

supply valve. In addition some proprietary systems have a method of balancing steam flow by the use of an orifice with a fixed area proportioned in accordance with the size of each heating unit, while others use a supply valve which is of standard size and has an orifice that may be adjusted for each individual heating unit. In many of them the pressure in the supply main is under self-contained, automatic control.

Although in any type of two-pipe system the condensation from the heat-emitting units returns through separate piping, the condensation from radiator branches and risers must return through these pipes counter to the steam. The velocity of steam flow in such pipes must be kept below a certain maximum or this water will be held up until it accumulates in sufficient quantity to produce objectionable sounds and to interfere with proper circulation.

Table 11 gives the maximum capacity and velocity of steam for two-pipe risers as determined by the Research Laboratory.