

trap, and in so doing, raise or tilt the float or mechanism which actuates a steam valve automatically. This admits steam to the receiver, at boiler pressure, and the equalizing of the pressures which follows allows the water to flow into the boiler.

Tilting Traps. With this type of trap, water enters a bowl and rises until its weight overbalances that of a counter-weight, and the bowl sinks to the bottom. As the bowl sinks, a valve is opened thus admitting live steam pressure on the surface of the water and the trap then discharges. After the water is discharged, the counter-weight sinks and raises the bowl, which in turn closes the valve and the cycle begins again. Tilting traps are necessarily intermittent in operation. They are not ordinarily equipped with glass water gages, as the action of the trap shows when it is filling or emptying. The air relief of tilting traps is taken care of by the valves of the trap.

Chapter 16

PIPING FOR STEAM HEATING SYSTEMS

Operating Characteristics, Steam Flow, Pipe Sizes, Tables for Pipe Sizing, One-Pipe Gravity Air-Vent Systems, Two-Pipe Gravity Air-Vent Systems, Two-Pipe Vapor Systems, Vacuum, Orifice, Atmospheric and Sub-Atmospheric Systems, Boiler and Radiator Connections, Piping for Indirect Heating Units, Dripping

IT is important that steam piping systems distribute steam not only at full design load but during excess and partial loads. Usually the average winter steam demand is less than half of the demand at the design outside temperature. Moreover, in rapidly warming up a system even in moderate weather, the load on the steam main and returns may exceed the maximum operating load for severe weather due to the necessity of raising the temperature of the metal in the system to the steam temperature and the building to the design indoor temperature. Investigations of the return of condensation have revealed that as high as 143 per cent of the design condensation rate may exist under conditions of actual operation.

The functions of the piping system are the distribution of the steam, the return of the condensate and in systems where no local air vents are provided, the removal of the air. The distribution of the steam should be rapid, uniform and without noise, and the release of air should be facilitated as much as possible, as an air bound system will not heat readily nor properly. In designing the piping arrangement it is desirable to maintain equivalent resistances in the supply and return piping to and from a radiator. Arranging the piping so the total distance from the boiler to the radiation is the same as the return piping distance from the heating unit back to the boiler, tends to obtain such a result. The condensation which occurs in steam piping as well as in radiators must be drained to prevent impeding the ready flow of the steam and air. The effect of back pressure in the returns, and excessive revaporization such as occurs where condensation is released from pressures considerably higher than the vacuum or pressure in the return, must be avoided.

The piping design of a heating system is greatly influenced by its operating characteristics. Heating systems do not operate under constant conditions as they are continually changing due to variation in load. As the system is being filled with steam the pressure existing in various