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 static head provided for the gravity return at the boiler. Fig. 10 illustrates the conversion of a conventional gravity return system to a typical low pressure system with a condensation pump. A check valve and a gate valve must always be installed between the pump discharge and the boiler. A check valve on the receiver vent will prevent the back flow of air when the system is cooling down.

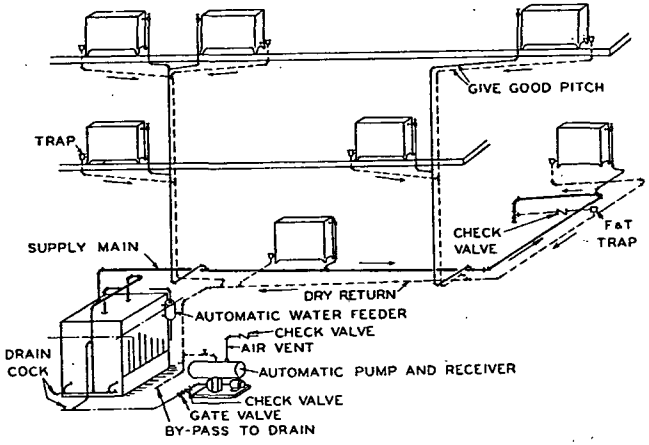


FIG. 10. TYPICAL INSTALLATION USING CONDENSATE PUMP

Two-Pipe Vapor Systems

Two-pipe vapor systems operate at pressures varying from 20 in. vacuum or more (depending upon the tightness with which the system is assembled) to 15 psig without the use of a vacuum pump. A typical two-pipe up-feed vapor system is shown in Fig. 11, and a typical two-pipe down-feed system is illustrated in Fig. 12. The method of dripping drop risers in a down-feed system is illustrated in Fig. 13. Radiators discharge their condensate and air through thermostatic traps to the dry-return main. Air is eliminated, when the system is under pressure, at the ends of the supply and return mains just before they drop to the wet return. The vent valves are of the float rather than float and thermostatic type since there should be no steam in the return main so long as the thermostatic traps on the radiators or convectors are operating properly. The float element of the valve closes the valve when, due to pressure differences, water rises to the point of overflow in the main. The vent valves are also provided with a small check disc which closes to prevent the inflow of air to the system when the pressure drops below atmospheric pressure. This enables the system

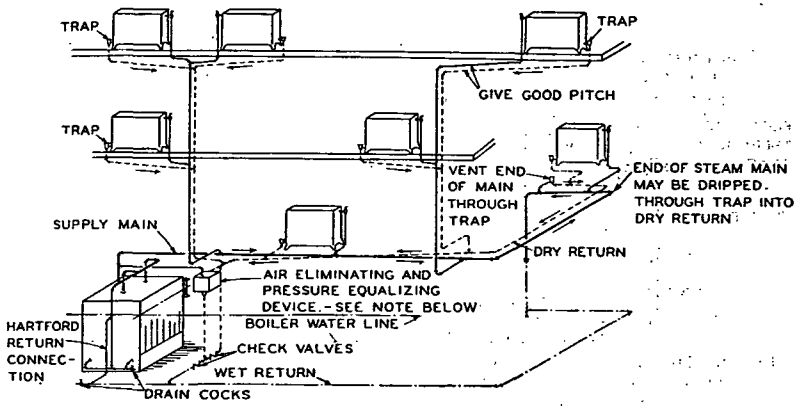


FIG. 11. TYPICAL UP-FEED TWO-PIPE SYSTEM WITH AUTOMATIC RETURN TRAP*

*Proper piping connections are essential with special appliances for pressure equalizing and air elimination.

to operate under vacuum conditions at lower steam temperatures for a period of four to eight hours, depending on the tightness of the system.

Vapor systems may also be provided with an automatic return trap or alternating receiver which automatically returns condensate to the boiler when the boiler is steaming under pressure conditions which would prevent the return of condensate by gravity. The typical connections for an automatic return trap are illustrated in Fig. 14. The two check valves are necessary for its successful operation.

Each heating unit in a vapor system, as in all two-pipe systems, is provided with a graduated or modulating valve which permits the control of heat in the radiator by varying the opening of the valve.

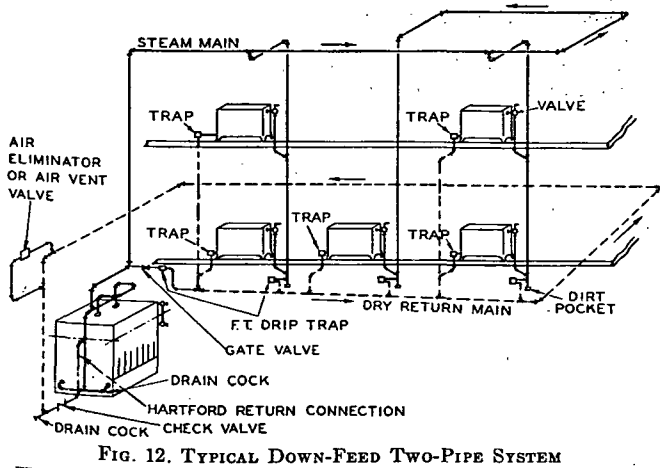


FIG. 12. TYPICAL DOWN-FEED TWO-PIPE SYSTEM

Note: When an air eliminator or vent valve is used on a vapor system, the boiler pressure must not exceed the static head necessary for the return by gravity of the condensate.